

**The influence of space and place characteristics on juvenile antisocial
behaviour development: an analysis of the effect of contextual disadvantage
in Santiago de Chile**

Andreas A. Hein Willius

Wolfson College

Word count: 91,132

**Thesis submitted in partial fulfilment of the requirements for the degree of DPhil
in Social Intervention in the Social Sciences Division at the University of Oxford**

July 2015

Abstract

The fact that social problems cluster in space is not new. Spatial clustering of social problems has been described for several issues such as low educational achievement, crime and drug use, among others. One key factor that has been linked to those problems is the geographical concentration of contextual disadvantage. It has been argued that this observed correlation is only to be attributed to the fact that housing and labour markets create incentives for vulnerable people to cluster in space. Some believe that this clustering generates additional effects leading to poorer outcomes that would not have been observed in the absence of spatial clustering. The literature is unclear on the question of whether there is a “neighbourhood effect” of contextual disadvantage on problems like antisocial behaviour, and how this effect might be transmitted.

Neighbourhood studies have been subject to persistent methodological and conceptual shortcomings. These may be partly related to the high costs involved in producing new datasets with adequate spatial measures. The availability of datasets with contextual data is scarce, thus many of the published papers on the subject have drawn on a low number of different studies (usually from the US and Europe). Consequently, the possibility to generalize their findings seems to be limited. In addition, the availability of high quality data (e.g. longitudinal datasets) that can help to rule out known methodological problems is even more restricted.

In order to contribute to improving the understanding of how contextual characteristics might influence adolescent antisocial behaviour, firstly, a systematic review of longitudinal neighbourhood effects studies was conducted.

In the first part of the thesis, results from the review suggest that the evidence supporting the existence of a direct neighbourhood effect of poverty and concentrated

disadvantage on antisocial behaviour is mixed. Contextual effects of concentrated disadvantage also seemed to be highly dependent on model specification, whereby most studies finding significant main effects usually failed to include potentially relevant confounders in regression models. Commonly omitted confounders were related to baseline antisocial behaviour, parenting and peer differential association. Furthermore, evidence was generally unsupportive of the idea that neighbourhood level residential instability, neighbourhood disorder and incivility, social capital and collective efficacy or exposure to violence may have a direct effect on antisocial behaviour. Regarding institutional resources, mixed results were found. Some evidence pointed to the idea that “subcultural” variables (e.g. community level tolerance to deviance) may have an effect on reduced individual level violence. At times, it seemed that more complex models regarding how neighbourhood influences may influence behavioural outcomes might be needed.

In the second part of the thesis, data from a longitudinal study, representative of the school population of Santiago de Chile, was merged with independent contextual level information (Census tract, schools and police records) and analysed. By examining the case of Santiago de Chile, a series of ideas regarding how contextual characteristics of activity spaces might relate to the growth of antisocial behaviour diversity over time were explored and tested. Specific attention was paid to examine and discuss how contextual effects might operate, in particular, how contextual disadvantage may influence criminogenic processes of strain, social control and contagion (peer effects). In order to test the proposed hypotheses, a series of hierarchical linear growth models were estimated.

No evidence supporting the idea that different types of activity spaces (home based or school based activity spaces) may have differential effects on antisocial behaviour was found. However, results suggest that higher levels of contextual concentrated disadvantage across activity spaces significantly predicted a steeper growth of antisocial behaviour diversity over time. In spite of this, no support was found for the existence of a direct contextual effect once other covariates (i.e. baseline antisocial behaviour, strain, family level social control, contagion effects, among others) had been controlled for. The effect of concentrated disadvantage on antisocial behaviour appears to be mainly indirect; that is, mediated by other covariates. Baseline antisocial behaviour and contagion effects (peer effects) seem to play a relevant role in explaining away the effect of contextual concentrated disadvantage on the growth of antisocial behaviour scores over time.

Only partial support for the idea that strain indicators may predict growth in antisocial behaviour diversity over time was found. Additionally, mediation analysis suggests that it may seem unlikely that the effect of contextual concentrated disadvantage on antisocial behaviour would be mediated by increased levels of strain. In spite of this, the effect of family level SES on the growth of antisocial behaviour diversity does seem to be partially mediated by some of the measured strain indicators. Measurement limitations (antisocial behaviour scale could only increase or remain stable) made it difficult to interpret some unexpected findings regarding strain effects.

Regarding social control variables, evidence suggested that, even though family level monitoring predicts antisocial behaviour, neither parental attachment nor monitoring seemed to mediate the effect of contextual disadvantage on antisocial behaviour. In relation to school level social control, none of the relevant measures (school value

added education and school attachment) significantly predicted antisocial behaviour in the fully specified model. Moreover, none of the hypothesized mediation effects held up, after controlling for other covariates. Regarding contagion effects (measured using peer variables), macro level concentration of juveniles with arrest records failed to predict individual level growth in antisocial behaviour diversity over time. Nevertheless, micro level concentration of antisocial peers in school and/or in activity spaces did predict growth in antisocial behaviour diversity. Results on micro level concentration of antisocial peers were subject to multicollinearity problems and thus were assessed separately. The effect of both variables (concentration in schools and concentration in activity spaces) was partially mediated by best friend's antisocial behaviour. Furthermore, concentrated disadvantage and concentration of deviant schoolmates in activity space interacted to predict a stronger relationship between affiliation to deviant peers and antisocial behaviour¹. Results are consistent with both geographic propinquity and co-offending process. , because of a low econometric reliability found for "concentration of antisocial peers in activity space", results regarding this variable are regarded as tentative.

An explanatory hypothesis of observed effects was proposed. Results may suggest that the effect of contextual disadvantage on antisocial behaviour is mainly indirect. Contextual disadvantage might be regarded as an expression of spatial clustering (social sorting) of low SES families due to housing and other governmental policies. In average, low SES families display poorer parenting skills, which might provide at least a partial explanation as regards to why higher concentration of antisocial peers (in school or activity spaces) and increased baseline antisocial behaviour scores are observed in disadvantaged contexts. In turn, higher concentration of deviant peers may

¹ This interaction effect lost its significance once concentration of deviant peers in school was dropped from the model to address multicollinearity problems.

be facilitating contagion effects. Results suggest that effects of concentrated disadvantage on antisocial behaviour might be due to simultaneous occurrence of compositional and contextual effects.

Study limitations, policy implications, and recommendations for future research are discussed.

Dedication

I wish to dedicate this thesis to my family. To my wife Marcela for being the most incredible person I have ever met. Without her support, advice and patience I would not have made it. I also dedicate it to my son Ian for his impressive patience while waiting every day for me to finish reading or writing something for my thesis. I promise I will make it up for the many un-played hours we have missed.

I would also like to dedicate the thesis to my parents. To my mother, for teaching me to be persistent and to never give up, even in face of nearly impossible situations. To my father, from whom I learned to care for other people's problems and to be outraged by poorly informed policy. I also wish to dedicate this thesis to my sister who has always challenged me to think critically about social problems.

I wish to specially dedicate this thesis to Gabriel Buzzetti, a great man who sadly is no longer with us. Your fascination and joy with human ingenuity continues to inspire me every day of my life. Until we meet again.

Acknowledgements

Doing a DPhil feels like a long journey, perhaps not because of the years that went by but because this processes may change you as a person. Beyond learning new skills and techniques and also arguing and reading and lot, the single most important thing I learned was how to exercise critical disciplined thinking. This has allowed me to improve my understanding of social interventions and to learn new ways to contribute to their development. In this regard I am grateful to have had the opportunity to be part of the Social Policy and Intervention Department.

There is no doubt in my mind that success in completing a DPhil depends on many people that support, advice and above all, challenge you. I will always be grateful to my

supervisor, Dr. Frances Gardner, for her sharp insights, always excellent advice and her support that went well beyond academic issues. I also want to thank all my teachers Evan Mayo Wilson, Paul Montgomery, Lucie Cluver, Mark Boyes and Thees Sprecklesen for their incredibly valuable advice and their generous disposition to share their experience. I would like to acknowledge Maggie Charles, who helped me to realize what “native English speaker” actually means.

I also cannot thank my examiners enough: Dr Christopher Bonell, Dr. Ben Bradford, Dr. David Humpreys and Dr. Alex Sutherland. It was quite surprising to find out that my examiners would not only assess my work but also be kind and interested people giving me generous help and advice to enrich my research.

Regrettably, I cannot acknowledge all by name, thus I would like to thank all the Staff at Wolfson College. You were always there to help, which made our family’s life so much easier.

I also had a lot of support back in my home country. I am indebted to Guillermo Wormald, Carolina Muñoz, Rodrigo Pantoja, and Darío Mellado for their support in providing “flexible office hours” so I could work on my dissertation .

Special thanks to Eduardo Valenzuela, General Marcia Raimann, and to the Ministry of Education for granting permission to access critical data sources.

And our friends Joe and Judy just for being there, and to Saima for her critical help when our son was ill.

Finally I would like to acknowledge that this dissertation would not have been possible without the fully funded scholarship provided by the CONICY (Comisión Nacional de Investigación Científica y Tecnológica), and the “BecasChile” scholarship program.

Index

Part I: Contextualisation and Thesis Overview	13
Chapter 1: Background and problem statement	14
1. The relationship between contextual concentrated disadvantage and antisocial behaviours: background and problem statement	14
2. The case of Santiago de Chile	20
3. Thesis overview	26
 Part II: Available Evidence and Theoretical Discussion	 28
Chapter 2: Neighbourhood effects on antisocial behaviour: results of a systematic review of longitudinal studies	29
1. Background and objective of this review	30
1.2. Common methodological shortcomings of neighbourhood effects research.....	33
1.3. The present review	40
2. Method	43
2.1. Review question.....	43
2.2. Inclusion and exclusion criteria	43
2.3. Search strategy	52
2.4. Critical appraisal	56
2.5. Synthesis strategy	57
3.1. Search results	59
3.2. Characteristics of included studies.....	60
3.3. Critical appraisal	86
3.4. Study results.....	95
3.4.1. Concentrated poverty, neighbourhood structure and disorder	101
3.4.2. Neighbourhood social capital	112
3.4.3. Exposure to neighbourhood violence	117
3.4.4. Neighbourhood institutions and resources	120
3.4.5. Neighbourhood culture	123
4. Summary and conclusions	129

Chapter 3: Theoretical discussion and empirical hypotheses	135
1. Introduction	136
2. Problematic operationalisation of “neighbourhoods”	137
3. From place to space: towards a “spatialisation” of neighbourhood effects research	142
3.1. Space versus place based approaches to the study of social phenomena.....	142
3.2. Awareness and activity spaces	145
3.3. Incorporating distance in the study of the relationship between space and behaviour	147
3.4. Bridging the notions of “activity space” and neighbourhood effects research: shaping opportunities to experience social influence.....	151
4. Contextual disadvantage, activity spaces and criminogenic processes: discussion of empirical hypotheses	152
4.1. Main effect hypotheses: the influence of contextual disadvantage from an activity space perspective.....	152
4.2.1. Strain and antisocial behaviour	154
4.2.2. Contextual disadvantage and strain.....	157
4.2.3. Informal social control and antisocial behaviour	163
4.2.4. Contextual disadvantage and social control	165
4.2.5. Contagion effects and antisocial behaviour	171
4.2.6. Contextual disadvantage and contagion effects	176
5. Summary of key discussion points	183
 Part III: Empirical Examination.....	185
Chapter 4: Empirical Methods Overview	186
1. Data and measures	186
2. Construction of an integrated data set and analytical sample	192
3. Data analysis strategy	202
3.1. Descriptive analysis	202
3.2. Model estimation and hypothesis testing.....	202
 Chapter 5: Building contextual level measures	208
1. Spatial aggregation strategy: census tracts vs. activity spaces	209
2. Construction of an Index of Contextual Concentration of Disadvantage	215

2.1. Indicator selection.....	218
2.2. Factor analysis	223
2.3. Spatial distribution across Santiago City	232
2.4. Spatial aggregation strategies of the Index for Contextual Concentrated Disadvantage.....	239
3. Contextual concentration of deviant peers.....	240
3.1. Contextual Concentration of Juveniles with Police Records.....	241
3.2. Proportion of Deviant Schoolmates	245
4. School Level Value-Added Education	247

Chapter 6: Building individual measures to address criminogenic processes and control variables 253

1. A note on the validity of the employed measures	254
2. Construction of the General Antisocial Behaviour Index	256
3. Indicators of strain	260
4. Indicators of informal social control	261
5. Indicators of contagion effects	264
6. Controls	265

Chapter 7: Contextual effects on antisocial behaviour: estimating main effects models 266

1. Method.....	268
2. Descriptive statistics	277
3. Model estimation	295
3.1. Traditional (Census tract based) models.....	295
3.2. Potential activity space based models.....	313
4. Chapter conclusions.....	324

Chapter 8: Examination of indirect contextual influences on antisocial behaviour: the relationship between strain and contextual variables.....328

1. Revisiting hypotheses regarding the relationship between contextual disadvantage and strain	329
2. Brief methods overview.....	333
3. Results	335

4. Chapter conclusions.....	340
Chapter 9: Examination of indirect contextual influences on antisocial behaviour: the relationship between social control and contextual variables	343
1. Revisiting hypotheses regarding the relationship between contextual disadvantage and informal social control	346
2. Brief methods overview	349
3. Results.....	350
4. Chapter conclusions	362
Chapter 10: Examination of indirect effects: the relationship between contagion effects and contextual variables	366
1. Revisiting hypotheses regarding the relationship between contextual disadvantage and contagion effects	369
2. Brief methods overview.....	372
3. Results	373
4. Chapter conclusions.....	381
Chapter 11: Conclusions: Summary, Discussion and Implications	385
References.....	409
Appendix 1: Systematic Review: data extraction and critical appraisal tool	449
Appendix 2: Observed percentage of non-response by question	453
Appendix 3: Analysis of Missing Data Patterns.....	456
Appendix 4: Systematic Review: list of excluded studies and reasons for exclusion...	464

Part I: Contextualisation and Thesis Overview

Chapter 1: Background and problem statement

The present chapter aims to introduce research questions, to provide relevant background information on Santiago de Chile as an interesting case to examine, and to describe briefly the thesis outline and structure.

1. The relationship between contextual concentrated disadvantage and antisocial behaviours: background and problem statement

The early tackling of children and youth who are engaged in antisocial and delinquent behaviour has become a growing concern for different governments around the world, because of its implications for prevention of potential future involvement in serious criminal behaviour. Research on risk factors for antisocial behaviours, like drug use or delinquency, has traditionally been focused on identifying individual, family, school and friend characteristics that increase the likelihood of adverse outcomes for children and youth (e.g. Braithwaite, 1981; Cooper, 1994; Dunway, Cullen, Burton, and Evans, 2000; Farnworth, Thornberry, Krohn and Lizotte, 1994; Sampson, 1986; Thornberry and Farnworth, 1982). Antisocial behaviour is considered to be serious matter meriting governmental intervention (Prior and Paris, 2005).

The terms “antisocial behaviour”, “delinquency”, “crime”, “antisocial personality disorder” or “problem behaviour” tend to be used indistinctly in the literature (Rutter, Giller and Hagell, 1998). The more traditional concept of antisocial behaviours defines them as behaviours that break a law, independently of the fact that those behaviours may or may not result in prosecution. For example, children or youth may engage in criminal activities but may not be prosecuted because they have not reached the legal age of criminal responsibility (Rutter, Giller and Hagell, 1998). However, views that are more contemporary suggest that antisocial behaviour may be better understood as

persistent behaviours that may be harmful to other people, but which do not necessarily break the law. Antisocial behaviours may be perceived as infringements of social or moral norms and not necessarily of the criminal law. The early manifestation of antisocial behaviours on the part of children and young people is usually considered as an indicator of risk of future engagement in criminal offences (Prior and Paris, 2005). Thus, traditional measures of antisocial behaviour may include a wide range of behaviours like drug use (Coley, Morris and Hernandez, 2004), self-reported offences (Elliott, Huizinga and Morse, 1986), or measures of clinical behavioural disorders like externalising behaviour problems (Bolger et al. 1995) or conduct disorder symptoms (Brody, Ge, Kim, Murry, Simons, Gibbons, et al., 2003; Curtis, Dooley, M. D., Phipps, 2004; Brooks-Gunn et al., 1993; Ingoldsby, Shaw, Winslow, Schonberg, Gilliom, and Criss, 2006).

In recent years, increasing attention has been paid to the influence that wider ecological contexts, like neighbourhoods, may have on antisocial behaviour (see, for example, Brooks-Gunn, Duncan, Aber, 1997; Loeber and Wikstrom, 1993; Plybon and Kliever, 2001; Schonberg and Shaw, 2007). Particular attention has been given to the relationship between a contextual concentration of disadvantage and behavioural outcomes.

The fact that social problems cluster in space is actually not new (Shaw and McKay, 1969; Wilson, 1987; Petronis, et al., 2003; Reboussin, et al., 2010; Wells, et al., 2009). As other social problems like poverty (see Wilson 1987; Jargowsky and Steiner, 1997), youth offending (Shaw and McKay, 1969), and/ or using drugs (Petronis and Anthony, 2003; Reboussin, Preisser, Song and Wolfson, 2010; Wells, Degenhardt, Bohnert,

Anthony and Scott, 2009) tend to be geographically clustered. This means that such problems tend to exist in close spatial proximity, in similar areas or neighbourhoods.

In their pioneering research conducted in Chicago, Shaw and McKay (1969) observed that juveniles with arrest records tended to reside in particular areas of the city. Moreover, they also discovered that, despite population turnover leading to changes in the composition of these communities over long periods of time (1900-1933), high rates of juvenile offenders remained stable within those areas. Since Shaw and McKay's research, increasing attention has been paid to the influence that wider ecological contexts may play in explaining antisocial behaviours (see, for example, Brooks-Gunn, Duncan and Aber, 1997; Loeber and Wikstrom, 1993; Plybon and Kliwer, 2001; Schonberg and Shaw, 2007). A wide range of studies have found that place characteristics, like concentrated disadvantage, are at least correlated with a wide range of problems like depression (Curry and Latkin, 2003), distress (Hill, Ross and Angel, 2005) and poor educational outcomes (Crowder, South, 2003; Owens, 2010; South, Baumer and Lutz, 2003), among others.

Even though it is common to find this type of geographic clustering, the reasons why these spatial patterns are observed are far less clear. On one side, it is believed that clustering may be due to *compositional effects*. This means that observed area effects are caused by selection effects where “at risk” or “vulnerable” individuals and families come to live into particular areas due to a complex interplay of labour and housing markets and government policies (Jargowsky, et al., 1997), such as, for example, social housing policies. Others believe that the concentration of disadvantaged individuals may produce emergent characteristics (known as contextual effects) that may have an independent effect on behaviour. Neighbourhood effects research has been focused on

testing if area level characteristics may have a contextual effect on antisocial behaviour (Shaw and McKay, 1969; Wilson, 1987).

One key issue related to the low clarity on why social problems cluster in space lies in the obvious difficulties implied in implementing causal level research regarding neighbourhood effects. Setting up high quality (i.e. experimental) studies involving manipulation of contextual variables involves important practical and ethical problems. These problems usually result in pervasive methodological shortcomings that are commonly found in neighbourhood effects studies (Sampson, et al., 2002). Recurrent methodological problems include issues related to design, sampling, defining neighbourhood boundaries, “same source bias”, model specification, and analysis strategies (these issues will be thoroughly discussed in Chapter 3). These problems have usually been considered to be serious enough as to make it difficult to attribute a causal link between area level variables and developmental outcomes (Gephardt, 1997; Sampson and Raudenbush, 1999; Ingoldsby and Shaw, 2002).

In addition, in the rare occasions where experimental studies have been possible, as in the case of the United States (US) based desegregation projects “Moving to Opportunity” (Kling, Ludwig and Katz, 2005; Leventhal and Brooks-Gunn, 2003; Larry, Orr et. al., 2003) and the “Yonkers Project” (Fauth, Leventhal and Brooks-Gunn, 2007) results have been mixed and sometimes contradictory. Additionally, even though these studies have linked changes in contextual poverty to changes in behavioural outcomes (antisocial behaviour), mechanisms through which contextual variables may exert its influence are not thoroughly explored. Results of these studies may suggest that the relationship between contextual level concentrated disadvantage and individual level variables (e.g. family characteristics) may be more complex than anticipated.

Furthermore, the greater majority of neighbourhood effects studies have been conducted in the US, and are based on a small number of different datasets (see Chapter 2).

If the understanding of the relationship between contextual concentration of disadvantage and antisocial behaviour is to be improved, more research addressing contextual effects in non-US regions and countries must be encouraged. Despite the fact that it is very difficult to implement experimental research, other high quality research designs, like longitudinal observational studies, may also be encouraged.

It is important to point out that, neighbourhood effects research seems to have been mostly focused on testing the “main effect” of neighbourhood concentrated disadvantage, and less on understanding implied mechanisms. Researchers addressing the “main effects” question seek to test whether there is (or not) a contextual effect of neighbourhood level disadvantage on developmental outcomes. This has been usually done by estimating different types of regression models and observing if contextual disadvantage still remains significant after all other reasonable controls have been taken into account. If it is, a neighbourhood effect is usually claimed to be found.

Findings of previous studies suggest that the effect of neighbourhood level concentrated disadvantage on individual outcomes is usually not strong (Mayer and Jencks, 1989; Kroneman, Loeber and Hipwell, 2004; Ingoldsby and Shaw, 2002). In addition, it seems that neighbourhood characteristics may be more likely to affect developmental outcomes in an indirect rather than a direct way (Murray and Farrington, 2010). It has also been suggested that these results might not even be attributable to neighbourhood poverty itself, but to other processes (e.g. population turnover and racial segregation) (Gephardt, 1997).

In this thesis, it will be argued that, rather than establishing if there is a marginal effect of contextual concentration of disadvantage on antisocial behaviour, it seems more relevant to explore which possible covariates might explain this effect away. It is expected to help in improving our understanding of potential linking mechanisms between contextual characteristics and behavioural outcomes and to illuminate the “black box” of neighbourhood effects (Van Ham, and Manley, 2012).

Thus, the present thesis aims to answer two overarching questions:

- i) Does contextual level concentration of disadvantage influence antisocial behaviour?
- ii) Is there evidence of a direct effect, or is the relationship between contextual concentrated disadvantage and antisocial behaviour indirect?

These questions are explored by i) conducting a systematic review of longitudinal studies addressing neighbourhood effects on antisocial behaviour, and ii) testing empirical hypotheses regarding the relationship between contextual disadvantage, key criminogenic processes (strain, informal social control and contagion effects) and antisocial behaviour. In order to do so, results of a representative longitudinal study conducted in Santiago de Chile will be examined. This longitudinal survey follows up a representative cohort of school level juveniles that has been linked with contextual level data.

Empirical testing sought to overcome shortcomings in the previous literature on the subject by i) using longitudinal data, ii) avoiding same source bias, and iii) explicitly acknowledging the spatial location of key developmental domains (home, school and peers) (see chapters 2, 3 and 4). Additionally, one key issue explored in the thesis concerns how contextual characteristics may be measured and aggregated to better reflecting contextual exposure patterns of studied subjects.

To the best of the author's knowledge, no longitudinal studies linking independently measured contextual variables with individual level measured variables to explain antisocial behaviours have been conducted in Latin America. Consequently, the present thesis contributes to an expansion of the empirical literature relating to countries other than the US.

Since the empirical part of this thesis will be focused on Santiago de Chile, the next section of this chapter describes some relevant background on the city. Particular attention will be paid to describing how historical social housing policies have contributed to shaping the presently observed spatial distribution of a disadvantaged population across Santiago.

2. The case of Santiago de Chile

In a context where most of the contextual effects research has been conducted in the US, United Kingdom (UK), and some Nordic countries, it is considered very relevant to expand the present literature by examining other countries and cities that may have different historical and policy development backgrounds. , it can be argued that the case of Santiago de Chile presents an interesting opportunity as regards addressing specific questions related to the impact of concentrated poverty on antisocial behaviours.

Santiago was founded in 1541 and has been the capital city of Chile since colonial times. Its current population is approximately 6,5 million inhabitants.

Chilean economic indicators are among the best in Latin America. However, when compared to members of the Organisation for Economic Cooperation and Development (OECD) Chile shows one of the highest levels of child poverty (OECD, 2011) and income inequality distribution (OECD, 2012).

In this context, each year between 70,000 and 90,000 police contacts involving under-aged² children and youth engaging in delinquent acts are registered. Studies have shown that between 16% and 25% of arrested juveniles will experience repeated police contacts within a four year period (Hein, 2014; Hein and Sepulveda, 2005; Hein et al., 2009). When analysing the geographic distribution of home addresses of arrested juveniles, some intriguing patterns have been found.

Nearly 50% of all police contacts involving under-aged children were attributable to children and youth living in only 35 of the 346 Chilean municipal districts, suggesting a high level geographic clustering. In addition, preliminary geographic density analysis performed in five of those districts located in Santiago City, also showed that there was a marked tendency for arrestees' residences to be located within no more than three distinct neighbourhoods in each district (Hein and Sepulveda, 2005). Those districts were usually perceived as "difficult to deal with" and sometimes dangerous by local authorities. Identified neighbourhoods tended to cluster disadvantaged families living in precarious conditions or social housing estates that required continuous help or aid in the form of social benefits. These initial studies seemed to confirm that there might be a relationship between contextual concentration of disadvantage and antisocial behaviour. Questions remain, however, about the nature of this relationship (Hein and Sepulveda, 2005).

Considering these results and the results of previous research, it might be thought that the observed levels of spatial clustering of addresses of juveniles with arrest records is somehow related to the distribution of the disadvantaged population across the city³.

² I.e. 17 years old or younger.

³ This will be empirically tested in chapter 4.

One interesting aspect of Santiago City is that its current geographical distribution of concentrated disadvantage has been shaped by a series of distinctive governmental policies that can be traced back to the late 19th century. In 1880, rising concerns about the quality of life of working class people living in city slums compelled the Chilean government to design solutions in response to various related problems. Since slum inhabitants were usually affected by a wide range of diseases as a consequence of a lack of access to fresh water sources and basic services, the first set of governmental policies tackled problems related to improving hygiene conditions. It was only after? 1925, that the government started to incentivise the construction of new housing estates and to facilitate mortgage loans for working class families. In spite of these efforts, the housing deficit quickly increased, particularly after an industrialisation process was initiated in the central zone of the country (MINVU, 2004). During this period, migration brought about a massive increase in the population in central cities (Santiago included). Increased population levels, along with insufficient levels of affordable housing and lack of tenure security, contributed to rising levels of family poverty and vulnerability. Consequently, between the 1960s and 1970s, hundreds of families organised and began to illegally occupy vacant lands throughout the cities and their surroundings (MINVU, 2004).

These were called “tomas de terreno”⁴ (Sepulveda, 1998, Lunecke, 2009) and they resulted in the emergence of new slums that provided extremely poor living conditions. Houses were made of pieces of tin, scrap lumber and cardboard, and the people living in them lacked access to basic services. As illegal settlements increased, the government struggled to devise strategies for dealing with this problem. Since building housing estates and facilitating loans were already an established strategy, the government

⁴ Means “land occupation”

concentrated on eradicating these households and moving them to the outskirts of the city. However, in the face of scarce housing alternatives, other families in the same situation immediately occupied vacated land again (MINVU, 2004). These eradications and other contemporary housing policies contributed to building increasing levels of socioeconomic segregation (Hidalgo, 2004; Cepal, 2001).

In the 1970s, during the government of the “Unidad Popular” (1970-1973), housing policies became a priority. Access to housing was defined as a right for all families that should not be traded for profit. Policies intended to reduce segregation, to improve the integration of families that settled in the periphery by improving service access, greenery and the reduction of home-work distance, among others (MINVU, 2004). However, according to several authors (Chamorro, 2013; Hidalgo, 2004; MINVU, 2004) the aims were overambitious and it was not possible to accomplish them with the available recourses. Therefore, no significant improvement for working class families was observed during this period.

As regards understanding Chilean housing policies, a significant period began in 1973, with the rise of the military dictatorship that lasted until 1990. Within this regime, a new policy framework emerged that proposed a different model for managing housing policies: this time though, based on the application of strict free market economy principles. However, this policy presented serious problems (MINVU, 2004; Chamorro, 2013; Hidalgo, 2004).

In the case of Santiago City, problems like a sharp increase in city level socioeconomic segregation was present. Large-scale removal of families living in “campamentos” and their forced migration to the city outskirts was implemented. It is estimated that around 172,000 persons were mobilised during those forced migrations. In the context of an

unregulated land use, social housing projects were usually build in the city outskirts because those lands were the cheapest alternative as regards building social housing (MINVU, 2004; Chamorro, 2013; Hidalgo, 2004).

Consequently, working class families relocated to severely underserved areas far away from public transport, schools, medical services, markets and job opportunities, among other lacking amenities (MINVU, 2004; Hidalgo, 2004; Chamorro, 2013; Sabatini, 2000). In addition, in 1981, in order to create homogenous areas in terms of social composition, the military regime also created new municipal districts in Santiago. It is notable that out of the ten new municipalities, five concentrated about 70 percent of all relocated household's (Hidalgo, 2004). On the other hand, anecdotal evidence suggest that another group of municipalities located in the central and eastern parts of the city, from where vulnerable families had been removed, seemed to have obtained important benefits, such as lowering of crime rates and important revenues from the building of large housing projects in lands that were now free from slums (Hidalgo, 2004).

Even though the negative effects of these measures were later recognised, and new housing projects were developed, these new projects were, however, targeted at improving family living conditions within the same location (Hidalgo, 2004)⁵, and thus had little effect in reducing previously achieved socioeconomic segregation. During this period, even though there was a substantial increase in available housing solutions for vulnerable families, this increase was not sufficient to meet the demand. In this context, many families moved in together with other families that had already benefitted from receiving a basic social house, leading to an increased number of families living in overcrowded conditions (Hidalgo, 2004).

⁵ The municipalities that benefited were Peñalolen, La Pintana, Recoleta, Maipú, La Florida, Renca, El Bosque y Cerro Navia (Hidalgo, 2004)

Since 1990, with the reinstitution of democracy, even though significant efforts have been directed towards increasing the number of houses and access to basic services (schools, markets, transportation, among others) socioeconomic segregation is still an issue. Nevertheless, many government housing projects are being implemented to benefit particularly poor municipalities.

Chilean housing policies have been criticised by several authors that recognised their negative effect on increased levels of socioeconomic segregation (Hidalgo, 2004; Chamorro, 2013), generating a “ghetto effect” (Sabatini, 2000; Sabatini, F., Cáceres G. and Cerda J. 2001 and Atisba, 2010), and affecting educational and work opportunities (Larrañaga and Sanhueza, 2007).

Since the year 2000, a wide range of programs and policies targeting under-aged children and youth who show persistent levels of antisocial behaviour, and are thus deemed at risk of being involved in future criminal activity, have been implemented. Even though many individual and family level preventive interventions have already been rolled out, there is still the question if observed geographical clustering patterns may have meaningful implications for designing and implementing effective prevention interventions. If so what kind of implications?

It is expected that improving empirical knowledge on this subject will help to inform early prevention initiatives, improving the likelihood that such initiatives will achieve positive outcomes. This is particularly worrying in Latin America, where many early prevention initiatives do attempt to target neighbourhood level variables, without clear evidence of the usefulness of these efforts or of whether the selected intervention targets are adequate (Fruhling, 2012; Vanderschueren, 2007).

3. Thesis overview

The present thesis is structured into 3 main parts, and 11 chapters. The first part (Part I) has been focused on providing an overview of the thesis background and questions.

The second part (Part II) will focus on examining the available evidence on contextual effects, and empirical literature. Chapter 2 will present a systematic review of longitudinal studies on neighbourhood effects. Chapter 3 will expand on the discussion systematic review findings. Recurrent problems related to conceptualisation and measurement issues will be discussed. Notions of space, place and neighbourhoods will be confronted and the implications of their use in research will be discussed. In the second section of Chapter 3, literature relating to the relationship between contextual variables and key criminogenic processes (strain, social control, and contagion) are examined and empirical research hypothesis are discussed. At the end of this chapter, a summary of the empirical research hypothesis (to be tested in Part III) are formally presented.

The third part of the thesis (Part III) focuses on testing empirical hypothesis regarding the relationship of contextual disadvantage, criminogenic processes, and antisocial behaviour. In addition, new ideas regarding potential differential effects that different types of activity spaces might have on antisocial behaviour are explored. Chapter 4 provides an overview of the empirical methods that are used to test the proposed hypotheses. Chapter 5 describes empirical methods used to construct contextual level measures (a contextual concentrated disadvantage index, contextual concentration of juveniles with arrest records, and the school value-added education index) and the different types of spatial aggregation strategies that are used (census tract based vs potential activity space perspective). Chapter 6, describes the construction of measures

of criminogenic processes and control variables. Later in Chapter 7, main effects models are estimated, and results are discussed. Particular attention is paid to compare results from models based on different spatial aggregation strategies (traditional vs. census tract). Chapters 8, 9 and 10 proceed to testing for hypothesised interaction and mediation effects. Each chapter is focused on a distinct criminogenic process, namely: strain (Chapter 8), informal social control (Chapter 9), and contagion effects (Chapter 10).

In the last chapter, 11, a summary and discussion of research findings is presented. Implications for research and policy are discussed.

Part II: Available Evidence and Theoretical Discussion

Chapter 2: Neighbourhood effects on antisocial behaviour: results of a systematic review of longitudinal studies

1. Background and objective of this review

The present chapter presents the results of a systematic review aiming to assess if the available evidence from longitudinal studies supports the hypothesis that neighbourhood characteristics predict antisocial behaviour outcomes in nine to twenty year old children and juveniles.

A literature review may serve a wide range of purposes, such as examining theories, finding the balance of evidence regarding a specific topic, or providing the basis for proposing interventions (Petticrew and Roberts, 2006). A systematic review refers to a specific type of literature review that is increasingly used as a scientific tool. In a context of information overload, where studies sometimes provide seemingly conflicting or contradictory results, systematic reviews seek to help researchers and decision-makers to organise and prioritise the most relevant information.

Systematic reviews are literature reviews that closely adhere to a set of scientific methods that explicitly seek to limit systematic error (bias) by attempting to identify, critically appraise, and synthesise all relevant studies to answer a particular question. To do so, systematic reviews set out a detailed plan of their methods before the actual review begins (Petticrew and Roberts, 2006).

For the present thesis it was considered necessary to assess if the available evidence supports the idea that contextual characteristics like contextual concentrated disadvantage may influence of antisocial behaviour in juveniles in the age range that is of interest.

Even though the available evidence seems to suggest that characteristics of wider ecological contexts like poverty may have an impact on behavioural problems (see

Wilson, 1987; Jargowsky and Steiner, 1997; Shaw and McKay, 1969; Petronis and Anthony, 2003; Reboussin, Preisser, Song and Wolfson, 2010; Wells, Degenhardt, Bohnert, Anthony and Scott; 2009), the explanatory mechanisms of this phenomena are less clear. This lack of clarity could, at least partially, be attributed to a series of methodological problems that seem to be common in the neighbourhood effects literature.

This review is not limited to the selection of studies examining the effect of contextual concentrated disadvantage, but also includes studies addressing any kind of contextual level characteristic and its effect on antisocial behaviours.

Several previous reviews of neighbourhood effects are available. One central query driving these reviews has been the “main effects question”. Researchers addressing the main effects question seek to test whether there is, or is not, a direct contextual effect of neighbourhood level characteristics on developmental outcomes. Even though neighbourhood effects literature has explored a very wide range of neighbourhood variables that may have an impact on antisocial behaviours (e.g. poverty, disorder, social capital, violence, etc.), previous reviews have focused primarily on two of these variables: the effect of neighbourhood disadvantage and the effect of exposure to neighbourhood violence.

According to Gephhardt (1997), because of a marked increase in geographical poverty concentration and segregation indicators in urban areas, increased research interest addressing the impact of socioeconomic and political forces on family and individual outcomes was observed in the 1990s. Several reviews looking at this relationship have concluded that children living in poor and disadvantaged areas are at higher risk of having negative experiences and developmental outcomes. Negative outcomes include

issues like abuse, infant mortality, low birth weight (Gephardt, 1997), crime and behaviour problems (Kroneman, Loeber and Hipwell, 2004; Ingoldsby and Shaw, 2002), low achievement, lower graduation rates, early labour market experiences and teen pregnancy rates (Mayer and Jencks, 1989).

Nevertheless, most reviewers agree that the evidence for existence of a main effect of neighbourhood level variables is not strong (Mayer and Jencks, 1989). Furthermore, if effects are found, their size is usually small to moderate (Kroneman, Loeber and Hipwell, 2004). For example, Ingoldsby and Shaw (2002) conclude that “economic disadvantage” variables are not strongly related to the initiation or progression of early-onset antisocial behaviour. In addition, research suggests that these results might not be attributed to neighbourhood poverty itself, but to other processes like population turnover and racial segregation. These processes may in turn lead to increased levels of concentration of poor people in particular neighbourhoods (Gephardt, 1997). Neighbourhood characteristics are also said to be likely to affect developmental outcomes in an indirect rather than a direct way, for example moderating the relationship between other variables (Murray and Farrington, 2010).

The other main neighbourhood characteristic that has received a high level of research attention is exposure to neighbourhood violence. Several reviews have addressed the problem of neighbourhood violence and its implications for developmental outcomes. For example, in their review Aisenberg and Herrenkohl (2008) assert that research has demonstrated that exposure to community violence is a significant risk factor for the development of emotional and behavioural problems among young people, including violence and crime. In the same way, Ingoldsby and Shaw’s (2002) review concludes that evidence suggests that “exposure to community violence,” seems to facilitate the

initiation of an antisocial behaviour pathway. In another review based on a meta-analysis of 114 studies, Fowler, Tompsett, Braciszewski, Jacques-Tiura, and Baltes (2009) concluded that community violence also had significant effects on posttraumatic stress disorder (PTSD) and the externalising of behaviour problems. Smaller effects on other internalising symptoms were also observed.

Only very recently (June 2014) a new systematic review of multilevel studies on social and socio-demographic neighbourhood effects on adolescent alcohol use was published (Jackson, Denny and Ameratunga, 2014). The authors identified 23 studies, examining 11 different neighbourhood-level exposures. The majority of studies found no associations with residential mobility, neighbourhood disorder or crime, employment or job availability, neighbourhood attitudes to drinking, social capital and collective efficacy. In the case of neighbourhood-level socio-economic disadvantage, mixed results were reported.

1.2. Common methodological shortcomings of neighbourhood effects research

Even though the neighbourhood effects literature is vast, several reviews have identified a number of common methodological problems in this field. These problems are usually serious enough to make it difficult to attribute a causal link between area level variables and developmental outcomes (Gephardt, 1997; Sampson and Raudenbush, 1999; Ingoldsby and Shaw, 2002). The most important problems are related to research design, sampling, neighbourhood boundary definitions, measurement, model specification and analysis. Some of these problems can be serious enough to cast doubts on study results.

a) Design problems: As stated before, the neighbourhood effects literature is vast, but it is also somewhat limited. Most studies are based on cross sectional designs. Although cross sectional designs allow testing correlations while controlling for confounders (statistically or through a group comparison), they cannot establish the temporal sequence in which participating variables occur. This is an important condition must be met in order to increase confidence about inferences regarding causal relationships (Murray, Farrington and Eisner, 2009). Among others, when cross sectional designs are used, neighbourhood level effects might be confounded by selection or individual level effects.

Although experimental designs would normally be preferred, due to their capacity to control for unknown confounders, practical problems involved in randomising persons to neighbourhoods make this a very difficult task to achieve. Hence, limited experimental research regarding neighbourhood effects is available. In addition, existing experimental research (see, for example, the Moving to Opportunity Project) has been able to provide only limited insights on intervening mechanisms that may explain the observed outcomes (Ludwig et. al, 2008).

For the purpose of studying neighbourhood effects on developmental outcomes, longitudinal designs might be considered the next best design. This is because they have the capacity to establish a temporal sequence, to rule out reverse causation (Murray, Farrington and Eisner, 2009; Duncan and Raudenbush, 1999), to study change and its determinants, and to address how relationships between variables depend on time (Frees, 2008). Furthermore, longitudinal data analysis techniques provide some

alternatives for dealing with problems related to unmeasured variables (Dougherty, 2007).

b) Sampling problems: Two main sampling problems have usually been described. The first relates to the adequacy of sampling strategies to enable ecological inference. Good ecological measures, (referring to ecological units, usually groups of people like organisations and neighbourhoods) maximise variability between ecological units (i.e. neighbourhoods) and minimise variability within ecological units (Raudenbush and Sampson, 1999). It is common for neighbourhood studies to select intensive samples that are drawn only from similar neighbourhoods (e.g. including only poor neighbourhoods), or a low number of different kinds of neighbourhoods. This strategy is problematic because it maximises variability between sampled individuals within those neighbourhoods (within neighbourhood-variability), but minimises between neighbourhood variability. Studies attempting to make contextual inferences must ensure that the sample comprises a heterogeneous group of neighbourhoods (Leventhal and Brooks-Gunn, 2000; Duncan and Raudenbush, 1999). The second common sampling problem is related to the use of non-random (convenience) samples of individuals or the use of samples drawn only from vulnerable populations (e.g. only juveniles with arrest records, only poor or only immigrant groups, among others). This is problematic because some individual characteristics of vulnerable populations (e.g. African American and poor) have shown to be strongly correlated with living in distressed neighbourhoods. If selection effects exist, then this lack of variability might introduce bias.

c) Neighbourhood boundaries definitions: Another common issue refers to the definition of neighbourhood boundaries. Due to dataset availability, many studies use census tract boundaries to define neighbourhoods. This is problematic because it

ignores people's routine activities and how natural social ties and organisations may distribute themselves through space. How boundaries are defined may also have an important impact on the final results. This is known as the “modifiable area unit problem” (MAUP). The MAUP refers to the fact that, for the analysis of spatially aggregated data, results will depend on the size and boundaries of areal units for which the data is reported (see Fotheringham, Brundson and Charlton, 2000). This implies that different results can be obtained for the same dataset merely by changing either the scale of the aggregation (scale effect), or the way the boundaries of the areas have been defined (*zoning effect*) (Fotheringham et. al., 2007; Dark and Bram, 2007). A strategy alternative approach is to define neighbourhoods based on community perceptions (Leventhal and Brooks-Gunn, 2000). Implications of the selection of area units are rarely discussed in the literature.

d) Measurement problems: Two critical measurement problems have been described. The first relates to the informant dependence of measures, also called “same source bias” (Diez-Roux, 2007). In an ideal research design, measures of contextual or neighbourhood variables should be independent from measures of individual data. This is not always the case. For example, if a self-report survey is used to correlate child antisocial behaviour report with the child's own perceptions of neighbourhood dangerousness, this analysis would be at risk of bias. This because children frequently engaging in antisocial behaviours may, because of their behaviours, expose themselves to more neighbourhood danger, and not the other way around. To avoid this type of problems, independent measures of neighbourhood characteristics should be preferred (Sampson and Raudenbush, 1999; Duncan and Raudenbush, 1999). A second critical problem relates to the construct validity of several commonly studied neighbourhood variables. In a review conducted Morenoff and Gannon-Rowley (2002) the authors

found little consistency across studies in the way neighbourhood, social and institutional processes were operationalised. It might be possible to attribute this to the fact that the most common used data sets are census based, thus a very restricted number of theoretically pertinent variables may be available. Sampson et. al. (2002) also observed that neighbourhood variables usually show high levels of inter-correlations, which casts doubts on the discriminant validity of tested concepts. Furthermore, information on psychometric or econometric properties (see Sampson and Raudenbush, 1999), especially external validity of area level measures, are usually not reported or not even tested (Hein and Gardner, 2011).

e) Model specification: Due to the nature of neighbourhood effects research, multivariate statistical modelling is the most commonly used analytical approach. Statistical controls are needed to adjust for the effect of relevant individual level variables that might confound the observed neighbourhood effects. Tested theoretical models might suffer from specification problems due to a failure to include relevant variables. Omitted variables (i.e. not including relevant mediators, moderators, or confounders) will lead to biased neighbourhood estimates, usually involving an overestimation of the marginal effect. Adequate information to test theoretical relationships might not always be available, facilitating omitted variable bias (Leventhal and Brooks-Gunn, 2000). Several relevant individual level confounders usually need to be included in the model in order to control for the most obvious individual level effects. Relevant confounders that should be controlled include, but might not be limited to, individual demographics (sex, age) and family poverty or socioeconomic status. One of the most critical confounders that need to be included is family level socioeconomic status. Possible self-selection of poor families in poor neighbourhoods needs to be taken into account. In addition, neighbourhood poverty is one of the most

commonly studied neighbourhood factors. The need to control for race may vary for different countries. Controlling for race might be crucial in studies conducted in the US, but may not be necessary in studies conducted, for example, in Chile. An adequate model specification has been considered as one of the main strategies for dealing with self-selection bias. Although this is a subject which can be debated, if a neighbourhood characteristic retains a significant effect on developmental outcomes once other individual level variables have been controlled, this has usually been accepted as evidence of an independent contextual effect.

f) Analysis problems: Recurrent problems have also been described in relation to usually employed analysis strategies. Clustered samples are a common feature of neighbourhood effect research. Usually, when data are clustered, hierarchical statistical models should be preferred. Failure to take into account possible sample clustering will result in wider confidence intervals, increasing the risk of type I errors in statistical inference. A second problem, related to measurement issues is that of the high risk of multicollinearity that the low discriminant validity of area level variables poses for classical regression analysis. A high correlation between explanatory variables may lead to larger standard errors of the coefficients, thus increasing the risk of obtaining erratic estimates (Dougherty, 2007).

In sum, an ideal (non-experimental) type of study aiming to explore questions about the main effects of neighbourhood characteristics on individual level outcomes should:

- Use a longitudinal design, allowing individual and contextual level measures to vary across time.

-Draw a random sample that is representative of general population. It would avoid sampling only economically deprived or institutionalized people. In addition, sampling would need to ensure between-neighbourhood variability.

-It would define neighbourhood level boundaries by a combination of theoretical reasoning and empirical testing. It would not rely only on existing administrative data like census tracts.

-It would avoid “same source bias” by using contextual level variables that are measured independently from individual level outcome variables.

-It would pay special attention to carefully defining a model specification that accounts for key confounding factors.

1.3. The present review

Previous reviews have generally had a limited scope, examining only one type of outcome (e.g. alcohol use) or neighbourhood characteristic (e.g. disadvantage or exposure to community violence) at one time. In addition with the sole exception of Jackson et al. (2014) no previous reviews have included an explicit analysis of methodological quality of included studies and addressed how this might affect the review conclusions.

Two previous reviews have used a systematic approach. The first one was conducted by Fowler et al. (2009) and addressed the impact of exposure to neighbourhood violence on internalising/externalising behaviour problems and post-traumatic stress disorder. Results of this review might be misleading because they only used unadjusted effect sizes. Therefore, relevant confounders that may explain this effect may have not been controlled for in this research. The second relevant review was conducted by Jackson et al. (2014). As mentioned earlier, even though this review focused on multilevel studies, limited attention was paid to model specification (e.g. controlled confounders) and how this might affect the interpretation of results. It is also important to add that, that even though a large amount of research has been developed, there is still seems to be difficult to understand what specific neighbourhood characteristics might affect which developmental outcomes, and how this is possible (Ludwig et. al, 2008).

The present study seeks to overcome the shortcomings of previous reviews in four ways:

-Performing a systematic review of the literature that uses explicit and transparent search, selection and appraisal criteria.

-Including only high quality research that addresses the previously identified methodological problems. Therefore, the present review focuses only on longitudinal studies. In addition, study inclusion criteria were specifically designed to identify (and to exclude) neighbourhood effect studies with critical (usually also typical) methodological problems.

-Focusing on more than one antisocial behaviour type. As long as methodological quality criteria are met, any study measuring at least one neighbourhood level variable and at least one antisocial behaviour was included. This will facilitate obtaining a comprehensive picture of the neighbourhood level influences that have been only theorised and or tested in lower quality studies, and to identify those that have been tested using higher quality research designs. This will help to find research gaps.

-Focus on adjusted effect sizes. In the case of reviews and meta-analysis of risk factors, it is usual to focus on unadjusted effect sizes or simply not to specify what confounders need to be controlled. In the case of neighbourhood research, given the fact that variables tend to be correlated, the interpretation of unadjusted effects sizes (e.g. bivariate correlations) could be seriously misleading. Given the fact that typical neighbourhood effect studies are based on regression modelling, the main interest of the present review is to identify, interpret and to assess the methodological quality of particular regression slopes. The regression slopes that are of interest are those that express the adjusted relationship between a neighbourhood level variable and an antisocial behaviour outcome. A priori, no particular metric (e.g. linear, odd ratio) modelling strategy (e.g. linear, binary logistic, structural equations modelling, etc.) or estimation method (ordinary least squares, maximum likelihood, etc.) has been excluded. Jackson et al. (2014) would argue that only multilevel studies are suited to address

neighbourhood effects. In this review, it will be argued that multilevel modelling is meant to address clustering, when it is present in the data. When it is not present in the data (although studying a clustered phenomenon), multilevel modelling may not be necessary. The key issue was to ensure that included studies would maximize variability between ecological units (i.e. neighbourhoods) and to minimise variability within ecological units (Raudenbush and Sampson, 1999). This is a design feature, not an analysis feature.

2. Method

2.1. Review question

Even though systematic review questions are commonly structured in PICOT format that stands for Population Intervention, Comparison, Outcome, and Time, this strategy is not always useful as regards building review questions for risk factors. Therefore an alternative format was developed: a PROM format question. PROM is an acronym devised to structure four relevant aspects to organise inclusion and exclusion criteria for risk factors studies. These are **P**opulation, **R**isk factor, **O**utcome and **M**ethod.

Following the proposed structure, the review question is: *Do high quality longitudinal studies provide evidence that neighbourhood level characteristics can predict antisocial behaviour in nine to twenty year old children and juveniles?*

2.2. Inclusion and exclusion criteria

This topic, unlike other reviews, required a two-stage selection process. The first stage, as in most reviews, focused on the selection of studies that met formally predefined inclusion criteria (see 2.2.1). Unlike typical intervention studies, observational studies test more than one model with different specifications. This leads to an estimation of more than one effect size (slope) for the same relationship under different control conditions. In addition, a significant number of studies used similar or overlapping datasets (samples). Therefore, in the second stage (see 2.2.2.), the best effect size between studies using the same dataset and then within one particular study had to be selected. In any given study, a particular slope (effect size) could be included while others were excluded. The selection criteria are described below.

2.2.1. First stage: study selection

a) Population

The review included studies targeting juveniles aged between nine and twenty years of age. This age range was selected because it is the one in which most serious antisocial behaviours leading to potential delinquent involvement increase and reaches their peak (Petersilia, 1980). It was also expected that extra-familial environments like neighbourhoods would have a more direct influence on behaviour within this age range rather than at an earlier age (Wikstrom and Loeber, 2000).

In addition, the sampling strategy should ensure a representative (random or multistage) and heterogeneous or otherwise representative sample of juveniles.

Studies were excluded if the sample comprised:

- i) *Only disadvantaged subgroups:* e.g. only poor juveniles or only a single race or ethnicity background (e.g. African American)
- ii) *Only juveniles that have been institutionalised:* e.g. psychiatric patients
- iii) *Only juveniles with crime records:* e.g. studies focusing on recidivism
- iv) *Only social or health service clients:* e.g. victims of family violence.
- v) *Only juveniles living in a rural environment.*

These exclusion criteria were defined a) in order to include only studies that can be generalised to the general population, and b) to avoid potential risk of bias due to studying only at risk populations. As Wikström and Loeber (2000) suggest, the impact of neighbourhood characteristics may be less relevant for high risk populations, than for low or mid-level risk populations. This could lead to the conclusion that neighbourhoods do not have an effect on antisocial behaviour, when in fact they may

have such an effect. On the other hand, strong selection effects in disadvantaged neighbourhoods have been linked to particular characteristics like for example race (e.g. African American, see Wilson, 1987). These kinds of studies may lead to attribute to the neighbourhood effects that may actually explained by individual level variables. Therefore, studies including only one race or only estimating separated slopes by racial groups were excluded. On the other hand, studies focusing only on boys or girls were eligible. There were no reasons to suspect selection effects related to gender.

vi) *Non-random or convenience sample*: Finally, any study based on convenience, intentional or any non-random sampling strategy was also excluded.

b) Risk factor

Even though it is usually not explicitly stated, the main reason why neighbourhoods are a relevant unit of analysis is because they are assumed to be “the smallest form of social organization outside of the family (...)” (Ailshire, Bade, Morenof and Meldendez, 2010, p.3). According to the authors, neighbourhoods are socially defined entities that share common boundaries that can change over time, but which are essentially stable. In other words, neighbourhoods are conceptualised as a proxy to actually measure community structural and social process related characteristics. Most studies in the neighbourhood effects literature define neighbourhoods by their geographic characteristics (census tract, district, block, and so on).

Studies were eligible for inclusion if they measured any neighbourhood characteristic as a predictor of any type of antisocial behaviour. In some cases this could include variables that were the main focus of study. In other cases, neighbourhood

characteristics could have been included only as a control variable. Neighbourhood variables could include any measurable demographical (structural), social processes or institutional characteristic. Commonly measured structural variables usually focused on concentrated disadvantage (poverty levels, mean educational level, percentage of families on welfare, social isolation/segregation, and so on). Regarding social processes, commonly studied variables included neighbourhood level crime and violence (perceived or independently measured), social capital (informal social control/collective efficacy, connectedness, sense of community, among others), cultural variables (street culture) and social disorganisation (either perceived disorganisation or structural variables believed to cause social control to deteriorate, like racial heterogeneity, residential instability, physical deterioration, among others). Institutional characteristics that are usually studied include, for example, school quality, existence of youth directed services and strong local voluntary organisations.

Studies were excluded if:

i) *The design did not ensure “between neighbourhood” variability:* Even though the primary unit of analysis of the included studies is the individual, the studies that were included should ensure that enough neighbourhood level (or between neighbourhoods) variability would be present. Snijders and Bosker (1999) suggest that the power of a multilevel study is as good as the number of groups in the highest level. Therefore a two-level design with ten groups should be considered at least as inadequate as a single-level design with a sample size of ten. Following this suggestions, studies were included if they represented at least 30 neighbourhoods or level two units (e.g. schools). Finally, studies based on samples drawn only from disadvantaged

neighbourhoods were excluded. This is because this strategy reduces between neighbourhood variability.

ii) *Average neighbourhood size exceeds 8000 inhabitants:* A small neighbourhood size is usually preferable because it is related to greater within neighbourhood homogeneity. This strategy allows maximising between neighbourhood variability (Oberwittler and Wikstrom, 2009). The question arises, however, why 8000 inhabitants (rather than any other number)? This is because 8000 is the upper level size of a typical census tract⁶ in the US. Given the fact that most of the included studies were conducted in the US this criterion was chosen in order to include comparable studies in terms of area size. Across studies, census tracts are the most common form of operationalising neighbourhoods. It is considered that a higher size would lead to the inclusion of studies that may not be comparable and may not be able to reflect a neighbourhood effect, even though one might present.

Beyond these inclusion and exclusion criteria, any type of neighbourhood level variable was accepted.

c) Outcome/s

To be included, studies must report measures of antisocial behaviours or official crime records of juvenile residents in the studied area (s). Antisocial behaviours include a wide range of behaviours, such as aggression, theft, vandalism, fire starting, lying, truancy, running away, and others (Kazdin, 1987). In broad terms, antisocial behaviour is used to denote any type of behaviour that contravenes the norms of society (Rutter, 1997) reflecting social-rule violations or acts against others (Kazdin, 1987).

⁶ http://www.census.gov/geo/www/cob/tr_metadata.html

Antisocial behaviour is a broad concept that overlaps with other psychiatric or legal constructs referring to similar behavioural patterns like externalising behaviours, oppositional defiant disorder, crime, delinquency and social maladjustment (Loeber, 1991; Merrel and Walker, 2004). Nevertheless antisocial behaviour measures commonly include substance use and abuse (alcohol and drugs), property damage (e.g. vandalism), public disorderly conduct, property offences (theft, shoplifting), harming others (assault, fighting, using or concealing weapons) and truancy.

Studies were excluded if:

-None of the eligible outcome measures were free from same source bias. For example, studies where both reports on neighbourhood conditions and a child's behaviour were given by the same parent, were excluded. The same case applied to studies where juveniles reported on their behaviour and also on their perception of neighbourhood characteristics. On the other hand, studies where parents reported on neighbourhood characteristics while juveniles reported on behaviour were accepted. If at least one outcome measure was free from same source bias, the study was considered eligible for inclusion.

d) Method

Studies were included if:

i) Longitudinal design was used: Longitudinal design implies that at least two measures of child and adolescent outcomes were performed while the adolescent was between nine and 20 years old.

ii) The unit of analysis was the individual, not the neighbourhood: Studies were eligible if their unit of analysis was the individual, and neighbourhood variables were

incorporated to explain individual level outcomes. Individual level analysis can account for nested samples, but aggregated level analysis (e.g. study neighbourhood averages) cannot control for individual level confounders; thus, such analysis is at an increased risk of ecological bias. This is a critical feature in order to control for individual level confounders that may account for self-selection processes.

iii) *Control for individual or family level SES:* The most critical individual feature that needed to be controlled for was individual or family level SES. Although there are several other potential individual level confounders, the one that represents the most clear risk of bias due to selection effects is individual level SES. Controlling for race was not set as a selection criteria because this would have led to the inclusion only of studies from the US. In effect, race as a predictor of antisocial behaviour and potential confounder has been historically important in the US, and has been linked to potential selection effects in disadvantaged neighbourhoods (Wilson, 1987). Given the fact that SES may capture most of the potential confounding effects of race, and that race might not be a relevant predictor in other countries, it was not set as a selection criterion. The potential relevance of race, among other confounders, was addressed during the critical appraisal. It was decided that other relevant predictors, like parenting and peer variables, could vary among studies. This was because these predictors were not considered to be potential confounders (not necessarily related to selection effects in particular neighbourhoods) but potential mediators of neighbourhood effects.

Studies were excluded if:

i) *Longitudinal data was treated as cross sectional:* Longitudinal analysis can be approached in several ways. For this review only longitudinal studies that | individuals through time were included. This would include studies predicting outcomes (time one

variables predicting time two outcomes), studies addressing determinants of change or analysing how variables relate across time (e.g. a multilevel analysis approach). Some studies use panel data without tracking individuals. That is, every follow-up measure is treated as an independent subject. Although this approach increases the total sample size, it treats data as if they were cross sectional, and thus does not take advantage of any of the benefits of using longitudinal data.

ii) *They were an intervention study*: Intervention studies data (e.g. trials) are sometimes treated as observational studies to test a neighbourhood hypothesis. In order to assure the inclusion of more or less homogeneous designs, intervention studies were excluded. Nevertheless, most of the excluded intervention studies would also have been excluded because they use unrepresentative samples or they do not ensure between neighbourhood variability.

Table 2.1: Summary of Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
-Children and juveniles between nine and twenty years of age. -Representative and heterogeneous sample of juveniles (random or multistage) or otherwise representative. -Includes at least one type of antisocial behaviour as the dependent variable. -Measures any neighbourhood characteristic as a predictor of antisocial behaviour. -Longitudinal design, at least two outcome measures. -Controls for individual or family level SES.	-Sample comprises i) Only disadvantaged subgroups: e.g. includes only poor juveniles or only a single race or ethnicity background (e.g. African American), ii) Only juveniles that have been institutionalised: e.g. psychiatric patients, iii) Only juveniles with crime records (e.g. studies focusing on recidivism), iv) Only social or health service clients (e.g. victims of family violence). -Non-random or convenience sample. -The design did not ensure between neighbourhood variability. -Average neighbourhood size exceeds 8000 inhabitants. -Outcome variable is dependent on all neighbourhood variables. -Longitudinal data treated as cross sectional. -Intervention studies.

2.2.2) Second stage: selection of the best effect size

As mentioned before, this systematic review focused on the identification, interpretation, and assessment of the quality of particular regression slopes that express the marginal effect of a neighbourhood level variable on an antisocial behaviour outcome. There were two recurrent situations in which more than one slope for the same eligible variables based on the same dataset was found. This was when:

- i) The same pair of neighbourhood outcome variables was included in several studies using the same dataset, and
- ii) More than one model including the same pair of neighbourhood outcome variable was estimated within the same paper (e.g. progressive inclusion of explanatory variables and interaction effects or estimation for different subpopulations).

Following Kochel, Wilson and Mastrofski (2011), for each dataset, only one slope for each pair of outcome-neighbourhood variables was selected.

The slope was selected if it:

- i) *Represented the most comprehensive and synthetic indicator of a neighbourhood variable (selection between studies):* In several studies that tested the same relationship using the same or an overlapping sample, the slope that was based on a more comprehensive neighbourhood indicator was selected. Consider, for example, three papers based on the National Longitudinal Survey of Adolescent Health (Add Health) data have studied the relationship between neighbourhood disadvantage and drug use. In this case the slope based on a single comprehensive neighbourhood disadvantage scale derived through factor analysis and based on multiple indicators was preferred

over studies using single or separated indicators (e.g. only the percentage of people receiving welfare assistance). This was done in order to avoid biased results due to multicollinearity problems.

ii) *Was based on the highest analytical sample (selection between studies):* If in the previous case all studies used the same indicators, the study using the highest analytical sample was selected. The analytical sample refers to the sample effectively used in the analysis, after losing cases to attrition and missing data. In general terms, full samples were also preferred over the use of subsamples. For example, studies using boys and girls were preferred over samples based only on girls. At this stage, some studies were excluded, for example because they only estimated models separated by race. According to the first stage selection criteria these studies were not considered eligible.

iii) *Was estimated for the full model (selection within studies):* Within a given study the slope that was selected to be analysed and reported was the one estimated for the fully estimated model. A common analysis strategy in observational studies is to progressively include explanatory variables in the model, and to observe the variation of the size and significance of a particular coefficient. In this type of strategy, the size, significance and direction of the relationship that will be taken into account in the review is the one specified in the last or full model.

2.3. Search strategy

Given the fact that large longitudinal studies are not common, and available data sets tend to be widely used, the search strategy concentrated on available electronic resources. Both published and unpublished studies (e.g. theses) were searched. Given

the fact that the author's thesis focuses on the Latin American context, researchers working in this region were contacted in order to identify relevant unpublished studies⁷.

2.3.1. Databases

The search strategy comprised searches of the following databases: ASSIA, CINAHL, CJA, Cochrane Library, Dissertations Abstracts, EMBASE, ERIC, IBSS, LILACs, LexisNexis, Butterworths, MEDLINE, NCJR, Service Abstracts Database, PsycINFO, Sociological Abstracts, Jstor, GeoRef and Econlit.

2.3.2. Search terms

The search strategy was developed in order to be highly sensitive, rather than specific. Priority was given to locating longitudinal studies that addressed any kind of neighbourhood or contextual variables. As mentioned earlier, since all possible neighbourhood variables were of interest to this study only general and not specific search terms for contextual variables were used (e.g. neighbourhood or community). Also, although initially no specific outcome terms were included, the high level of hits (over 200,000) made it necessary to narrow the search criteria. This was achieved by including specific search terms for outcomes addressing the most common studied forms of antisocial behaviour.

In the case of methodological specifications, results of preliminary searches suggested that studies based on longitudinal designs were not always clearly identifiable by reading either the title or abstract of a paper. Therefore, a complementary approach was used. It should be noted that many abstracts tended to highlight the statistical procedures employed rather than the type of design (e.g. longitudinal or cross sectional)

⁷ However, no study meeting the inclusion criteria was found.

as a key feature of the study. Therefore, the search terms included words relating to the statistical procedures commonly used in the analysis of longitudinal data (e.g. “fixed effects” or “random effects”). In most of the databases, the search was focused mainly on title and abstract information⁸. The full search terms are presented in table 2.2. The search terms had to be adapted for use in different data bases, for example changing or eliminating wild cards.

⁸ One exception is Jstor where only a low percentage of articles has an abstract. Therefore, the search strategy was adapted to cover the full text of the articles.

Table 2.2: Full Search Terms

Population <i>Youth or child or children or teen or teens or teenagers or adolescent or juveniles or infant or infants or juvenile or minor or minors or youngster or youngsters or kid or kids or boy or boys or girl or girls.</i>	Risk Factor <i>Neighbourhood or neighbourhoods or neighborhood or neighborhoods or area or areas or place or places or community or ghetto or slum or barrio or “electoral division” or “electoral divisions” or ward or parish or district or borough or “enumeration district” “enumeration district” or “census tract” or block or canton or village or locality.</i>
Method <i>Longitudinal or predict or “follow up” or “repeated measures” or baseline or prospective or panel or cohort or lag or lagged or wave or trajectory or path or pathway or “Latent growth” or “time series” or “survival analysis” or “survival model” or “hazard ratio” or “hazard model” or “failure analysis” or “duration analysis” or “duration model” or “change analysis” or “proportional hazard” or “fixed effect” or “fixed effects” or “random effect” or “random effects” or “structural equation” or “structural equations” or SEM or HLM or MLM or “hierarchical linear” or multilevel.</i>	Outcome <i>Antisocial or deviant or deviance or crime or crimes or criminal or criminals or felon or felony or misdemeanour or delinquent or delinquency or offend or offending or law breaking or “break rules” or “breaking rules” or illicit or violation or “conduct disorder” or “externalising behaviour” or “externalising behaviour” or “disruptive behaviour” or “disruptive behaviour” or “cruel behaviour” or “cruel behaviour” or violent or violence or aggression or aggressive or fight or fighting or bully or bullying or firearm or firearms or weapon or weapons or “hate crime” or “hate incident” or “school dropout” or truancy or “running away” or “physical harm” or assault or “property loss” or “property damage” or “property destruction” or “set fire” or vandalism or theft or mugging or “purse snatching” or robbery or shoplifting or “breaking and entering” or “substance use” or “substance misuse” or “substance abuse” or “alcohol abuse” or “alcohol use” or “alcohol misuse” or drinking or drunken or “sex offender” or “sex offence” or “sex offending” or “sexual offence” or “sexual offending” or “sex crime” or prostitution or prostitute or “sex work”</i>

2.4. Critical appraisal

The critical appraisal of research has become an essential skill, not only for researchers, but also for practitioners who are seeking answers to practical problems. The process of critical appraisal refers to a structured assessment of specific study characteristics, which aims to establish the credibility of the study's results. This process is complex, and usually needs to be assisted by structured instruments like guidelines, open ended questions, checklists, or scales.

Due to the wide range of research design types, the development of critical appraisal instruments has been a major challenge in the field of systematic reviewing. So far, a large and varied number of appraisal instruments have been developed (Deeks, 2003; Murray, Farrington and Eisner, 2009). Appraisal instruments vary in terms of type of research to which they are directed (e.g. experimental, cross sectional, longitudinal, qualitative studies, etc.), their format (from open questions that guide qualitative appraisal of quantitative studies to checklists and summative scales that seek to weigh study quality), the dimensions they address (e.g. internal vs. external validity) and the level of researcher judgement required (if they require the researcher to make a judgement or only require the researcher to check for the presence or absence of certain observable critical elements). Although a wide range of instruments are available, evidence regarding their external validity is conflicting (Deeks, 2003). This is possibly due to important differences in the contents considered. Also, no appraisal instrument that covers specific problems found in neighbourhood effects research could be located.

Therefore, an ad hoc extraction and appraisal instrument was developed. The objective of the developed instrument was to assess the internal, external and statistical validity of the results. The development was grounded on the Cambridge checklist to review

research on risk factors (Murray, Farrington and Eisner, 2009), the recommendations of the “Cochrane Handbook for Systematic Reviews of Interventions” for the assessment of risk of bias (Higgins and Altman, 2008) and specific methodological issues that have to be taken into account in the case of neighbourhood level effect studies (see section 1.2).

The developed instrument was structured into eight sections: i) Conceptual model (conceptual framework, theories and hypothesis), ii) Design (dataset, tested model, number of waves, etc.) iii) Outcomes (measures, measuring method, psychometric properties, etc.) iv) Neighbourhood variables (identical to outcomes), v) Other independent variables (identical to neighbourhood variables), vi) Sample (sampling strategy, sample size, attrition, missing cases), vii) Analysis (data structure, model used, treatment of longitudinal data, etc.), and viii) Results (key results). Each section contained specific dimensions addressing key study characteristics, followed by one or more appraisal questions. The full instrument dimensions and their descriptions are reported in appendix 1.

2.5. Synthesis strategy

Even though there have been developments in how to meta-analyse regression slopes (Becker and Meng-Jia, 2007; Kochel et. al., 2011), in this review it was decided not to attempt to pull data together using meta-analysis. This decision was made because it was possible to identify a wide range of approaches to longitudinal research (e.g. HLM, SEM, etc.) that would have made it difficult to interpret the results⁹. Also, the majority of the studies estimated full models that also included interaction terms. This introduces

⁹ For example, the meaning of an odds ratio estimated in an longitudinal HLM model where level one model estimates variance through time of the outcome variable as nested within one individual is different to that of an odds ratio expressing a heightened risk of an outcome in time three based on predictors measured in time one and time two.

a non-linear effect that needed to be interpreted in conjunction with the main effect slope. Thus, extracting only the main slope may turn out to be non-informative (see, for example, Kochel et. al., 2011). Also, within the final selection of studies, a third selection stage would have been necessary, in order to include only slopes that were eligible for meta-analysis. This would have led to an unacceptable loss of studies, heightening the risk of making a biased interpretation of the evidence.

3. Results

3.1. Search results

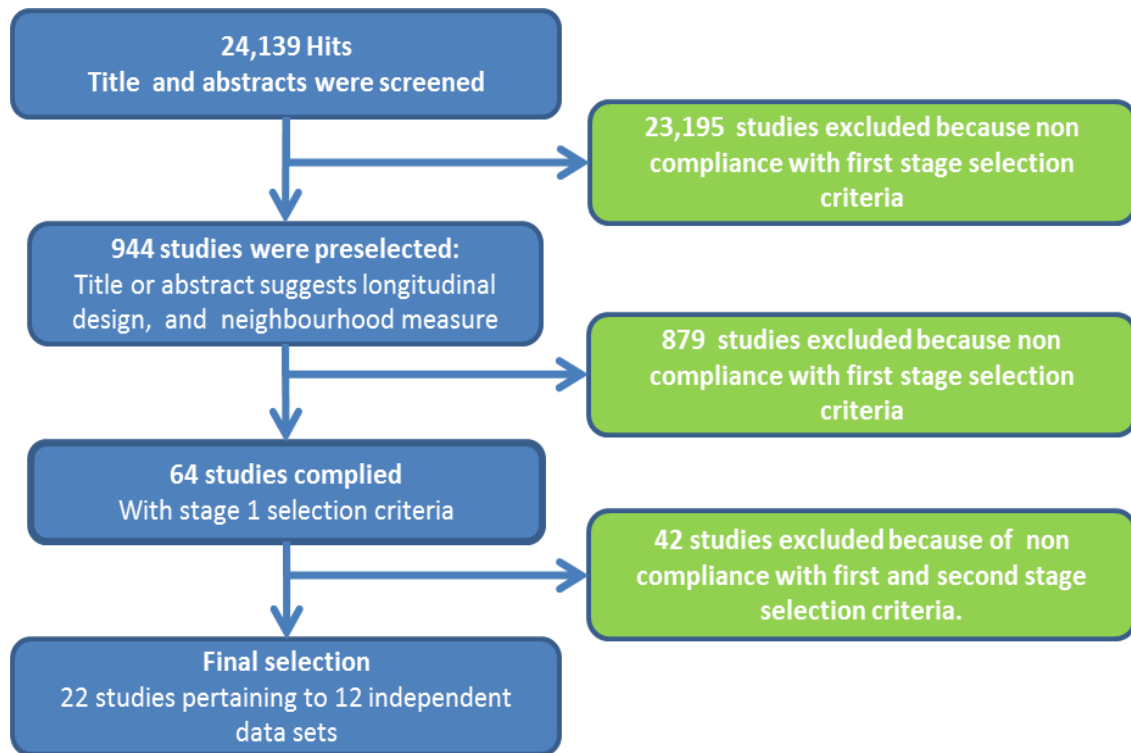
The main electronic search was performed between May and June 2011, by the author. In order to test the validity of the first search, the search was partially replicated in September 2011¹⁰. As a result, no new studies were included. In August 2014, the systematic review was updated. The full search was run again focusing this time on studies that were conducted between January 2011 and August 2014. Figure 2.1 details the flowchart of included and excluded studies.

In total 24,139 studies were screened (22,393 in 2011 and 1,746 in 2014). Even though this did mainly involve title search, occasionally abstracts needed to be screened in order to establish if selection criteria were met. At this stage, a study was preselected if they addressed at least one antisocial behaviour outcome, and at least one neighbourhood or community level measure, and if they seemed to be using a longitudinal approach. At this stage, if any exclusion criterion was found, the study was immediately excluded. After this first stage 944 studies were preselected.

These 944 studies were then screened in more detail, by reviewing abstract and, if necessary, the paper itself. After this stage, 64 studies were selected for in-depth review. Based on the rules explained in 2.2.2, 42 further studies were excluded (the reasons for exclusion are listed in appendix 4). The final selection included 22 papers pertaining to 12 independent studies.

¹⁰ This search included Medline, PsychInfo, Embase, Georef, Econlit, and totalled 14,000 hits.

Figure 2.1: Stages of Study Selection



3.2. Characteristics of included studies

Table 2.3 lists all selected studies and their primary characteristics, like author, dataset, eligible outcomes, eligible neighbourhood variables, other controlled variables and size of analytical sample (after attrition and missing information has been taken into account). Almost half (45.5%) of the included studies (see table 2.4) were based on data either from the Project on Human Development Chicago Neighbourhoods (PHDCN) or data from the Add Health study. In table 2.5, details of the selected slopes for each paper are presented.

In sum, 22 papers representing 12 independent datasets were included in the review. Within these 22 papers, 62 slopes were selected to be analysed as evidence of neighbourhood effects. Even though some studies contribute more than one estimated slope within the same paper, no study contributes more than one piece of information

for each analytical category (e.g. disadvantage as a predictor of drug use). The primary analytical categories (table 2.6) were defined by reference to the actual measure rather than the theory they tested. For example, a composite neighbourhood variable including “percentage poor”, “percentage female-headed households” and percentage “unemployed”, could be used to test the effect of concentrated disadvantage in one study, but another study could use the same (or a very similar measure) to test social disorganisation theory. Therefore, the classification intendeds to be descriptive rather than theory based.

The 22 included studies tested eight different types of neighbourhood measures (income-poverty, concentrated disadvantage, residential instability, exposure to neighbourhood violence, neighbourhood disorder or incivility, neighbourhood collective efficacy and social capital, neighbourhood culture and neighbourhood resources) and four types of antisocial behaviour outcomes (serious violence, drug use, general delinquency/conduct disorder, and externalising behaviour). See table 2.5.

i) *Neighbourhood income-poverty*: This category grouped variables that exclusively and directly measured neighbourhood level income or poverty. Since it is a very specific measure, it is considered to be different a type of measure when compared to neighbourhood concentrated disadvantage. Please see next section.

ii) *Neighbourhood concentrated disadvantage*: This second type of measure is usually conceptualized in a more general way. It is frequently measured as a complex index composed by many variables in addition to income or poverty. Typical employed measured include variables like for example “mean income”, “percentage female

households”, “percentage with college degree”, “percentage unemployed”, among others.

iii) *Residential instability*: Refers to indicators addressing neighbourhood population turnover. Measures usually comprise indicators like the percentage of residents who are owners of their house and the percentage of people renting or living for less than five years in the neighbourhood.

iv) *Exposure to neighbourhood crime, violence*: Neighbourhood level crime and or violence were usually measured through the use of official statistics (e.g. homicide rate), victim self-report, or more general perceptions of crime and safety (e.g. how safe is your neighbourhood?).

v) *Neighbourhood disorder or incivility*: For the purposes of this review, only direct measures which reflected social or physical disorder were considered as indicators of social disorganisation. Neighbourhood disadvantage, even though it has being a hypothesised as a proxy of social disorder, was not interpreted as direct evidence of disorder.

vi) *Social capital-collective efficacy*: Social capital usually refers to the ability of existing social structures and underlying attitudes to increase the efficiency of collective action. These include measures like trust, collective supervision, and participation in community organisations, willingness to help or intervene in certain situations, among others.

vii) *Neighbourhood culture*: Although related, neighbourhood cultural variables are believed to be different from social capital variables. Cultural variables usually refer to shared attitudes, values, goals, and practices that characterise an organisation, group or, in this case, a neighbourhood.

viii) *Neighbourhood resources*: This type of variable usually refers to the availability and quality of institutional resources available in the neighbourhood. These resources can include youth services, social services, and schools, among others. Neighbourhood resources variables were mainly derived from community surveys, and, in some cases, parent reports.

In the case of antisocial behaviours, four types of measures were identified: serious violence, drug use, general delinquency/conduct disorder, and externalising behaviour.

i) *Serious violence* refers to grave behaviours like engaging in physical fights, seriously hurting someone, or using a weapon to threaten.

ii) *Illegal drug and alcohol use* involves usually the self-reported use of drugs and or alcohol.

iii) *General delinquency/conduct disorder* includes more general antisocial behaviours like stealing, damaging private property, and truancy, among others. This measure can also include violent behaviours, but these were reported in an aggregated way. In terms of content validity, general delinquency type measures were very similar to indicators of conduct disorder, thus both categories were taken together.

iv) *Externalising behaviours* are related to milder and less serious antisocial behaviours, involving acts of defiant and oppositional behaviour, like lying to parents or talking back to teachers. Outcomes were assessed either through self-reporting (ad hoc instruments or standardised instruments like, for example, Youth Self Report (YSR), structured clinical interviews (e.g. diagnostic interview Schedule for children) and parent reports (e.g. Chile Behavioural Checklist, CBCL) or teacher reports (e.g. Teacher Report Form (CBCL)).

The role of neighbourhood is conceptualised in two ways. The first one conceives neighbourhood level variables as a cause of antisocial behaviour, which exerts their effect either in a direct way, or in an indirect way. The indirect influences of the neighbourhood are usually defined as being either moderated (e.g. Hart et. al., 2009) or mediated (Beshears et. al., 2005) by other individual family, school, or peer level variables (e.g. Baumer, 1999; Jang et. al., 2001). The second conceptualisation conceives neighbourhood level variables as moderators of other predictors of antisocial behaviour. Neighbourhood influences are conceived as variables that may intensify or weaken the effect of other predictors on antisocial behaviours (e.g. Beyers et. al., 2003; Bellair et. al., 2009).

Included studies included between two and five waves, separated by an average of one to five years. Even though the model specification and model development varied widely across studies, three main types of designs were the usually used (see table 2.5).

These are:

- i) Neighbourhood variables were treated as if they were being measured at time A and their capacity of predicting a latter (time B or later) antisocial behaviour outcome was tested. This effect could be treated as direct or indirect (mediated or moderated by other variables). It is important to note that the real time ordering of the measures did not always correspond to the analytical treatment of them. For example, in the case of Beshears (2005), the neighbourhood variable was actually measured after all other waves, but treated analytically as a time one predictor. This can only be done if it is assumed that neighbourhood level variables do not change.
- ii) In studies with more than two waves, where the analysis was approached through a multilevel modelling framework, neighbourhood variables were treated as

predictors of the change or time related variability that is observed in level one variables.

iii) Fixed effects (first differencing) analysis was performed in order to estimate how the change in neighbourhood variables (Time 1-Time 2) impacted the change in measured outcomes (Time 1-Time 2). This approach was used by only one of the included studies (see Hart et. al, 2009).

Other approaches, for example using pooled regressions, were excluded from this review because they do not make use of any of the advantages of the longitudinal datasets.

Table 2.3: Included Studies¹¹

Study	Dataset	Eligible Outcomes	Eligible Neighbourhood variables	Other Controls	Analytic sample ¹²
1 Antunes, M. J. L., & Ahlin, E. M. (2014)	Project on Human Development in Chicago Neighborhoods (PHDCN)	i) Youth violent behaviour (SR). Self-Report of Offending (SRO) (carried a hidden weapon, damaged property, set fires, snatched a purse, hit someone, attacked someone with a weapon, thrown objects at people, chased someone, shot at someone, shot someone, been in a gang fight, and/or threatened to hurt someone)	i) Concentrated disadvantage (C): % residents who were below the poverty line, % on public assistance, % unemployed, % less than 18 years of age, % black, % female-headed households. ii) Residential stability (C) (% lived in the same house since 1985, % owner occupied homes) iii) Immigration concentration (C): % Latino or foreign- born	-Demographics: gender, race/ethnicity, and socioeconomic status. -Individual: locus of control. -Family management strategies, supervision, restrictiveness, familiarity with child peers -Peers: deviance -School:--- -Other: Exposure to violence.	N= 1,611 9 and 12 year olds (W1).

¹¹ Key: (SR) Self report; (PR) Parent report; (CR) Community report; (PolR) Police report; (C) Census; (I): Interview; (W) Wave; (Nbh):Neighbourhood; (SSO): Systematic Social Observation.

¹²Analytic sample refers to the effectively used sample after attrition, missing data and special selection criteria have been taken into account.

Study	Dataset	Eligible Outcomes	Eligible Neighbourhood variables	Other Controls	Analytic sample
2 Aspy, C. B., Tolma, E. L., Oman, R. F., & Vesely, S. K. (2014).	Youth Asset Study	- Drug use (SR) : includes 19 of the most common drugs (e.g. marijuana, inhalants, methamphetamine, speed, cocaine, crack or heroin, among others).	i) Social Disorder: Broken Windows Survey (SSO) (dwelling condition, trash, graffiti, abandoned cars, among others) ii) Neighbourhood concerns related to crime, safety and to services (PR) iv) Sense of community (PR) v) Neighbourhood support (PR) v) Informal social control (PR)	-Demographics: gender, race/ethnicity, parental income. -Individual: Assets (e.g. responsible choices, educational aspirations, among others, -Family: Assets (e.g. communication, relationship with mother, monitoring, among others. -Peers: Positive peer role models -School: participation in organized school activities, school connectedness. -Others: Community level assets (e.g. community involvement). <i>Assets are tested in independent models.</i>	N= 986 12 to 17 at W1
3 Baumer, E. P. (1999). [Dissertation]	National Survey of Children (NSC)	i) Delinquency (SR) (damaged property, carried hidden weapon, attacked someone, sold drugs. ii) Illegal drug use (SR) (Cocaine, Marihuana or other drugs, e.g. LSD) iii) Alcohol use (SR) (Frequency of alcohol use) [Ad hoc instrument]	i) NBH socioeconomic disadvantage (C): % poor, % w/ public assistance, % unemployed, % 25+ without college education, % families earning less than 30.000 USD/year, % workers not in managerial professions. ii) Neighbourhood residential mobility: % residents moving in the last 5 years.	-Demographics: age, race, gender -Individual: hyperactivity, prior delinquency, drug and alcohol use -Family SES, size, res. mobility, parental deviance, attachment to parents, parent employment, monitoring, , number of residential moves. -Peers: deviance, Delinquency drug use- School: attachment, educ. expect Other:---	N=1128 12 to 16 years (W1)

Study	Dataset	Eligible Outcomes	Eligible Neighbourhood variables	Other Controls	Analytic sample
4 Bellair, P. E., & McNulty, T. L. (2009)	National Longitudinal Survey of Youth (NLSY97)	i) Violence: (attacked w/ intention to hurt) (SR) [Ad hoc instrument]	i) Community level disadvantage (C): % 16+ unemployed, % below the poverty threshold, % female headed households. [Derived through factor analysis]	-Demographics: Sex, age race -Individual: Drug selling, prior violence involvement Gang member -Family: Structure, SES, Parent Education, res. mobility -Peers: Substance use -School: Verbal ability, school achievement - Other:---	N= 5567 16 years (W1)
5 Beshears, E., & Toro, P. (2005) [Dissertation]	Homeless study (HS)	i) Delinquency (SR) [Diagnostic Interview Schedule for Children 2.3: conduct disorder, substance and alcohol use (number of symptoms)].	i) Concentrated disadvantage (C): % poor, % on public assistance, % unemployed, % female headed households with children ii) Residential instability (C): % of owner occupied homes, % residents living 5 or more years in NBH. <i>[Homeless neighbourhood was defined by last residence]</i>	-Demographics: Gender, age, race -Individual: homeless condition -Family: marital status, parent education/occupation, number siblings, sibling order, parental monitoring, Fly climate -Peers: --- -School: --- -Other:---	N= 299 homeless and housed matched pairs. 13 to 17 years at (W1)

Study	Dataset	Eligible Outcomes	Eligible Neighbourhood variables	Other Controls	Analytic sample
6	Beyers JM, Bates JE, Pettit GS, & Dodge KA. (2003)	The Child Development Project (CDP)	a) Externalizing behaviour (TR): [Achenbach Teacher Report Form] i) Structural disadvantage: % female-headed fly, % poor, % households w/ public assistance, % unemployed. ii) Concentrated affluence: % families earning over 75,000 USD/year, % w/ with college degree, % employed in professional or managerial positions. iii) Res. instability (C): % renter-occupied homes, % householders living less than 5 years in NBH.	-Demographics: age, gender ethnicity. -Individual:--- -Family: Parental supervision, monitoring and positive involvement. Time unsupervised, and time unsupervised in the community, fly structure and SES. -Peers:--- -School:--- - Other:---	N= 585 11 to 13 years at W1
7	Brezina, T., Agnew, R., Cullen, F. T., & Wright, J. P. (2004)	National Youth Survey (NYS)	i) Violence (SR): [SRD, Crimes Against Persons Scale.(Elliott and Huizinga (1983, p. 157))] i) Perceived NBH crime (PR): extent to which muggings, theft, and vandalism are perceived to be a “big problem” in the neighbourhood. [Ad hoc instrument]	Demographics: Age race, urban residence, Individual: Victimization (beaten up, things taken by force, personal items damaged) Family: SES (income, earners occupation and education), structure, parental discipline and supervision. Peers: aggression (% friends hot someone). School:--- Other: Perceived lack of opportunity	N= 752 males, 11 to 17 years at W1.

Study	Dataset	Eligible Outcomes	Eligible Neighbourhood variables	Other Controls	Analytic sample
8 Coster, S. D., Heimer, K., & Wittrock, S. M. (2006).	National Longitudinal Survey of Adolescent Health (Add Health)	a) Violent Delinquency (I): (Serious fight, used weapon, threatened w/weapon, hurt someone, stabbed someone. [Ad hoc instruments]	i) Network Closure (PR): (talk to parents child's friends parents) ii) Parents' Participation in Organizations (PR): (Parent/teacher, hobby, sports, civic, social, school, fund-raising volunteer organizations. iii) Collective Supervision (PR): (disposition to talk to neighbours if their child misbehaves, perceived disposition of neighbours to do the same). iii) Neighbourhood disadvantage: % black, % female headed households, % divorced -separated men, % unemployed, % male unemployed, median household income, % poor.	-Demographics: Sex, age, race -Individual: Prior violence, exposure to violence, expectation of lethal victimization, Past Violent Victimization -Family: Parent education, receiving public assistance, cohesiveness -Peers: Deviant peers -School:--- -Other: Accessibility to guns	N= 11,207 7th to 12 graders at 80 high schools at W1.

Study	Dataset	Eligible Outcomes	Eligible Neighbourhood variables	Other Controls	Analytic sample
9 Desmond, S. A., & Kubrin, C. E. (2009)	National Longitudinal Survey of Adolescent Health (Add Health)	i) Violence (SR): (Used weapon, group fight, serious fight, pulled a knife or gun, shot or stabbed someone) [Ad hoc instruments]	i) Neighbourhood disadvantage (C): % female-headed households, % public assistance, % poor, % 18+ high school dipl., % unemployed. ii) Residential stability (C): % occupied housing units moved in last 5 years. iii) Racial heterogeneity (C): Racial dispersion in a NBH, % foreign born, % aged 5+ who does not speak English well.	- Demographics: Sex, race, foreign born, language, urban, geographical region. - Individual: moved, parental attachment, previous delinquency - Family: On welfare, parent education, attachment to child, supervision - Peers: delinquency - School: grades, school attachment - Other: ---	N= 9,500 7 to 12th graders (W1), 80 high-schools
10 Drukker M., Kaplan C.D., Feron F.J., Van Os, J. & Korebrits A. (2010)	Maasricht Cohort Study. Neederlands (MCSN)	i) Delinquency (SR) (Stole a bicycle, shoplifting, vandalism, graffiti, stole money from family member or stranger, fought at school or at night out, brought a weapon, got physically violent, harassed someone) [Ad Hoc Instrument: Child Health Questionnaire (CHQ)]	i) NBH Socioec. Disadv. (C): % single parent families, % ethnic group, % non-voters, % unempl., % unempl. for 1+ years, % in social security, % in social security for 3 years +, mean income, mean income employed for 52 weeks/year, % high /low incomes, % economically inactive. ii) Residential Instability (C): i) % Single persons, mobility variables. [Derived through factor analysis]. iii) Social Capital (CR): (informal social control ii) social cohesion and trust, [Sampson et al 1997]	- Demographics: - Individual: general health, mental health, self-esteem, problem behaviour, d) baseline behaviour - Family: Fly SES (occupation education), quality of child-parent interaction, parental perceived difficulty (in child raising). - Peers: ---- - School: --- - Other: ---	N=1007, 11 years (W1), 52 schools

Study	Dataset	Eligible Outcomes	Eligible Neighbourhood variables	Other Controls	Analytic sample
11	Fauth, R. C., Roth, J. L., & Brooks-Gunn, J. (2007). Project on Human Development in Chicago Neighborhoods (PHDCN)	i) Delinquency (SR) [SRD Elliot et al 1985] ii) Substance use (SR) [Ad hoc instrument]	i) Community resources for youth (CR): number available youth services [youth centres, recreation programs, after-school programs, mentoring/counselling, mental health services, crisis intervention] ii) Perceived violence (CR): Frequency of observed fights w/ weapons, gang fights, and sexual assaults) [Ad hoc instrument]	-Demographics: age, sex, race, -Individual: -Family: maternal education, mother married, income to needs ratio -Peers: -School: -Other: after school participation	N=1315 9 and 12 year olds (W1).
12	Haegerich, T. M., Oman, R. F., Vesely, S. K., Aspy, C. B., & Tolma, E. L. (2014). Youth Asset Study	Physical Fighting (SR): Youth Risk Behaviour Surveillance System	i) Psychological sense of community (PR) ii) Informal Social Control (PR) iii) Neighbourhood support (PR) iv) Neighbour concerns crime and safety (PR). v) Neighbourhood disorder (broken windows survey) (SSO)	-Demographics: age at base- line, gender, race/ethnicity. -Individual: --- -Family: structure, parent-reported poverty status, parent education, parenting and monitoring. -Peers: --- -School: --- -Other: ---	N=1093 12 to 17 at W1

Study	Dataset	Eligible Outcomes	Eligible Neighbourhood variables	Other Controls	Analytic sample
13 HART, D., & MARMO RSTEIN, N. R. (2009).	National Longitudinal Survey of Adolescent Health (Add Health)	i) Aggression (SR) how often involved in four types of violence (e.g. serious physical fight’). [Ad hoc instrument]	i) Neighbourhood child saturation: % under the age of 15 ii) Poverty: % individuals living in poor households. iii) Racial heterogeneity: Probability that two randomly drawn individuals would have same race.	- Demographics: sex, age, race, urban status - Individual: Monoamine oxidase A (MAOA) allele - Family: parental education, marital status, receiving public assistance - Peers: --- - School: --- - Other: ---	N= 672 males, 11 to 20 years (W1), have genetic information available. Two most common MAOA length
14 Jang, S. J., & Johnson, B. R. (2001).	National Youth Survey (NYS)	i) Illicit drug use (SR) (marijuana, hashish, hallucinogens, tranquilizers, amphetamines, barbiturates, heroin, and cocaine) [Ad hoc instrument]	i) NBH Disorder (PR): How big of a problem are vandalism, abandoned houses, burglaries, theft, junkies, traffic, etc. in the neighbourhood.	- Demographics: sex, race - Individual: religiosity, pro drug use attitudes - Family: fly bonding, intact fly, size - Peers: Drug use - School: school bonding - Other:	N= 1725 , 11 to 17 years (W1), did not move between neighbourhoods

Study	Dataset	Eligible Outcomes	Eligible Neighbourhood variables	Other Controls	Analytic sample
15	Kirk, D. S. (2008). Project on Human Development in Chicago Neighborhoods (PHDCN)	a) Delinquency (PolR): Person year frequency of arrests	i) Concentrated poverty (C): % poor families, % families on public assistance, % unemployed, % female-headed families with children. ii) Residential stability(C): % age 5 + living in the same house five years earlier, % owner-occupied homes. iii) % foreign born (C) [Derived through factor analysis] iv) Tolerance of deviance (CR): "how wrong" it is for a 13-year-old to (i) smoke cigarettes, (ii) use marijuana, (iii) drink alcohol, and (iv) get into fist fights. v) Collective efficacy (CR): (Social cohesion, informal social control), [Instrument by Sampson et al. (1997)]	-Demographics: sex, age, race, ethnicity. -Individual: immigrant generational status (first, second, or third and higher) -Family: SES, structure, presence of extended adult kin, d) number of household children, family control -Peers:--- -School: --- -Other: Cohort	N= 1775; aged 12, 15; consented their criminal records to be searched.

	Study	Dataset	Eligible Outcomes	Eligible Neighbourhood variables	Other Controls	Analytic sample
16	Molnar BE, Browne A, Cerda M, & Buka SL. (2005).	Project on Human Develop ment in Chicago Neighbor hoods (PHDCN)	a) Violent behaviour (SR) (hit/attacked someone, thrown objects at people, carried a weapon, set fire, snatched a purse/picked a pocket, gang fight) [Ad hoc instrument based on SRD Elliot et al 1985]	i) Violent victimization (CR): NBH aggregate of household victimization [Community survey]. ii) NBH homicide rate (PolR): Police reports iii) NBH concentrated poverty (C) % percentage living below the poverty line, % unemployed, percentage on public assistance.	-Demographics: Age -Individual: past year Frequency of substance use and self-reported offences, violent victimization past year -Family: SES, structure, parent marital status -Peers: deviant peers -School: --- -Other: ---	N=637 girls aged 9 to 15 years (W1)
17	Molnar, B. E., Cerda, M., Roberts, A. L., & Buka, S. L. (2008).	Project on Human Develop ment in Chicago Neighbou rhoods (PHDCN)	i) Aggression/Violence ii) Delinquency (SR, PR) Achenbach system: CBCL, Youth Self-Report, Young Adult Self-Report)	i) Collective efficacy (CR) (Social cohesion, informal social control), [Instrument by Sampson et al. (1997)] ii) Organizations and services (presence of general and youth specific local organizations, resources, and programs) (CR), iii) Concentrated poverty (C), % poor, % unemployed, % on welfare.	-Demographics: Age, race -Individual: Witnessed violence more than once, Perception of harmfulness of substances score -Family: SES, size, family support rating -Peers: Prosocial peers, friend support rating -School:--- -Other: Number of hour in pro social activities, non-parental mentor rating	N=2345 9 to 15 year olds at W1

Study	Dataset	Eligible Outcomes	Eligible Neighbourhood variables	Other Controls	Analytic sample
18	Reijneveld, S. A., Veenstra, R., de Winter, A. F., Verhulst, F. C., Ormel, J. & de Meer, G. (2010).	Tracking Adolescents' Individual Lives Survey (TRAILS)	i) Antisocial behaviour (SR) c) Antisocial Behaviour Scale (Moffit and Silva 1988)	i) NBH deprivation: National area deprivation score: % unemployed, mean income, mean educational level per area.	-Demographics:--- -Individual:--- -Family: SES, Parenting practices, mental health history -Peers:--- -School:--- -Other:---
19	Schneiders, J., Drukker, M., Ende, J. v. d., Verhulst, F. C., Os, J. v., & Nicolson, N. A. (2003).	Rotterdam Study (RS)	i) Externalising problems: [Child Behaviour Checklist (PR) and the Youth Self-Report (SR)]	i) NBH socioeconomic disadvantage (C), % 17 year olds enrolled in education; % adults (>20 years) receiving welfare; % foreign residents, % adult male unemployment; % moving out of the neighbourhood in a one year period; % households with married couples and/or children; mean income; and mean age of residential buildings. [Derived through factor analysis]	-Demographics: age -Individual: -Family: SES (education y occupation) -Peers: -School: -Other:
					N= 2230 10 to 11 years olds (W1)
					N= 1837 10 to 11 year olds coming from 74 neighbourhoods

	Study	Dataset	Eligible Outcomes	Eligible Neighbourhood variables	Other Controls	Analytic sample
20	Trucco, E. M., Colder, C. R., Wieczorek, W. F., Lengua, L. J., & Hawk, L. W. (2014).	Erie County Study	Lifetime Alcohol use (SR): from the National Youth Survey (Elliott & Huizinga, 1983)	i) NBH disadvantage (C): % poor families, % on public assistance, median family income, % female-headed households, % poor with children ages 0–17, % children living below poverty line. ii) NBH cohesion (PR) Based on Los Angeles Family and Neighbourhood Survey.	-Demographics: Age, gender, race -Individual: Rule breaking behaviour. -Family: Positive parenting, SES (family income, parent education, and public assistance income) -Peers: Delinquency -School: --- -Other: ---	N=387 11 to 12 years at W1.
21	Tucker, J. S., Pollard, M. S., de la Haye, K., Kennedy, D. P., & Green, H. D. (2013).	National Longitudinal Survey of Adolescent Health (Add Health)	i) Marihuana use (SR) ii) Binge drinking (SR) (five or more drinks in a row)	i) % poor (C) ii) % female households with children under 18 (C)) iii) Unemployment rate (C) iv) % of individuals of age 5 or older who lived household 5 years earlier (C).	-Demographics: Age, gender, race -Individual: Initial binge drinking during the past year, initial marijuana use during the past 30 days, self-reported delinquency. -Family: household income, mother's education family structure, parental perception of friends as a good influence, low parental control, closeness to mother, drugs available in home alcohol available in home. -Peers: Friends using marihuana or binge drinking (network data) -School: Trouble at school (getting along with peers, paying attention, getting homework done, getting along with other students), low school participation. -Other: ---	N= 6516 12 a 19 years at W1.

Study	Dataset	Eligible Outcomes	Eligible Neighbourhood variables	Other Controls	Analytic sample
22 Wright, E. M., & Fagan, A. a. (2013)	Project on Human Development in Chicago Neighbourhoods (PHDCN)	Violence (SR): (throwing objects at someone, hitting someone, hitting someone you live with, carrying a weapon, attacking with a weapon, being involved in a gang fight, and committing robbery. [Based on SRD Elliott & Huizinga, 1983]	i) Tolerance to deviance (CR) (how wrong is it for 13- to 19-year-olds to smoke cigarettes, use marijuana, drink alcohol, and get into fist fights) ii) Tolerance to fighting among family and friends (“fighting between friends or within families is nobody else’s business.”	-Demographics: Age, gender, race -Individual: Rule breaking behaviour. Low self-control. -Family: Positive parenting, SES (family income, parent education, and public assistance income) -Peers: Delinquency -School: --- -Other: Child physical abuse (Conflict Tactics Scale for Parent and Child)	N=1372 9 to 15 year olds at W1

Table 2.4: Included Papers According to Dataset

Dataset	% (N)
Project on Human Development in Chicago Neighbourhoods (PHDCN)	27.3 (6)
National Longitudinal Survey of Adolescent Health (Add Health)	18.2 (4)
Youth Asset Study	9.1 (2)
National Youth Survey (NYS)	9.1 (2)
The Child Development Project (CDP)	4.5 (1)
Maasricht Cohort Study. (MCS)	4.5 (1)
National Longitudinal Survey of Youth (NLSY97)	4.5 (1)
National Survey of Children (NSC)	4.5 (1)
Homeless Study (HS)	4.5 (1)
Rotterdam Study (RS)	4.5 (1)
Tracking Juveniles' Individual Lives Survey (TRAILS)	4.5 (1)
Erie County Study	4.5 (1)
Total	100 (22)

Table 2.5: Selected Slopes for Each Paper¹³

N	Study	Dataset	Selected slopes	Model	Slope interpretation
1	Antunes, M. J. L., & Ahlin, E. M. (2014)	PHDCN	i) Youth violent behaviour-Concentrated disadvantage. ii) Youth violent behaviour-Residential stability. iii) Youth violent behaviour-Immigration concentration.	Hierarchical linear modelling (Poisson)	NBH measured at time A predicts outcomes measured at time B or later
2	Aspy, C. B., Tolma, E. L., Oman, R. F., & Vesely, S. K. (2014).	YAS	i) Drug use- Social disorder ii) Drug use-NBH concerns (crime) iii) Drug use-NBH concerns (services) v) Drug use-sense of community vi) Nbh support v) Drug use-informal social control.	Generalized Estimating Equations	NBH measured at time A predicts outcomes measured at time B or later
3	Baumer, E. P. (1999). [Dissertation]	NSC	i) Illegal drug use - NBH residential mobility ii) Illegal drug use - NBH socioeconomic disadvantage	Structural equations modelling	NBH measured at time A predicts outcomes measured at time B or later (direct and indirect)
4	Bellair, P. E., and McNulty, T. L. (2009)	NLSY97	i) Violence – Community level disadvantage	Hierarchical linear modelling	NBH association with violence level over time
5	Beshears, E., and Toro, P. (2005) [Dissertation]	HS	i) Delinquency – Concentrated disadvantage	Structural equations modelling	NBH measured at time A predicts outcomes measured at time B or later (direct and indirect)

¹³ Key: (SR) Self report; (PR) Parent report; (CR) Community report; (PolR) Police report; (C) Census; (I): Interview; (W) Wave; (Nbh):Neighbourhood; (SSO): Systematic Social Observation.

N	Study	Dataset	Selected slopes	Model	Slope interpretation
6	Beyers JM, Bates JE, Pettit GS, and Dodge KA. (2003)	CDP	i) Externalising behaviour- structural disadvantage ¹⁴ ii) EB - concentrated affluence iii) EB - residential instability	Hierarchical linear modelling	NBH predicts within subject growth rate in externalising behaviours
7	Brezina, T., Agnew, R., Cullen, F. T., and Wright, J. P. (2004)	NYS	i) Violence - Perceived neighbourhood crime	Structural Equations modelling	NBH measured at time A predicts outcomes measured at time B or later (direct and indirect)
8	Coster, S. D., Heimer, K., and Wittrock, S. M. (2006).	Add Health	i) Violent delinquency - Network closure ii) Violent delinquency- Parents participation in organisations iii) Violent delinquency - collective supervision iv) Violent delinquency- NBH disadvantage	Hierarchical binary logistic - ordered logistic	NBH measured at time A predicts outcomes measured at time B or later (direct)
9	Desmond, S. A., & Kubrin, C. E. (2009)	Add Health	i) Violence - residential stability	Ordered logistic	NBH measured at time A predicts outcomes measured at time B or later (direct)
10	Drukker M., Kaplan C.D., Feron F.J., Van Os, J. & Korebrits A. (2010)	MCSN	i) Delinquency- NBH socioeconomic disadvantage ii) Delinquency - residential Instability iii) Delinquency - ISC iv) Delinquency - social cohesion and trust (SC&T))	Multilevel logistic regression	NBH measured at time A predicts outcomes measured at time B or later (direct)

¹⁴ This variable was dropped in the final analysis of the paper, presumably due to multicollinearity problems.

N	Study	Dataset	Selected slopes	Model	Slope interpretation
11	Fauth, R. C., Roth, J. L., & Brooks-Gunn, J. (2007).	PHDCN	i) Substance use – community resources for youth ii) Substance use – perceived NBH violence iii) Delinquency - NBH resources iv) Delinquency - perceived NBH violence	Hierarchical linear modelling	NBH predicts within subject time related variance
12	Haegerich, T. M., Oman, R. F., Vesely, S. K., Aspy, C. B., & Tolma, E. L. (2014).	YAS	i) Physical Fighting- Psychological sense of community ii) Physical Fighting- Informal Social Control (PR) iii) Physical Fighting- Neighbourhood support (PR) iv) Physical Fighting- Neighbour concerns crime and safety (PR). v) Physical Fighting- Neighbourhood disorder (broken windows survey) (SSO)	Generalized Estimating Equations	NBH measured at time A predicts outcomes measured at time B or later
13	HART, D., & MARMORSTEIN, N. R. (2009).	Add Health	i) Violence - NBH poverty ii) Violence - child Saturation	Hierarchical linear modelling/ fixed effects regression (first difference)	a) For non-movers NBH measured at time A predicts outcomes measured at time B or later (direct) b) For movers: Impact of change in NBH variable on change in problem behaviour.

N	Study	Dataset	Selected slopes	Model	Slope interpretation
14	Jang, S. J., & Johnson, B. R. (2001).	NYS	i) Illicit drug use - NBH disorder	Hierarchical linear modelling	NBH predicts within individual's change (or growth) over time as a function of their age and a squared age term
15	Kirk, D. S. (2008).	PHDCN	i) General delinquency - NBH disadvantage ii) General delinquency – NBH residential instability iii) General delinquency - % foreign born iii) General delinquency - collective efficacy iv) General delinquency – tolerance to deviance (street code)	Growth curve modelling	NBH predicts within individual's change (or growth) in arrest over time as a function of their age and a squared age term
16	Molnar BE, Browne A, Cerda M, & Buka SL. (2005).	PHDCN	i) Violence - NBH violent victimisation ii) Violence – NBH homicide rate	Hierarchical linear modelling	NBH measured at time one predicts outcomes measured at time three (direct)
17	Molnar, B. E., Cerda, M., Roberts, A. L., & Buka, S. L. (2008).	PHDCN	i) Violence - collective efficacy ii) Violence - NBH resources. iii) General delinquency and NBH resources	Generalised estimated equations propensity/ score matching	NBH measured at time one predicts outcomes measured at time three (direct)
18	Reijneveld, S. A., Veenstra, R., de Winter, A. F., Verhulst, F. C., Ormel, J. & de Meer, G. (2010).	TRAILS	i) Antisocial behaviour (externalising behaviour) - NBH disadvantage	Hierarchical linear modelling	NBH measured at time one predicts outcomes measured at time two (direct)

N	Study	Dataset	Selected slopes	Model	Slope interpretation
19	Schneiders, J., Drukker, M., Ende, J. v. d., Verhulst, F. C., Os, J. v., & Nicolson, N. A. (2003).	RS	i) Delinquency - area deprivation	Hierarchical linear modelling	a) Pooled regression b) NBH measured at time one predicts outcomes measured at time two (direct).
20	Trucco, E. M., Colder, C. R., Wieczorek, W. F., Lengua, L. J., & Hawk, L. W. (2014).	ECS	i) Lifetime Alcohol use- NBH disadvantage ii) NBH cohesion	cross-lagged mediation path analysis	NBH measured at time A predicts outcomes measured at time B or later
21	Tucker, J. S., Pollard, M. S., de la Haye, K., Kennedy, D. P., & Green, H. D. (2013).	Add Health	i) Marihuana use -% poor ii) Marihuana use -% female households with children under 18 iii) Marihuana use - Unemployment rate iv) Marihuana use- % of individuals of age 5 or older who lived household 5 years earlier. v) Binge drinking -% poor vi) Binge drinking -% female households with children under 18. vii) Binge drinking - Unemployment rate viii) Binge drinking - % of individuals of age 5 or older who lived household 5 years earlier.	Logistic regression models	NBH measured at time one predicts outcomes measured at time two.
22	Wright, E. M., & Fagan, A. a. (2013)	PHDCN	i) Violence- Tolerance to deviance ii) Violence-Tolerance to fighting among family and friends	Multilevel logistic regression	NBH measured at time one predicts outcomes measured at time two.

Table 2.6: Studies Informing Analysis, According to Type of Outcome and Type of Neighbourhood Variable

Column1	Violence	Drug use	General delinquency/ conduct disorder	Externalising behaviour
NBH income – poverty	-Hart et. al (2009)	Tucker et. al (2013)	--	--
NBH structure disadvantage	-Bellair (2009) -Coster (2006) -Antunes et. al (2014)	-Baumer (1999) -Trucco et. al (2014) -Tucker et. al (2013)	-Beshears et. al. (2005) -Drukker et. al. (2010)	Beyers et. al. (2003) Scheiders (2003) -Reijneveld et.al. (2010)
NBH residential instability	-Desmond et. al, (2009) -Antunes et. al (2014)	-Baumer (1999) -Tucker et. al (2013)	-Drukker (2010) -Kirk (2008)	Beyers et. al. (2003)
Exposure to NBH Crime, violence	-Brezina et. al. (2004) -Molnar et. al. (2005) -Haegerich et. al (2014)	-Fauth et. al. (2007) -Aspy et. al (2014)	-Fauth et. al. (2007)	--
NBH disorder incivility	-Haegerich et. al (2014)	-Jang et. al. (2001) -Aspy et. al (2014)	--	--
NBH social capital - collective efficacy	-Coster et.al (2006) -Molnar et. al. (2008) -Haegerich et. al (2014)	-Aspy et. al (2014) -Trucco et. al(2014)	-Drukker et. al. (2010) -Kirk (2008)	--
NBH culture	-Wright et. al (2013)	--	-Kirk (2008)	--
NBH resources	-Molnar et. al. (2008)	-Fauth et. al. (2007) -Aspy et. al (2014)	-Fauth et. al. (2007) -Molnar et. al. (2008)	--

3.3. Critical appraisal

Table 2.7, presents the structured appraisal for each study's critical area. These will be commented on in detail during the discussion of the study results. A "+", means the study complies with the assessed criteria. A "-" means it does not comply and "o" means that it is unclear if it complies or not. Finally "/" means that the criteria were not applicable. On the last column, the percentages of studies complying with the assessed criteria are presented¹⁵. These are also presented in a graph (see figure 2.2).

In general terms it is possible to identify several weaknesses that present themselves repeatedly across this body of evidence. These weaknesses are not necessarily critical, but it is still important to note them. Low levels of compliance (under 50% of the included studies) were observed in relation to using instruments with evidence of discriminant and convergent validity, both in the case of outcomes and in the case of neighbourhood variables. Especially in the case of outcomes, a common practice was to select and aggregate ad hoc indicators (items) to test the hypothesis. In more than one occasion, the authors made partial use of available indicators for tested constructs (e.g. used seven out of nine available items on the scale measuring the same outcome). The problem here is that this selection was rarely explicitly explained or justified, and in some cases was not reported. This raises concerns about the content and discriminant validity of some of the employed measures. In the case of neighbourhood measures, even though there seems to be considerable agreement regarding a three factor structure of census based neighbourhood disadvantage (see Sampson et al., 1997), the indicators incorporated within this factors tend to vary across studies, particularly between

¹⁵ This is calculated by adding all "+", and dividing the sum by the number of studies minus the number of studies assessed as "o" or "/".

different countries. However, most of the concerns about the neighbourhood indicators are related to social process measures (e.g. social capital, cultural variables). If available instruments are used (e.g. Sampson's collective efficacy scale), psychometric (or econometric) properties are not reported.

As regards to the model specification, almost all the included studies controlled for the most relevant confounders. In spite of that parenting, peer and previous behaviour variables are among the least controlled for. This is a particularly relevant shortcoming in the case of "previous antisocial behaviour" measures. Incorporating this control would help to reduce (but certainly not eliminate) uncertainty regarding possible self-selection effects.

Another area in which potential problems seem to concentrate is related to sampling. Most of the included studies have problems involving attrition and missing cases that exceed the criteria set for this review (see appendix 4). In spite of this, these criteria are only a rule of thumb and thus cannot be interpreted in a rigid way. Small levels of attrition can lead to substantial bias if loss of cases is not random. Conversely, large levels of case loss may lead to minimal bias, only increasing the standard errors. If the loss of cases is not attributable to chance, then it is important to establish how this non-random loss was addressed (e.g. weighting, list wise deletion, imputation, among others). In only 28.6% of the studies could it be reasonably assumed that loss of cases was due to chance. In 35% of the studies explicitly acknowledged having implemented some corrective measure (e.g. weighting or imputation). Authors usually do not discuss if their results can be generalised to the intended population. If it is not possible to

generalize to the intended population, authors also rarely discuss to which population they can be generalised.

In the case of the employed analysis strategies in included studies, there are two issues that may need some attention. The first issue relates to how the different studies treat moving neighbourhoods. It is usually expected that a fraction of the sample will move between neighbourhoods, eventually changing their environmental characteristics. Only two of the included studies explicitly acknowledged that people may move between neighbourhoods during the follow up, and only one addressed how this change might affect the measured outcomes. Ignoring potential movement might be problematic, depending on how high the fraction of movers is and how different destination neighbourhoods are. For example, in Jang et. al. (2001) the amount of movers across five waves was 12,8%, but depending on the employed subsample, the percentage of movers may be as high as 40% (Hart et. al, 2009). Depending on the analysis strategy, ignoring this fact may introduce an unacknowledged source of bias into the analysis.

Finally, it is worth noting that only 61.9% of the studies provided a complete report on the outcome variables and results.

Figure 2.2: Percentage of Studies Complying With Methodological Criterion

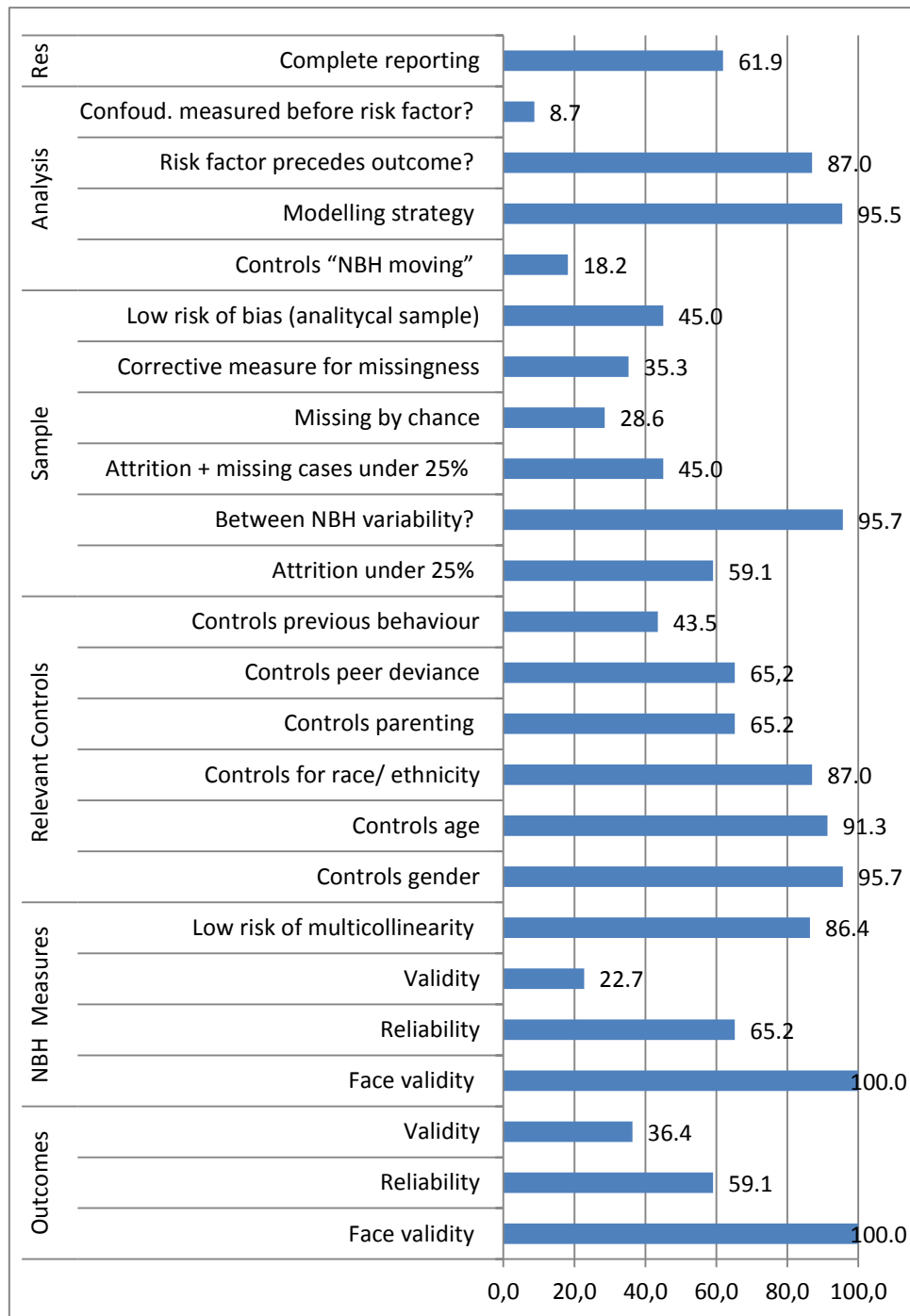


Table 2.7: Critical Appraisal

	+= yes += No o= Unclear //= Not applicable	Antunes, et. al. (2014)	Aspy et. al. (2014)	Baumer, (1999)	Bellair, et. al. (2009)	Beshears, (2005)	Beyers, et.al. (2003)	Brezina, et. al. (2004)	Coster et. al. (2006).	Desmond, et. al. (2009)	Drukker, et. al. (2010)	Fauth, et. al. (2007)	Haegerich et al. (2014)	HART, et. al (2009)	Jang, et. al. (2001)	Kirk, et. al. (2008)	Molnar et. al. (2005)	Molnar et. al. (2008)	Reijneveld et. al. (2010)	Schneiders et. al. (2003)	Trucco et. al. (2014)	Tucker et. al. (2013)	Wright, et al. (2013)
Outcomes	Is the face validity reasonable? ¹	+	+	+	+	+	+	o ²	+	+	+ ³	+	+	o ⁴	+	+	+	+	+	+	+	+	+
	Evidence of reliability or internal consistency reported or referenced? ⁵	+	-- ⁶	-- ⁷	--	+ ⁸	+	+ ⁹	-	+	--	+	+ ¹⁰	+	--	// ¹¹	-- ¹²	+	+	+	+	--	+ ¹³
	Evidence of convergent or discriminant validity reported or referenced?	--	-- ¹⁴	--	--	-- ¹⁵	+	+ ¹⁶	--	--	--	+	--	--	--	// ¹⁷	-- ¹⁸	+	+	+	+	--	+ ¹⁹
NBH Measures	Face validity is reasonable? ²⁰	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	Evidence of reliability or internal consistency is reported or referenced? ²¹	+	+	+ ²²	-- ²³	--	+	--	+	+	-- ²⁴	+	+	--	+	+	+	+	--	--	+	--	+
	Evidence of convergent or discriminant validity is reported or referenced?	--	--	--	-- ²⁵	--	+	--	--	--	--	+	--	+	--	+	//	--	--	--	--	--	+
	Low risk of multicollinearity among NBH variables?	+	+ ²⁶	+	+	+	--	+	+ ²⁷	+	-- ²⁸	+	+	+	+	+	+	+	+	o	+	--	+
Relevant Controls	Controls for gender?	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	--	+	+	+	+
	Controls for age?	+	+	+	+	+	+	+	+	+	--	+	+	+	+	+	+	+	--	+	+	+	+
	Controls for race/ ethnicity?	+	+	+	+	+	+	+	+	+	--	+	+	+	+	+	+	+	--	--	+	+	+
	Controls for parenting variables?	+	--	+	--	+	+	+	+	+	+	--	--	--	+	--	--	+	+	--	+	+	+
	Controls for peer deviance?	+	--	+	+	--	+	+	+	+	--	--	--	--	+	+	+	+	--	--	+	+	+
	Controls for previous behaviour	--	--	+	+	--	--	--	+	+	+	--	--	--	--	--	+	+	--	--	+	+	--

Table 2.7: Critical Appraisal (Continued)

Study description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
	+ = yes += No o= Unclear //= Not applicable	Antunes, et. al. (2014)	Aspy et. al. (2014)	Baumer, (1999)	Bellair, et. al. (2009)	Beshears, (2005)	Beyers, et.al. (2003)	Brezina,et. al. (2004)	Coster et. al. (2006).	Desmond, et. al. (2009)	Drukker, et. al. (2010)	Fauth, et. al. (2007)	Haegerich et al. (2014)	HART, et. al (2009)	Jang, et. al. (2001)	Kirk, et. al. (2008)	Molnar et. al. (2005)	Molnar et. al. (2008)	Reijneveld et. al. (2010)	Schneiders et. al. (2003)	Trucco et. al. (2014)	Tucker et. al.. (2013)	Wright, et al. (2013)
Sample	Attrition under 25% between first and last wave?	+	--	+	+	+	+	+	--	+	--	+	--	+	+	o	--	--	+	--	+	--	+
	Sample strategy ensures between NBH variability?	+	+	+	+	+	+	+	+	+	-- ²⁹	+	+	+	+	+	+	+	+	+	+	+	+
	Are additional missing cases + attrition under 25% ?	+	--	+	+	+	+	+	--	--	--	+	--	--	--	--	--	+	+	o	o	--	--
	Are missing cases attributable to chance?	--	+	--	--	o	--	--	--	--	--	+	+	--	+	--	--	+	+	--	--	--	--
	If so, is any corrective measure implemented? (Weighting, imputation, others.)	--	//	+	+	--	--	--	+	+	+	//	//	--	//	--	--	//	//	--	-- ³⁰	--	+
	Analytical sample with low risk of bias?	--	+	--	+	o	--	+	o	o	+ ³¹	+	+	-- ³²	--	-- ³³	--	+ ³⁴	+	-- ³⁵	+	--	--
Analysis	Is “neighbourhood moving” controlled or modelled?	--	--	--	+	--	--	--	--	--	--	--	--	+ ³⁶	+ ³⁷	--	--	--	--	o	--	+	--
	Was modelling procedure pertinent?	+	+	+	+	+	+	+	+	+	+	+	+	+	+	o	+	+	--	+	+	+	+
	Does risk factor precede the outcome?	+	+	+ ³⁸	+ ³⁹	-- ⁴⁰	+	+	+	+	+	+	+	--	+	--	+	+	+	+	+	+	+
	Are Confounders measured before risk factor?	--	--	--	--	+	--	--	--	--	--	--	--	-- ⁴¹	--	--	+ ⁴²	--	--	--	--	--	--
Results	Complete reporting? (No detectable reporting bias?)	+	+	+	-- ⁴³	+	-- ⁴⁴	+	+	+	-- ⁴⁵	+	-- ⁴⁶	-- ⁴⁷	+	+	+	-- ⁴⁸	-- ⁴⁹	-- ⁵⁰	+	+	-- ⁵¹

-
- ¹ Face validity refers to a subjective judgement on the operationalisation of a construct. Given the subjective component, Face validity is often seen as a weak form of construct validity (Drost, 2011).
- ² Author declares to use 10 items a scale, but original scale only comprises 9 items. See Elliott and Huizinga's (1983, p. 157)
- ³ One item is excluded to avoid offending parents.
- ⁴ Does not report used questions. Only uses 4 out of 5 possible questions, reasons are not explained.
- ⁵ Reliability coefficients are above 0.7 or 0.6 in the case of test retest based coefficients. "No" marked if reliability is under this criterion or not cited nor referenced.
- ⁶ Reliability coefficient not reported. Referenced source that explains how the measure was constructed but does not provide evidence on reliability.
- ⁷ Reliability coefficient not reported, even though other reliability coefficients are reported. Used scales have low reliability, see Furstenberg et. al. 1987
- ⁸ Cited evidence supports that test retest reliability is low but acceptable 0.6. See Schwab-Stone et. al. 1993
- ⁹ See Elliot and Huizinga (1983, 1986)
- ¹⁰ Information was found in Brener et. al. 1999
- ¹¹ Outcome is arrest rates, difficult to establish reliability.
- ¹² Author states that scale has good reliability, does not report coefficient or method.
- ¹³ See Elliot and Huizinga (1983, 1986).
- ¹⁴ Reliability coefficient not reported. Referenced source that explains how the measure was constructed but does not provide evidence on validity.
- ¹⁵ According to Piacentini et. al. (1993), sensitivity is only of 50%.
- ¹⁶ See Elliot and Huizinga (1983, 1986).
- ¹⁷ Outcome is arrest rates, controlled for self-reported.
- ¹⁸ Author states that scale has good validity, does not report coefficient or method.
- ³⁹ See Elliot and Huizinga (1983, 1986)
- ²⁰ Face validity refers to a subjective judgement on the operationalisation of a construct. Given the subjective component, Face validity is often seen as a weak form of construct validity (Drost, 2011).
- ²¹ Reliability coefficients are above 0.7 or 0.6 in the case of test retest based coefficients. "No" marked if reliability is under this criterion or not cited nor referenced.
- ²² See South et. al., (1999).
- ²³ Even though scale construction process is described, evidence of reliability is not reported.
- ²⁴ Even though disadvantage is derived through factor analysis, reliability is not informed. In the case of Sampson's Social Capital and Trust scales, no psychometric or econometric properties for the sample are reported.
- ²⁵ Even though construction process is described, evidence of validity is not reported.
- ²⁶ Contextual variables are tested in separated models.
- ²⁷ Factor analysis used.
- ²⁸ High correlations between social capital scales suggest risk of multicollinearity. Neighbourhood disadvantage was derived through factor analysis, thus risk of multicollinearity is considered low.
- ²⁹ It has to be noted that response rate to community analysis is 48%.

-
- ³⁰ Evidence of potential bias was found, though it was assessed as being unlikely to impact results. Missing at random assumption was made (MAR) instead of completely missing at random (MCAR).
- ³¹ High levels of attrition and inconsistent reporting of sample sizes used in analysis.
- ³² Approximately 1700 cases with genetic information are lost to attrition or missing. Reasons are not addressed.
- ³³ Even though samples do not differ by self-reported arrests, they do differ by self-reported offending, race, parental marital status, suggesting possible bias.
- ³⁴ Differences by SES, family size, and race.
- ³⁵ Dropouts differed on poverty and parent occupation, and CBCL.
- ³⁶ Analyses movers and non- movers in separate analysis.
- ³⁷ Only analyses on non-movers.
- ³⁸ Even though neighbourhood are measured before the outcome, some of the mediators are not. This limits the interpretation of the results of mediation analysis.
- ³⁹ Data is recollected between years 1997 and 2001. Neighbourhood variable is based on Census 2000 data.
- ⁴⁰ NBH disadvantage is measured after delinquency. See McCaskill et. al. 1998.
- ⁴¹ Census is measured in year 2000, after the last wave.
- ⁴² NBH treated as potential confounder.
- ⁴³ Incomplete report of results: does not report standard errors.
- ⁴⁴ Incomplete report of results: NBH disadvantage variable excluded from final analysis without discussing it.
- ⁴⁵ Incomplete use of available indicators for outcome, without justification.
- ⁴⁶ The original instrument has several measures addressing physical violence only one is selected. No justification is provided. See Brener et. al. (1999).
- ⁴⁷ Incomplete use of available indicators for outcome, without justification.
- ⁴⁸ Incomplete report of results: NBH victimization slope not reported.
- ⁴⁹ Incomplete use of available indicators for outcome, without justification.
- ⁵⁰ Incomplete report of results: does not report disaggregated externalizing and internalizing scores (CBCL) for longitudinal analysis, only for the cross sectional analysis.
- ⁵¹ Only seven out of 9 possible violence measures are used, no justification is provided.

3.4. Study results

In order to give the discussion a theoretical coherence, the presentation of results will be structured into five sections: a) concentrated poverty, neighbourhood disadvantage, and disorder; b) social capital and collective efficacy; c) exposure to violence; d) neighbourhood institutional resources; and e) neighbourhood culture.

Each section will begin with a brief introduction of the variable type and will discuss relevant findings of previous studies that were excluded from the present review. The limitations of these studies will be highlighted. These results will later be contrasted with the findings of the studies that were included for this review. Each section will conclude with a critical appraisal of the evidence provided by included studies. A summary of included study results are presented in tables 2.8 to 2.16.

Table 2.8: Summary of Results: Neighbourhood Income-Poverty

Neighbourhood Income-Poverty		
Outcome type	Study	Results
Violence	Hart et. al (2009)	No significant main effect of neighbourhood income on violence was found.
Drug and Alcohol use	Tucker et. al (2013)	No significant effects on marihuana use or binge drinking were found
General delinquency	No studies were found	
Externalising behaviour	No studies were found	

Table 2.9: Summary of Results: Neighbourhood Structure- Disadvantage

Neighbourhood Structure- Disadvantage		
Outcome type	Study	Results
Violence	Bellair (2009)	Significant positive main effect on violence. In addition, Contextual disadvantage interacts with gang membership to intensify violence (Moderation)
	Coster (2006)	No significant main effect could be found
	Antunes et. al (2014)	Immigrant concentration significantly reduces violence (expected result). Concentrated disadvantage fails to significantly predict violence.
	Hart et. al (2009)	Proportion of children and youth ("child saturation") is positively related to violence.
Drug and Alcohol use	Baumer (1999)	Contextual disadvantage was significantly related to decreased levels of alcohol use (unexpected). No significant effects on drug use were found.
	Tucker et. al (2013)	Unemployment rate is significantly related to increased levels of marihuana use but not to binge drinking. Percentage of female households with children under 18 failed to significantly predict marihuana use or binge drinking.
	-Trucco et. al (2014)	Effect of concentrated disadvantage on lifetime alcohol use is completely mediated by peer delinquency.
General delinquency	Beshears et. al. (2005)	No main effect of concentrated disadvantage on delinquency was observed. The effect is completely mediated by parental monitoring.
	Drukker et. al. (2010)	Concentrated disadvantage significantly predicts lower general delinquency involvement.

Table 2.10: Summary of Results: Neighbourhood Structure- Disadvantage (Continued)

Neighbourhood Structure- Disadvantage		
Outcome type	Study	Results
Externalizing behaviour	Beyers et. al. (2003)	No main effect of concentrated disadvantage on externalising behaviours was found. Concentrated disadvantage moderates the effect of monitoring on externalising behaviour, strengthening it.
	Schneiders (2003)	Concentrated disadvantage is significantly related to increased levels of externalising behaviour problems.
	Reijneveld et.al. (2010)	Concentrated disadvantage is significantly related to increased levels of externalising behaviour problems.

Table 2.11: Summary of Results: Neighbourhood Residential Instability

Neighbourhood Residential Instability		
Outcome type	Study	Results
Violence	Desmond et. al. (2009)	Residential instability is related to increased violence.
	Antunes et. al (2014)	Residential instability fails to significantly predict violent behaviour.
Drug and Alcohol use	Baumer (1999)	Residential instability significantly predicts lower drug use (unexpected). In addition it fails to predict alcohol use.
	Tucker et. al (2013)	No significant effect of residential instability on Binge drinking or marihuana use was found.
General delinquency	Drukker (2010)	No significant effect of residential instability on general delinquency was found.
	Kirk (2008)	No significant effect of residential instability on general delinquency was found. However, residential instability moderates (weakens) the race-delinquency relationship.
Externalizing behaviour	Beyers et. al. (2003)	Residential instability fails to significantly predict increased levels of externalising behaviours.

Table 2.12: Summary of Results: Neighbourhood Exposure to crime and violence

Exposure to crime or violence		
Outcome type	Study	Results
Violence	Brezina et. al. (2004)	Perceived neighbourhood crime significantly predicts violence.
	Molnar et. al. (2005)	Both, neighbourhood level victimization and neighbourhood homicide rate fail to significantly predict violence
	Haegerich et. al (2014)	Neighbour concerns for crime and safety fail to predict physical fighting or weapon carrying. However, increased neighbourhood concerns are related to a stronger relationship (moderates) between a weapon carrying and race (Hispanic white).
Drug and Alcohol use	Fauth et. al. (2007)	No significant effect of exposure to crime on alcohol use was found.
	Aspy et. al (2014)	Crime concerns fail to significantly predict drug use.
General delinquency	Fauth et. al. (2007)	Exposure to violence does not significantly predict general delinquency.
Externalizing behaviour	No studies were found	

Table 2.13: Summary of Results: Neighbourhood Disorder Incivility

Neighbourhood Disorder Incivility		
Outcome type	Study	Results
Violence	Haegerich et. al (2014)	Neighbourhood physical disorder fails to significantly predict physical fighting. or weapon carrying.
Drug and Alcohol use	Jang et. al. (2001)	Perceived neighbourhood disorder is significantly related to increased drug use.
	Aspy et. al (2014)	Social disorder fails to significantly predict drug use.
General delinquency	No studies were found	
Externalizing behaviour	No studies were found	

Table 2.14: Summary of Results: Neighbourhood Social Capital- Collective Efficacy

Neighbourhood Social Capital- Collective Efficacy		
Outcome type	Study	Results
Violence	Coster et.al (2006)	No significant relationship between collective efficacy and violence could be found.
	Molnar et. al. (2008)	No significant main effect was found. However, collective efficacy intensifies the effect of family support, prosocial peers, and non-parental mentors on the reduction of violence.
	Haegerich et. al (2014)	Sense of community and neighbourhood support failed to significantly predict physical fighting. In spite of that, informal social control significantly predicted reduced levels of physical fighting. Regarding indirect effects, the interaction between neighbourhood support and one parent households, significantly reduced physical fighting. Neither sense of community, informal social control or neighbourhood support significantly predicted weapon carrying. However, the interaction between neighbourhood support and one parent house hold significantly decreases weapon carrying.
Drug and Alcohol use	Trucco et. al (2014)	Neighbourhood cohesion failed to significantly predict lifetime alcohol use.
General delinquency	Drukker et. al. (2010)	Collective efficacy significantly predicted reduced levels of delinquency involvement.
	Kirk (2008)	No significant effects could be found.
Externalizing behaviour	No studies were found	

Table 2.15: Summary of Results: Neighbourhood Culture-“Street Code”

Neighbourhood Culture-“Street Code”		
Outcome type	Study	Results
Violence	Wright et. al (2013)	Tolerance to deviance and tolerance to fighting among family and friends significantly predicts increased levels of violence (expected).
Drug and Alcohol use	No studies were found	
General delinquency	Kirk (2008)	Tolerance to deviance predicts decreased levels of arrest rates [expected result]. Tolerance to deviance weakens (moderates) the self-reported delinquency-arrest relationship.
Externalizing behaviour	No studies were found	

Table 2.16: Summary of Results: Neighbourhood Resources

Neighbourhood Resources		
Outcome type	Study	Results
Violence	Molnar et. al. (2008)	Number of youth programs in neighbourhood significantly predicts lower levels of aggression.
Drug and Alcohol use	Fauth et. al. (2007)	ME: Participating in sports increases drug use unexpected result whereas participating in art related activities reduces drug use. Participating in Church reduces drug use, but only in nonviolent neighbourhoods.
	Aspy et. al (2014)	Concerns related to neighbourhood services fails to predict drug use.
General delinquency	Molnar et. al. (2008)	No significant effect could be found.
	Fauth et. al. (2007)	Participation in sports was related to increased general delinquency.
Externalizing behaviour	No studies were found	

3.4.1. Concentrated poverty, neighbourhood structure and disorder

i) Context and findings of excluded studies

The development of the field of neighbourhood effects has been closely tied to the study of the impact of concentrated poverty and disadvantage. The two main contributions to this field that have been widely acknowledged are Shaw and McKay (1969), in relation to the development of social disorganisation theory, and William Julius Wilson (1987) in relation to studies of the formation of racially isolated areas. Both contributions were primarily developed in the US and refer strongly to this context.

Shaw and McKay (1969) observed that certain urban neighbourhoods had a high concentration of juvenile residents with arrest records. They also discovered that, despite the almost complete turnover of the community, arrest rates among the resident youths of those areas did not vary over long periods of time (1900-1933). Shaw and McKay concluded that the ecological context must be having an effect on criminal variables. Those areas had particular common characteristics, like physical deterioration of public spaces and homes, high rates of single parent families and out of wedlock births, high levels of racial heterogeneity and population turnover, concentrated poverty, low educational attainment levels, high adult delinquency, drug and alcohol use, prostitution, and mental illnesses. The authors theorised that high concentrations of poverty, high racial heterogeneity and high turnover of residents (all processes related to industrialisation), were deteriorating the communities' capability to exert social control, leading to communities where high rates of crime and criminals could be observed. This proposition is known as the “social disorganisation theory.”

Another key contribution was the study of the social isolation of ghetto-like neighbourhoods. In the context of the study of urban poverty and racial inequality, Wilson (1987) described the emergence of a new subpopulation which he called the “underclass”. The underclass refers to a large subpopulation of urban low income families and individuals who show a marked contrast, as regards their behaviour, in comparison to the mainstream society. The conjunction of isolation and concentrated disadvantage would facilitate the emergence of what Wilson called “social dislocations.” Social dislocations refer to the emergence of deviant behaviour due to the accumulation of strain and breakdown down in social control. According to Wilson, “the underclass”, shows not only increasing levels of poverty and crime, but also drug addiction, out of wedlock births, female-headed houses and welfare dependency. Wilson argued that due to several complex economic and social processes, this subpopulation (predominantly African Americans), were experiencing increased levels of geographical concentration in the inner-city, leading to involuntary racial isolation from the mainstream society.

Subsequent empirical research has been heavily influenced by these two perspectives, leading to what Sampson, Morenoff and Gannon-Rowley (2002) called a “fixation” on examining the impact of structural neighbourhood characteristics on developmental outcomes.

Studies testing hypotheses regarding the impact of neighbourhood poverty and structural characteristics are abundant. This seems to be partially because of the availability of census and other official datasets which provide an easy way to characterise geographical analysis units (blocks, census tracts) in terms of variables like

“percentage of families under the poverty line”, “racial heterogeneity”, “percentage of single parents”, “percentage of children under 15 years”, "percentage of concentration of specific racial groups like Latino, African American or whites", "percentage of unemployed", "percentages of foreign born", "percentage of unmarried couples", "percentage of families receiving welfare support", among others.

Past research has linked neighbourhood structural variables to several detrimental outcomes. For example, neighbourhood disadvantage has been related to higher rates of delinquency and alcohol use in juveniles (Cantillon, 2003). Direct effects were stronger when official police data was analysed, and weaker for self-reported data. Contrary to the expected results, Ozer and Fernald (2008) found no direct relationship between community living standards (% of indigenous origin; presence of a functional drainage system; presence of street lighting; and the presence of a health clinic) and alcohol use. However, living in a majority-indigenous community did have an effect, reducing alcohol use.

One common finding is that the impact of neighbourhood structural characteristics like disadvantage does not always hold after controlling for individual factors. For example, Boardman, Finch, Ellison, Williams and Jackson (2001) found that neighbourhood loses its statistical significance as regards drug use once individual family income and stressful life events are controlled for.

A common feature of previous studies is the fact they are of a cross sectional design, and thus they do not allow the establishment of the sequence in which explanatory and outcome variables occur.

ii) What are the included studies' finding on violence, drug use, and general delinquency and externalising behaviours?

The first set of studies examines the relationship between contextual concentration of *low-income population* (not in conjunction with other disadvantage indicators) and behavioural individual level outcomes. On the subject of violence outcomes, only one study could be found (Hart et. al. 2009). The authors found that neighbourhood poverty remained a significant predictor of violence in cross sectional analysis, but did not predict future aggression in longitudinal analysis. In their analysis, the only neighbourhood variable that was found to be significantly related to future aggression was child saturation (% children living in the same neighbourhood). Even though this study (Hart et. al. 2009) does not control for peer and parenting effects, it deals with unobserved heterogeneity by using a fixed effect model, providing credible results.

Regarding drug use outcomes, Tucker et. al (2013) found no significant effect of “percentage of poor living in the neighbourhood” on marihuana use or binge drinking once all relevant confounders were controlled for.

Taken together both studies (Hart et. al. 2009; Tucker et. Al, 2013) provide no evidence to support the idea that there is a main effect of concentration of low-income population on either alcohol, drug use or violence. No studies addressing this effect on general delinquency or externalizing behaviours could be found. In spite of that, both studies show high levels of lost data due to attrition and non-response, suggesting that results may not be generalizable to the intended population. Moreover, both studies fail to measure potential confounders before the risk factor, and thus are assuming that contextual characteristics remain stable in time.

Regarding the relationship between *neighbourhood structural disadvantage* and antisocial behaviour outcomes, results are less clear. In relation to *violence* Bellair et. al. (2009) found that neighbourhood disadvantage had a significant direct effect on violence. They also observed that neighbourhood level disadvantage significantly interacted with gang membership. This meant that gang membership was associated with heightened violence in disadvantaged neighbourhoods. The authors did not, however, control for parenting variables. Not all studies confirm this relationship. In Antunes et. al (2014) no significant effects of concentrated disadvantage or immigrant concentration on violence were found. Finally, in the case of Coster et. al. (2006), neighbourhood disadvantage ceases to be significant in the last model, once criminogenic context (peer influences, victimisation, gun accessibility, among others) is taken into account.

Only in the study of Coster et. al. (2006) were all relevant confounders controlled for, resulting in a non-significant effect of neighbourhood concentrated disadvantage. The other two studies also failed to control for parenting variables (Bellair et. al., 2009) or “previous behaviour” (Antunes et. al, 2014). Results suggest that finding “neighbourhood effects” may be highly dependent on the type of controlled confounders. Other common issues are related to high levels of missing cases, and confounders not being measured after neighbourhood variables.

Regarding *neighbourhood structural disadvantage* and *drug and alcohol use*. Baumer (1999) found that once individual and family characteristics had been controlled for, (sex, age, race, family SES, parenting, deviant peers, and prior antisocial behaviour) it predicted less frequent alcohol use, but not lower drug use, which was unexpected. On

the other hand Trucco et. al (2014) did not find a main effect of concentrated disadvantage on lifetime alcohol use. Its effect was, however, mediated by peer delinquency. In addition Tucker et. al (2013) tested for the effect of neighbourhood unemployment rate and percentage of female households with children under 18 on marihuana use and binge drinking. Only unemployment rate was related to higher levels of marihuana use.

The abovementioned studies show problems related to missing data that might potentially affect their generalizability to the intended populations. Nevertheless, all included studies control for the required confounders. Results are however mixed or even unexpected. It is interesting to note that Trucco's et. al (2014) study suggests that peer effects might be a relevant mediator explaining the impact of structural variables on behavioural outcomes.

Concerning *neighbourhood structural disadvantage* and *general delinquency*, Drukker, et. al (2010) found that *disadvantage* had a significant effect on delinquency, but only for girls. Contrary to this finding, Beshears et. al. (2005) found no direct effect of *concentrated disadvantage* on delinquency. Parental monitoring fully mediated the relationship between *concentrated disadvantage* and delinquency. In particular, mixed results may be related to Drukker's study ignoring several relevant confounders, while Beshears' study suggests that effects are mediated by parenting (key confounder). Taken together they provide weak evidence in favour of the effect of contextual disadvantage on general delinquency.

Regarding *neighbourhood structural disadvantage* and *behavioural problems and externalising behaviour*, Reijneveld, Veenstra, de Winter, Verhulst, Ormel, and de Meer

(2010) found that prevalence and early inception of behavioural problems occurred more frequently among young juveniles in deprived areas than in affluent areas. Also, Schneiders et. al. (2003) found that neighbourhood disadvantage significantly predicted later increased externalising behaviours once family SES, age and gender had been adjusted for. In contrast, Beyer, Bates, Pettit, and Dodge (2003) found that after controlling for age, gender, ethnicity, parenting, time spent unsupervised, family structure and SES, *neighbourhood concentrated disadvantage* did not independently predict initial levels of externalising behaviours beyond significant individual and family level variables.

Again results seemed to be shaped by key issues that are related to uncontrolled confounders. Reijneveld et. al's (2010) study and Schneiders et. al's (2003) study miss important confounders like peer effects and previous behaviour. If this is the case, the included studies provide low evidence for a main effect on concentrated disadvantage on externalizing behaviours.

Now we will turn our attention to the effect of *residential instability* on *antisocial behaviour*. In relation to the effect of *residential* instability on violence, Desmond et. al. (2009) did find a significant direct effect, while Antunes et. al (2014) did not. Both studies control for most confounders, but still show some potential generalisability problems due to missing data. Mixed results and low number of included studies do not allow to draw well-founded conclusions to be drawn about this relationship.

In relation to *residential instability*, Baumer (1999) found it to be unexpectedly related to lower *illegal drug use*, but not lower alcohol use. Explanations for these findings included the possibility that more stable and less disadvantaged neighbourhoods were

subject to fewer police controls and that residential stability might favour higher social cohesion among deviant peers. In this context alcohol and drug use might be perceived as less risky. On the other hand, Tucker et al. (2013) did not find residential instability to be related to marihuana use nor to binge drinking. Even though both studies control for all required confounders, they still may be subject to some generalizability problems. Inconsistent results might suggest that the theoretical model had not been adequately specified. The unexpected relationship may be explained by other unmeasured factors. So far, studies provide no clear evidence in favour of the existence of a relationship between residential instability and drug-alcohol use.

Regarding *general delinquency*, Kirk (2008) found that *residential instability* did not have an overall significant effect on arrest rates after controlling for age race and gender. There were, though, significant moderation effects. Residential instability strengthened the relationship between black and white ethnicity on arrests, while weakening the relationship between Mexican ethnicity and arrests. On the other side, Drukker et. al. (2010) did not find that residential instability explained delinquency. Even though the cited studies did not control for all relevant covariates, results seem to suggest that residential instability may not have a main effect on general delinquency.

Regarding *externalizing behaviour*, Beyers et. al. (2003) did not found any direct effect on *externalising behaviour*. In spite of this, *residential instability* significantly interacted with parental monitoring. The effect of parental monitoring on the reduction of externalising behaviours was stronger in residentially unstable neighbourhoods than in stable neighbourhoods. In other words, the role of parenting mattered more in neighbourhoods with high residential instability. Even though no effects were found it is

difficult to draw conclusions based on only one study about the relationship between residential instability and externalizing behaviours.

We turn our attention now to the effect of neighbourhood disorder on antisocial behaviour. Only a handful of studies addressing neighbourhood disorder qualified to be included in this review. Regarding neighbourhood disorder measured through systematic social observation, Haegerich et. al (2014) found it to be unrelated to either physical fighting or weapon carrying. Using the same measure of social disorder, Aspy et. al (2014) found it also to be unrelated to drug use. On the other hand, Jang (2001) did find that parental perceptions of neighbourhood disorder were significantly related to higher levels of drug use in all estimated models (Jang et. Al, 2001). The authors also observed that perception of disorder interacted with religiosity to decrease drug use. Even though Jang's study has overall good methodological properties, the employed measure of disorder is not the most ideal one (parental perception). On the other hand, higher quality direct measures based on systematic social observations or community surveys do not show significant associations. Having considered this, it could be concluded that the included studies provide low evidence in favour of a main effect of neighbourhood disorder on antisocial behaviours.

Despite the fact that the evidence regarding the main effect of neighbourhood structural characteristics on antisocial behaviours is low, or at best mixed, many studies report significant indirect or interaction effects, even if no main effects are found. Significant interactions were related to race (Kirk, 2008), gender (Beyers et. al, 2003), family variables (Beyers, 2003), and community cohesion (Baumer, 1999).

iii) **Appraisal of research on concentrated poverty, neighbourhood structure and disorder**

Several problems can be identified in relation to the included studies. The first problem is related to the observed variability in how similar operational measures are used to test different theoretical propositions (see Sampson and et. al, 2002), such as concentrated disadvantage (e.g. Beshears and Toro, 2005), concentrated affluence (Beyers, Bates, Pettit, and Dodge, 2003), social disorganisation (e.g. Drukker, Kaplan, Feron, Van Os, J. and Korebrits, 2010) to name a few. Even though there are multiple tests either supporting or not supporting the relationship between concentrated disadvantage and outcomes, the poor conceptualisation behind the employed indicators make it sometimes difficult to interpret these tests. Following Sampson et. al. (2002) it is not clear, for example, if there is one main neighbourhood disadvantage variable, or if there are several sub-dimensions. Little attention has been paid to the implications of variability in disadvantage measures for the conclusions drawn in neighbourhood effects research.

A second common problem is that only a fraction of studies attempt to actually use direct measures of some of the theorised neighbourhood level variables. For example, even though social disorganisation is involved in several papers as a possible explanation for the impact of disadvantage, of the 22 included studies, only 3 measured social disorganisation directly by using community survey or systematic observation. (Jeng et. al. 2007; Haegerich et. al 2014; Aspy et. Al, 2014). It has to be acknowledged that this is not a new problem. It was only in 1989 that a direct measure of social

disorganisation was developed and its theoretical relevance tested by Sampson and Groves (1989)¹⁶.

Most of the studies had sampling problems, failing to take into account if subjects moved, and presented problems in terms of the ideal sequence in which the variables should have been measured. In relation to the sampling problems, since in several of the studies significant differences between the original and analytical sample were found, and thus the studies may not be representative of the originally presented sample. Therefore, to understand for whom the study is representative the makeup of the final sample needs to be assessed. This is not always clearly reported.

In relation to the control of potential confounders, a little over half of the included studies miss two key variables: “previous antisocial behaviour” and “affiliation with deviant peers”. These are two important confounders that may change the size and significance of the slope of neighbourhood structural characteristics, therefore potentially contributing to explain found mixed results. These factors could also play a relevant role as mediators of the found neighbourhood effects that researchers are trying to assess.

One last comment on studies of concentrated poverty and neighbourhood structure on adolescent outcomes needs to be made. It seems that finding significant effects of such variables is not always informative, especially when the mechanisms that mediate between area level variables have not been identified or measured. Even though some

¹⁶ The authors distinguished between exogenous sources of social disorganisation (low economic status, ethnic heterogeneity, residential mobility, and family disruption) and mediating dimensions (local friendship networks, the control of street-corner teenage peer groups, and the prevalence of organisational participation). They concluded that mediating factors transmitted much of the effect of community structural characteristics on rates of victimisation and offending. The study could not be included because the analysis unit was the neighbourhood and thus it could not be usefully used to investigate developmental effects.

studies may have “explained away” structural effects through neighbourhood or individual process variables, the exact way in which structural characteristics, like poverty concentration, affect adolescent outcomes is still not yet clearly understood. One of the potential reasons for this is that the geographic location of potential mediators is not explicitly incorporated into the model. This will be discussed in the next chapter of this thesis.

3.4.2. Neighbourhood social capital

i) Context and findings of excluded studies

Traditionally, neighbourhood level variables have been classified as structural variables (e.g. concentrated disadvantage and social process variables). Process variables refer to what can be called shared determinants of risk (Altman, 1995). Shared determinants of risk are emergent collective processes of a community (or residents of a neighbourhood, area or place) that can be considered as a risk factor or protective factor as regards child development (Altman, 1995). Shared determinants of risk refer to the social milieu characteristics in which individual risk occurs. One type of neighbourhood social process that has been studied as a relevant factor predicting antisocial behaviour is social capital. The concept of social capital can be traced back to the 19th century (Grootaert and van Bastelaer, 2002), and refers to the ability of social structures and underlying attitudes to increase the efficiency of collective action. Social capital refers also to the nature of social interaction, trust, and reciprocity, all critical elements in producing both beneficial and/or harmful collective outcomes (Grootaert and van Bastelaer, 2002). Portes (1998) proposes that it is possible to distinguish three basic functions of social capital: (a) as a source of social control (related to rule enforcement

promoting discipline and compliance); (b) as a source of family support; and (c) as a source of benefits through extra familial networks. Social capital research has had a primary role in the context of economic development interventions. Lately, it also has been considered as a useful conceptual tool to understand neighbourhood and community influences on children and youth outcomes (Coleman, 1988).

Conceptualisations vary in their specificity, from general conceptualisations like “sense of community”, to more concrete and task-focused concepts like collective efficacy (Sampson et al., 1997 and 1999). Social capital variables have been tested both as independent variables in their own right, and as mediators of structural variables.

Previous cross sectional studies have been generally supportive of the relationship between social capital variables and reduced antisocial behaviours. For example, Tobler et. al (2009) found that neighbourhood strength (e.g. a strong community identity, the level of community resources, participation in local policy decisions, among others) was related to reduced alcohol use among juveniles. In another cross sectional study, Bernburg, Thorlindsson and Sigfusdottir (2009) found that increased neighbourhood levels of disrupted family processes (weak social ties to parents and coercive family interactions) are related to increased levels of adolescent substance use (cigarette smoking, heavy drinking, and life-time cannabis use). This effect seemed to mediate the relationship between neighbourhood disadvantage and substance use.

Regarding the relationship between social capital and antisocial behaviour, an interesting (excluded) study of Simons et. al. (2004), found that increases in neighbourhood collective efficacy within a community were associated with increases in authoritative parenting, and that both authoritative parenting and collective efficacy

reduced deviant peer affiliation and involvement in delinquent behaviour. This is one of the few studies in this field that assesses the impact of time variant and independent neighbourhood measures on adolescent outcomes. In spite of being longitudinal, the main problem of this study (and the reason for its exclusion) was that it only sampled African American juveniles and their families, and thus it could be subject to selection bias.

On a more general approach Brunton-Smith, Sutherland, and Jackson, (2014) found that collective efficacy fully mediated the relationship between concentrated disadvantage and peoples' beliefs about neighbourhood violence.

ii) What are the included studies' findings on violence, drug use, general delinquency, and externalising behaviours?

Regarding violence, Coster, Heimer and Wittrock (2006) did not find any significant effect of parental reports of network closure¹⁷, parents' participation in organisations, or collective supervision on delinquency. The same conclusion was reached by Molnar et. al. (2008). They found that the main effect of collective efficacy had only a “marginally significant” (which actually means non-significant) effect on violence. Still, they found several significant cross-level interactions, suggesting that collective efficacy may have a moderating role. The relationship between family support, presence of prosocial peers, and availability of non-parental mentors was related to lower violence in neighbourhoods with high levels of collective efficacy. Both studies show good overall methodological properties resulting in credible results.

¹⁷ Refers to the situation in which parents know their children's friends and friends' parents.

Also Haegerich et. al (2014) tested several collective efficacy related measures (sense of community, informal social control, neighbourhood support) and their impact on physical fighting and weapon carrying. Only informal social control had an effect on reduced levels of physical fighting. None of the other contextual factors had any significant main effect on weapon carrying. In addition, the authors however report two moderating effects. Neighbourhood support did reduce physical fighting and weapon carrying, but only in juveniles living in one-parent homes. Regarding this study, it has to be noted that it fails to control for parenting, peer effects, and previous antisocial behaviour. If we consider previously examined results, this methodological decision may have resulted in finding significant effects.

Regarding drug use, one study assessed the link between neighbourhood cohesion and lifetime alcohol use (Trucco et. al. 2014). No significant effects were found. In this case all required confounders were controlled for.

As regards to general delinquency, Drukker et. al. (2010) found that informal social control and social cohesion and trust were significantly associated with a reduction in delinquency involvement, but only for girls. Finally, Kirk (2008), after controlling for neighbourhood disadvantage, percentage foreign born, and residential stability, failed to find any effect of collective efficacy on arrests. Both studies omit relevant confounders, and in the case of Drukker's study some problems related to measures could be found (see next section).

iii) Appraisal of research on social capital

Most of the included studies did show adequate methodological properties. However, issues regarding measurement issues and incomplete control of key confounders.

Investigating neighbourhood level social processes is surely among the most difficult tasks within neighbourhood effects literature. Such measures are more difficult to develop, and are not always truly independent from outcome data (e.g. parental reports). Having said this, several points regarding the methodological quality of the evidence should be noted.

The psychometric properties of social capital measures are less than ideal. In two of the seven studies (Molnar, 2008; Kirk, 2008), psychometric properties of the measure were known because they used PHDCN data (Sampson et. al, 1997). In spite of this, Sampson's paper (1997) did not establish the discriminant validity of the measures of collective efficacy. Because of the high correlation between social capital components, the inclusion of collective efficacy indicators into regression analysis may lead to multicollinearity problems. In the case of Coster et. al. (2006), the variables used comprised only a low number of indicators (one or two items) suggesting possible weak psychometric properties (which are not reported). Finally, in the case of Drukker (2010) the measure of collective efficacy in this study might be biased because the response rate of the community survey was as low as 48%. All studies had high levels of missing cases suggesting their external validity might be limited. In addition, studies showing some significant results also fail to control for key confounders.

Even though there are some significant results, these may be limited by model specification and measurement issues. Studies with stronger methodological design show non-significant results, thus providing low support for the effect of collective efficacy-social control variables on antisocial behaviour measures.

3.4.3. Exposure to neighbourhood violence

i) Context and findings of excluded studies

Exposure to neighbourhood crime and violence has received increased research attention in recent years. Exposure to violence has been usually studied as a component of social disorganisation. It is believed that living in a violent neighbourhood might impact adolescent antisocial behaviour, either by exposing families and youth to stress, and therefore impacting their mental health (Fowler et. al., 2009), or increasing the risk of exposing children and youth to deviant peers, therefore increasing the risk that they will engage in social learning of deviant behaviour (Ludwig and Kling, 2007).

As mentioned earlier, several previous reviews have addressed this subject. For example, in their review Aisenberg and Herrenkohl (2000) assert that research has demonstrated that exposure to community violence is a significant risk factor for the development of emotional and behavioural problems among young people, including violence and crime. In the same way, in another review Ingoldsby and Shaw (2002) concluded that evidence suggests that “Exposure to Community Violence” seems to facilitate the initiation of an antisocial pathway. Furthermore, based on a meta-analysis of 114 studies, Fowler, Tompsett, Braciszewski, Jacques-Tiura, and Baltes (2009) concluded that community violence also had significant effects on PTSD, internalising an externalising behaviour problems, and smaller effects on other internalising symptoms were also observed.

For the purpose of this review it is important to determine if the phenomena these studies have addressed are genuine contextual factors or not. From the perspective of routine activities, victims and aggressors tend to share similar characteristics. Offending

and being a victim of violence are both highly correlated (Smith, 2004), thus implying that victims and offenders might be part of the same population. In the context of neighbourhood effects research, one key methodological requisite to be able to establish a contextual effect is that the neighbourhood factor should be measured independently from the adolescent outcome. From this perspective, it is important to know if contextual level violence will have an effect on people that is over and above their own personal characteristics.

Even though the literature on exposure to community violence is vast, the great majority of this literature (literature that is excluded from this review) suffers from same source bias: it measures exposure to neighbourhood violence as self-reported personal victimisation, and correlates this measure with self-reported antisocial behaviour. This approach makes it difficult to disentangle a true contextual effect from individual level effects (e.g. a lifestyle that predisposes a subject to being a victim of violence).

ii) What are the findings of the included studies' regarding violence, drug use, general delinquency and externalising behaviours?

Only a small number of longitudinal studies with independent measures of neighbourhood violence could be found. The overall quality of studies is good. However, some model specification issues arise.

As regards violence, Brezina, Agnew, Cullen and Wright (2004) found that a parental report of perceived violence did have a significant direct impact on violence measured at time two, but not at time tree. In another paper, Molnar et. al. (2005) studied the impact of personal victimisation, neighbourhood level victimisation (parent reports of violent victimisation of a family member) and the neighbourhood homicide rate, as a

completely independent measure. They found that individual level victimisation had a significant impact on future violence, but neither family level victimisation, nor overall neighbourhood homicide rate did.

On another study, Haegerich et. al (2014) tested if parental levels of concerns with neighbourhood crime were related to physical fighting and/or weapon carrying. The authors found no support for a direct main effect. They did, however find a moderation effect. Parental neighbourhood crime concerns were related to increased weapon carrying, but only for hispanic-whites.

Regarding drug use, two studies could be found. On one side, based on a different indicator of the same dataset (PHDCN), Fauth, Roth, and Brooks-Gunn (2007) found that community reports on perceived neighbourhood violence were not related to substance use. In addition, Aspy et.al (2014) failed to find a significant relationship between parental neighbourhood crime concerns and drug use. Fauth, et. al (2007) also tested for the impact of perceived neighbourhood violence on general delinquency, finding no significant effect.

iii) Appraisal of research exposure to violence

The abovementioned studies had fewer measurement and sample related problems than the previously analysed studies. In the case of these studies, more observations could be made in relation to model specification. Only Molnar (2005) controls for previous behaviour and none of the studies actually controls for confounders before the risk factor is measured, or models the impact of moving neighbourhoods. In spite of this, it is not clear if the results would have been significantly affected by a better model specification.

3.4.4. Neighbourhood institutions and resources

i) Context and findings of excluded studies

In their famous framework for the study of neighbourhood effects, Jencks and Maher (1989) posed that one relevant perspective investigating neighbourhood effects is the study of institutional resources available for neighbourhood residents. Characteristics of schools, police protection and strong neighbourhood organisations, might have an important role in influencing children's development. Even though it seems reasonable to think that strong institutions might help build and maintain social control (police) and reduce strain through service provisions (youth services, social services, among others), the overall available evidence that this is the case is limited.

In a cross sectional study, Pinderhughes, Nix, Foster, and Jones (2001) studied the impact of several perceived neighbourhood variables on parenting (warmth, appropriate discipline, and harsh parenting). Based on parent reports, and once controlled for neighbourhood poverty, residential instability, limited social networks, and danger, they found that a higher satisfaction with public services was related to better discipline, and

lower levels of satisfaction were related to higher levels of harsh parenting. Even though the results are interesting, it is necessary to keep in mind that the study focused on African Americans, and neighbourhood measures were not independent (except for poverty and residential instability). Another interesting work by Mahoney, Stattin and Magnusson (2001) studied whether the participation of Swedish youth in recreation centres (Fritidsgardar) was related to long-term criminality as assessed from late childhood to mid-adulthood. Based on a longitudinal investigation, the authors found that the decision to participate in youth centres was not random. That is, boys with a multiple problem profile (social and academic problems) at age ten showed more frequent participation in recreation centres at age 13. The frequency of criminal offending increased for all configurations of boys who became involved in a recreation centre. Frequent participation in youth centres was linked to high rates of juvenile offending and persistent offending. The findings held after controlling for individual, family, and economic factors prior to involvement in the youth centre.

ii) What are the findings of the included studies' regarding violence, drug use, general delinquency and externalising behaviours?

In general terms, included studies show good methodological properties. Differences arise in relation to model specification and controlled confounders.

Regarding violence, Molnar et. al. (2008) found that, after controlling for individual neighbourhood covariates, the number of general and specific youth local organisations (one standard deviation above the mean), resources, and programs, were related to decreased levels of aggression, but not reduced levels of delinquency.

Using the same dataset (PHDCN), Fauth et. al. (2007) explored the longitudinal impact of participation in extracurricular conventional activities and developmental outcomes. They found that participation in sports was associated with lower anxiety/depression, but increased growth over time of both drug use. Participation in art activities was related to decreased levels of substance use and attenuated increases in usage over time. Finally, participation in church groups was related to decreased substance use only in nonviolent neighbourhoods.

Aspy et. al (2014) also tested if parental concerns regarding quality of neighbourhood services may predict increased drug use. No significant relationship was found.

Regarding general delinquency, Fauth et. al. (2007) found that participation in extracurricular conventional activities and developmental outcomes was related to increased growth of general delinquency over time. On the other hand, Molnar et. al (2008) found that the number of general and specific youth local organisations, resources, and programs, were unrelated to general delinquency.

iii) Appraisal of research on neighbourhood resources

Even though available evidence is scarce, it suggests that institutional resources may have an effect on antisocial behaviours. Effects arise regardless of different model specifications but do not always behave in the expected direction. This suggests that so far they may be poorly understood.

Even though no major methodological issues were found, it should be noted that the evidence in this area is scarce, even beyond the studies that were included in the present

review. In addition, studies finding significant effects use the same dataset (PHDCHN) thus limiting the potential generalisability of these results.

3.4.5. Neighbourhood culture

i) Context and findings of excluded studies

Neighbourhood cultural variables refer to social processes that promote learning or adoption of deviant behaviours, values and norms. Two related hypotheses are usually explored. These are the subcultural approach and the peer effects approach.

The subcultural hypothesis suggests that, in a similar way to contagion inside prisons, some neighbourhoods (usually disadvantaged ones) may promote learning of deviant behaviour patterns through exposure to deviant subcultures. A key reference in neighbourhood literature has been the “code of the street”, developed by Elijah Anderson (1990, 2002). Based on a longitudinal qualitative follow up of two neighbourhoods, Anderson observed that, in response to negative structural conditions and racial discrimination, the street code emerges as a cultural adaptation. Anderson suggests that the street code is a framework for negotiating respect in a place where people tend to have control only over a small number of things. The fundamental premise of the code is the display of a basic predisposition towards violence. The code of the street is believed to be related to a profound mistrust of the police or other mainstream institutions. In this context deviance might emerge as a response, seeking to gain physical and psychological autonomy (“take care of oneself”). Children “grow up hard” and need to learn early to defend themselves. Survival and respect has to be earned by themselves. Anderson suggested that families played a key role in this regard, and could be classified as “decent” families (middle class, distrustful, but believing that

they can change their children's fate through hard work) and "street oriented" families (those who embrace the street code). According to Anderson, children playing in the street may learn to fight: toughness is a virtue while humility is not. By the time the children are juveniles either they have internalised the code of the street or they will be acting according to its rules.

In this field, qualitative research is more common (Benoit, Randolph, Dunlap and Johnson, 2003), and quantitative testing is very limited. Using structural equations modelling, Brezina et. al (2004) tested the role of street code in youth violence, using a sample of 918 boys from the National Youth Survey. Street code was operationalised based on three self-reported questions addressing the belief that physical retaliation (a key component of the street code) is appropriate. They found that time two violence significantly predicted the adoption of the street code, and in turn that street code predicted time three violence. Even though the study was longitudinal, a limited operational measure was used (only one component of the concept) and the measure was subject to risk of same source bias. For this reason, the study was excluded from this review.

Two other studies were carried out by Steward and Simmons (2006 and 2010). Based on the same sample (700 African American families from the FACHS study), they made two longitudinal tests based on broader operational measures. In the first study (2006) they tested if individual adoption of a street code (justification of violence, toughness, beliefs about respect, among others) and two observational measures of the families classifying them as "decent" or "street oriented" (discipline, child monitoring, positive reinforcement, among others). The authors found that violent peers' prior street

code and family level street orientation predicted the adoption of an individual street code. Also, street code significantly increased violence, while decent families were related to a decrease in violence levels it. Even though the individual measure in this study is wider than the study conducted by Berezina et. al, it still is subject to same source bias. Regarding the street and decent family orientation, it seems that the operational measure is difficult to differentiate from traditional parenting variables. Later, in their 2010 paper, Steward and Simmons (2010) developed independent neighbourhood level street code measure. They used a nine item parent report to measure the extent to which street code values operated in the neighbourhood. Parent reports were averaged at the neighbourhood level. They used the same self-reported scale that they had used to address youth street code. They found that both the individual level street code and the neighbourhood level street code predicted later violence. It is important to note that, even if it is an independent measure, it still might be confounded with parenting, and thus it does not refer to a real neighbourhood level measure¹⁸.

A second approach relates to the study of affiliation with deviant peers. Affiliation with deviant peers is usually conceptualised as a powerful social influence on childrens' and juveniles' antisocial behaviour. Even though evidence suggests that affiliation with deviant peers predicts future antisocial behaviour (Keenan, Loeber, Zhang, Stouthamer-Loeber, and VanKammen, 1995; Sieving, Perry and Williams, 2000), other studies suggest that peer effects cannot be explained only by influence effects. For example, in relation to drug use, Valenzuela and Ayala (2011) found evidence suggesting that juveniles tend to befriend peers that are similar to them. After friendship has been

¹⁸ These last two studies were excluded because they only focused on African American families.

established, influence effects can be found. Not all studies find predictive peer effects. For example, Wiesner, Silbereisen and Weichold (2008) found concurrent but not time lagged effects on alcohol use.

There seems to be little agreement among researchers as to whether peer effects should be considered as neighbourhood (contextual) effects or individual effect (Ingoldsby and Shaw, 2002). A large number of studies do simultaneously test peer and neighbourhood variables, but only a few studies explicitly consider how neighbourhood and peer variables may actually interact.

In the context of neighbourhood research, “peer effects” are usually conceptualised as a mediator variable. From this perspective, the direct effects of area level variables are expected to be reduced or explained away by introducing peer effects into the models (see, for example, Haynie, Silver and Teasdale, 2006). Other studies seek to address how peer effects might be also related to parenting. For example, area level variables (e.g. disadvantage) are expected to impact family parenting variables, which in turn increase opportunities for affiliation with deviant peers. Through this path, adolescent outcomes are expected to be affected (see, for example, Lloyd and Anthony, 2003; Simons, Simons, Burt, Brody, and Curtona, 2005; Eamon, 2002). Neighbourhood disadvantage is also conceptualised as providing more opportunities for unstructured socialising opportunities with peers (Maimon and Browning, 2010) or intensifying the relationship between gang membership and violence (Bellair and McNulty, 2009).

Two important limitations of the research addressing peer and neighbourhood effects should be mentioned. The first one is related to the independence of the peer effects measures. With few exceptions (see, for example, Haynie, Silver and Teasdale, 2006),

most studies rely on adolescent self-reporting of antisocial peer affiliation. As a result, peer effects might be inflated (Valenzuela and Ayala, 2011). An independent measure of peer variables is necessary if any type of mediational effect is to be tested. The second problem is related to the operational measures of peer variables. Almost no study (a notable exception is Maimon and Browning, 2010) actually distinguishes between peers living inside and outside of the neighbourhood where the interviewed juveniles live. Failure to make this distinction makes it impossible to know if significant peer effects should be interpreted as compositional or contextual. For example, when analysing pairs of friends engaged in antisocial behaviour, Dishion, Andrews, and Crosby (1995) found that there was a tendency for close friends to live in the same neighbourhood. In spite of this, 73% of these friends met in school or some other organised activity, and only 17% met in their neighbourhood or in an unsupervised community setting. Friends living closer tend to have higher levels of dissatisfaction with the relationship, suggesting that these are friendships of convenience. It would be reasonable to think that a low distance between residences and attendance at the same school might have been spatial determinants of the friendship formation.

ii) What are the findings of the included studies regarding neighbourhood culture and violence, drug use, general delinquency and externalising behaviours?

Only two studies addressing subcultural variables measured through an independent source could be found. The first one was conducted by Wright et. al (2013). The authors tested if tolerance to deviance and tolerance to fighting among friends and family might

predict lower violence. They found that both community level measures were related to increased violence reporting by adolescents.

In another study, Kirk et. al. (2008), used the same tolerance to deviance measure seeking to predict general delinquency. Unexpectedly, in their final model, a higher level of tolerance to deviance was significantly related to lower levels of arrests. Also, the interaction between self-reported offending at wave one was significantly related to lower arrest rates at time two. This was interpreted as suggesting that in neighbourhoods with high levels of tolerance people might report less, thus leading to a difference between self-reported offences and official arrests.

None of the considered studies addressed peer influences in a satisfactory manner; that is, by differentiating between the influences of peers that live inside and outside of the neighbourhood. This is an important gap in the literature.

iii) Appraisal of research on neighbourhood culture effects

Both studies (Wright et. al, 2013; Kirk et. al, 2008), showed important differences between the initial sample and the analytical sample, potentially affecting their external validity. In addition, both studies omit relevant confounders, thus introducing some uncertainty regarding the reported results.

4. Summary and conclusions

The field of neighbourhood effects research has attracted the attention of a wide range of researchers from varied fields, including psychology, sociology health epidemiology, among others. This has led to the production of a large volume of studies addressing the problem of how ecological contexts might influence individual level outcomes. Potential policy implication of these studies should not be taken lightly. They may, and in fact have been used to justify the development of contextually focused interventions with the expectation of improving individual level outcomes.

The present review has sought to contribute to the literature through the systematic appraisal of higher quality longitudinal research of neighbourhood effects on antisocial behaviour. This in order to gain a comprehensive picture of what conclusions can be drawn about neighbourhood level influences from the research that may provide a higher level of confidence in their results. It was also expected that this review would help to uncover potential research gaps in relation to neighbourhood variables and mechanisms that have been theorised and or tested in the context of longitudinal studies, versus cross sectional ones.

Regarding *neighbourhood poverty and concentrated disadvantage*, 11 papers pertaining to nine independent data tested structural variables related to concentrated poverty or disadvantage. Three found no main effects and two of those found only moderating effects. Also, two of the studies finding non-significant effects used the same dataset (Add Health). One study (Baumer, 1999) found effects that were contrary to what was expected for drug and alcohol use. Even though previous results are mixed, studies

finding significant main effects also fail to include potentially relevant confounders in the regression equations.

“Peer effects” and “baseline antisocial behaviour” are key confounders missing in about half of the included studies and in most studies that produced significant results. This is considered a relevant issue that will be discussed in detail in Chapter 3. Even though evidence supports the idea that juveniles in disadvantaged and non-disadvantaged areas behave differently in terms of antisocial behaviour, risk of bias related to inconsistent use of indicators, sampling and not controlling for relevant confounders, and provide only weak evidence in favour of the existence of a direct causal relationship between *neighbourhood poverty and concentrated disadvantage* and antisocial behaviour.

In the case of residential instability, seven studies pertaining to five independent data sets tested the impact of neighbourhood level residential instability on antisocial behaviour. Only one study found a significant impact on increased antisocial behaviour. The other six studies found no significant main effect. Four of those could be attributed to only two different datasets. Of these six, two used the same dataset. One of the six studies found an effect that was contrary to that which was expected (again, Baumer, 1999). In this case, evidence is generally unsupportive of the idea that neighbourhood level residential instability, by itself, might have an effect on antisocial behaviour.

In the case of direct measures of *neighbourhood disorder and incivility*, three studies were included (Jang et. al. 2001, Haegerich et. Al, 2014; Aspy et. al., 2014). Only Jang et. al. (2001) finds a positive and significant impact. This is the only study using a perceptual parental measure. The two studies that did not find any significant effect where also based on the best measures, namely, on systematic social observations.

Turning our attention to social capital and collective efficacy indicators, seven studies, pertaining to five independent data sets, were selected. Four of these studies did not find any significant main effect on antisocial behaviour indicators (two of these used the same data set). Only Drukker et. al. (2010) and Haegerich et. al (2014) did find a significant main effects. In spite of that, Drukker's neighbourhood survey had a very large non-response rate, whilst Haegerich's study missed key confounders, suggesting an increased level of risk of bias.

Even though evidence is supportive of social capital and collective efficacy variables on antisocial behaviours, it is important to note that social capital and collective efficacy indicators did show important measurement issues in some studies. This may cast doubts on the validity of the construct, or at least the employed measures. Seemingly, more research is needed in order to improve measurement techniques of this construct.

The inclusion criteria employed in the present review led to the exclusion of a large number of studies addressing the impact of contextual level violence on antisocial behaviour. Therefore, only five studies pertaining to four independent datasets were included. Of these, only Brezina et. al. (2004) found a significant main effect. However, Brezina et. al. (2004) did not control for previous behaviour, a potentially important confounder to be accounted for in the study of the impact of exposure to violence. Haegerich et. al (2014) did, however, find an significant moderation effect.

One study (Molnar et. al., 2005) addressed several measures of victimisation (self-reported individual level victimisation, parent reports of violent victimisation of a family member, and neighbourhood homicide rate). Only individual level victimisation had a significant impact on future violence. Evidence suggests that contextual level

victimisation might not be as relevant as previously thought. Results of previous studies of exposure to violence might be confounded by individual level lifestyle characteristics.

Regarding neighbourhood institutional resources, three studies (two using the same dataset, PHDCN), did address the impact of neighbourhood level resources on antisocial behaviour. Fauth et.al. (2007) found significant but also unexpected results, for example that the role of sports participation was a predictor of increased delinquency and drug use. In spite of this, this study also failed to control for three relevant confounders (parenting, peer effects, and prior behaviour). On the other hand, Molnar et. al. (2008) did find that the number of general and specific youth local organisations was related to decreased levels of aggression, but not of delinquency. On the other hand, Aspy (2014) did not find a significant relationship between parental neighbourhood services concerns on drug use.

Regardless of the fact that evidence does not clearly support the idea that neighbourhood resources may influence developmental outcomes, included studies suggest that research on this subject has been very limited. The included studies only included one dataset and did not always differentiate where programmes were actually located (Fauth, et.al., 2007). In addition, the interpretation of the meaning and implications of the results was not always clear (Molnar, 2008).

Finally, in the case of cultural related variables; only two studies addressing indicators of “subcultural” variables were included. Both used the same dataset. Kirk et. al. (2008) even though this study was supportive of a main and an interaction effect, a non-random pattern of missing cases was found. On the other hand, Wright et. al (2013) finds

support for the idea that community level tolerance to deviance may reduce individual level violence.

As in the case of neighbourhood disorder variables, it is not possible to come to a conclusion on this subject based on only two studies. As said before, no longitudinal study addressing “peer effects” at a neighbourhood level variable could be found.

The presented evidence does provide low support for the idea that there is a neighbourhood level main and direct effect on behaviour that operates over and above individual level factors. Beyond sampling problems (attrition and loss of cases), measurement issues, inconsistent use of indicators (especially at the outcome level) and failure to include relevant confounders, all seem to explain variability in the observed results. Also, no study carried out a sensitivity analysis to address how the selection of area level analysis units (census block, vs. census tract) might impact results and conclusions. In addition, important gaps in research still exist in terms of assessing neighbourhood effects in terms of independent measures in all areas, but especially regarding the impact of crime and violence, social disorganisation, social capital, contagion effects, and neighbourhood resources.

Taken together, these problems make it difficult to infer a causal relationship between neighbourhood level variables and antisocial behaviour outcomes for a general population between nine and twenty years. Nevertheless, some critical issues need to be noted.

Most tested conceptual models seem to portray a somewhat simplistic way in which contexts like neighbourhoods are supposed to influence behaviour. For example, how should peer effects be conceptualised? If peers live in the neighbourhood, should they

not be considered as a neighbourhood effect? The same reasoning could be applied to schools and institutional resources, among other things. None of the included studies addressed how several relevant developmental contexts are distributed across space (schools, friends, youth programs) and how this distribution could impact youth outcomes. Studies exploring this type of question might help to change how current research approaches the problem of neighbourhood effects. Future studies in this field should concentrate on exploring more complex and interactive relationships between contextual level variables and behaviour, to improve the measurement of contextual level variables.

Chapter 3: Theoretical discussion and empirical hypotheses

1. Introduction

As has been acknowledged before, taken together, the evidence presented in the last section, provides low support for the idea that neighbourhood level variables can have a main and direct effect on antisocial behaviour outcomes for a general population between nine and twenty years of age. Even though more consistent results were found when examining indirect effects (specifically moderating effects), firm conclusions are limited due to the low number of included studies in each analytic category. In addition, important gaps in research still exist in terms of assessing neighbourhood effects in most areas, but especially regarding exposure to neighbourhood crime and violence, social disorganisation, social capital, contagion effects, and neighbourhood resources. Especially intriguing were the results related to drug and alcohol use.

Even though methodological problems are the most obvious sources of criticism (e.g. attrition, inconsistent use of indicators or failing to include relevant confounders, among others), the results of the review suggest that research in this field seems to be subject to important conceptual problems that may also explain the unsupportive and mixed results.

The main purpose of the present chapter is to conduct a theoretical discussion of the literature in order present empirical hypotheses that will be tested in the following chapters. It will be argued that the literature addressing neighbourhood effects on antisocial behaviour research has been subject to pervasive difficulties related to i) a problematic conceptualisation of how contextual effects may impact child development, and ii) a lack of explicit incorporation of spatial dimensions as a relevant factor to understand how key criminogenic processes may work. In turn, these problems have

impacted the way spatial and contextual variables have been measured and examined throughout the literature.

The first section of this chapter will focus on expanding the discussion of the nature of contextual effects by reviewing the notions of space, place, and neighbourhoods. These concepts will be confronted and the implications of their use for research will be discussed.

In the second section of this chapter, the literature on the relationship between contextual variables and key criminogenic processes (strain, social control and contagion) will be examined. Empirical research hypotheses will be presented and discussed.

2. Problematic operationalisation of “neighbourhoods”

Unfortunately, with a few notable exceptions, such as for example, the PHDCN (Sampson and Groves, 1989; Sampson, 1997; Sampson, Morenoff and Earls, 1999; Raudenbush and Sampson, 1999) or the FACHS (Steward and Simmons, 2006 and 2010), the vast majority of neighbourhood studies equate neighbourhoods to some fixed level of aggregation of census data (blocks or tracts).

Although convenient, this strategy has received both methodological and substantive critiques. The main methodological critique relates to the fact that the size and shape of area level units will impact the results that are obtained. This is known as the MAUP (it stands for Modifiable Area Unit Problem). The MAUP is a common methodological problem discussed in the geographical literature (see, for example, Fotheringham, Brundson and Charlton, 2005; Dark and Bram, 2007; Mitra and Buliung, 2012). The

MAUP refers to the fact that, for the analysis of spatially aggregated data, results will depend on the size and boundaries of area units for which the data are reported (see Fotheringham, Brundson and Charlton, 2005). This implies that different results can be obtained for the same dataset merely by changing the scale of the aggregation (scale effect), or the way the boundaries of the areas have been defined (*zoning effect*) (Fotheringham et al., 2005; Dark and Bram, 2007). For example, correlations between the same variables might increase, merely as a result of switching the unit of analysis from block level data to census tract level. This is an important problem that has not been explicitly addressed in neighbourhood effects research. In order to address it, sensitivity analysis of the impact of changing units of analysis should be performed (see, for example, Mitra and Buliung, 2012; Dark and Bram, 2007).

The second, and probably most significant critique, relates to the substantive problem implied in selecting census blocks or tracts as proxies for neighbourhoods or communities (Brunton-Smith, Sutherland and Jackson, 2013). Neighbourhoods are usually conceptualized as the next relevant social organisation beyond the family (Ailshire, Bader, Morenoff and Meldendez, 2010, p.3). Neighbourhoods are believed to be socially defined entities that share common boundaries that can change over time, but are assumed to be essentially stable. In other words, neighbourhoods are thought of as a proxy for actually measuring “community” structural and social process characteristics. In particular, process-related neighbourhood level characteristics are thought to be shared determinants of risk [or protection] (Altman, 1995). Shared determinants of risk are usually referred to as emergent collective processes of a community (or residents of a neighbourhood, area or place) that can be considered as a risk or protective factor for child development (Altman, 1995). Shared determinants of

risk refer to the social milieu characteristics (like norms, values, and policies) within which individual risk occurs. This implies that neighbourhoods are conceptualised as a developmental context that can have a meaningful impact on child development. Even though there is a tendency to reify space (Gans, 2002), it can safely be argued that a key idea behind most of neighbourhood effects research is that neighbourhoods may be able to influence behaviour, because the people living in them are capable of influencing behaviour. Neighbourhood effects are to be ascribed to the people involved and their relations, and not to the neighbourhoods themselves (Gans, 2002). Even though census tracts are designed to provide small homogeneous geographical units, this does not guarantee that they will work as an adequate proxy of a meaningful social context or community. There seems to be no convincing evidence to support this assumption that many researchers may take for granted.

Furthermore, if the key idea behind neighbourhood effects research is that people living in neighbourhoods are the ones influencing behaviour, then another important question needs to be answered: are neighbourhoods of residence the only potentially meaningful context (besides family and school) that need to be accounted for? Direct neighbourhood effects depend on the assumption that most of a juvenile's out of school time will be spent in the neighbourhood. It is usually assumed that in this context, social influence will take place. Evidence provided from recent research suggests that this assumption might not be accurate. Increasing attention has been paid to the fact that adolescent daily activities are complex; involving travel beyond the home neighbourhood, to other relevant locations where daily activities take place. These locations include activity locations like school, a friend's home, and entertainment facilities, among others (Oberwittler, 2007; Wikstrom, Ceccato, Hardie and Treiber,

2009; Mason et al., 2009 and 2010; Mennis and Mason, 2011; Perchoux, Chaix, Cummins, and Kestens, 2013; Robinson, 2011). Evidence suggests that traditional geographical boundaries may not be an effective way of capturing juveniles' spatial movements, and thus may not be able to reflect its impact on behavioural and health outcomes (Mason, et al. 2009; Wikstrom, Oberwittler, Treiber and Hardie, 2012).

These new findings have at least two key implications for research. The first relates to the geographical delimitation of what contexts may be significant to explain developmental outcomes. If contextual characteristics of a neighbourhood of residence can have an influence on behaviour, then all contexts where a juvenile may spend time, would need to be considered. If this is the case, the relationship between context and behaviour needs to be viewed as interactive, and more user-centred approaches need to be developed (Gans, 2002; Mason et al., 2010). The second implication relates to the attribution of neighbourhood effects. Since people are routinely exposed to multiple contexts, the meaningful attribution of “neighbourhood effects” becomes difficult. In order to make this attribution, the relative geographical location of different activity nodes needs to be explicitly acknowledged. Consider, for example, the problem of peer and neighbourhood effects. Oberwittler (2007) keenly observed in his study, that neighbourhood poverty only seemed to matter as long as peers lived within the same neighbourhood. If deviant peers live within the same neighbourhood and the neighbourhood is an important after-school activity space, then peer effects might very well explain the observed neighbourhood effects of, for example, concentrated disadvantage. In particular, peers can be considered as both a compositional and a contextual effect. The same problem happens with school effects. If the school happens to be located within the same neighbourhood, how could school and neighbourhood

effects be teased apart? It can be argued that ignoring the location of key activity nodes may introduce confounding effects that are rarely acknowledged in the literature. It could be proposed that one way to address this is to explicitly acknowledge “*where*” significant activity nodes and developmental domains are located in space.

Even though several studies have tested “cumulative effects” of risk factors (controlling for neighbourhood SES, school level characteristics, peer influences, and family variables) (see, for example, Hay, Fortson, Hollist, Altheimer, and Schaible, 2007; Arditti, Burton and Neeves-Botelho, 2010; Margolin, Vickerman, Oliver and Gordis, 2010; Mrug, Loosier and Windle, 2008; Oberwittler, 2007; Wikstrom, Ceccato, Hardie and Treiber, 2009; Mason et al. 2009 and 2010; Mennis and Mason, 2010) limited research has taken into account the spatial location of different activity nodes (or developmental domains) and addressed how their relative location may impact on youth outcomes.

To assume that neighbourhoods are the only relevant extra-familial developmental context for juveniles is what has been called as “falling into the local trap” (Cummings, 2007). Currently this problem is intently debated within the fields of geography and epidemiology. Furthermore research has been called out to take into account this “spatial polygamy” when researching connections between individuals and place (Matthews, 2011).

Others (Lobao, Hooks and Tickamyer, 2007) have referred to this problem as “under-spatialisation” of social theory. It is surprising though to find this “under-spatialisation” within neighbourhood effects literature. This has been identified as a key contemporary challenge faced by neighbourhood effects research (Van Ham and Manley, 2012).

3. From place to space: towards a “spatialisation” of neighbourhood effects research

3.1. Space versus place based approaches to the study of social phenomena

In the context of a renewed interest in spatial analysis of social problems (Gotham, 2003; Gans, 2002; Lobao and Saenz, 2002; Lobao, Hooks and Tickamyer, 2007), an active debate about the relevance of how spatial variables might interact with social life has emerged. On one hand, social scientists have become increasingly interested in explicitly integrating space as a relevant dimension in the explanation of social phenomena (Lobao and Saenz, 2002; Lobao, Hooks and Tickamyer, 2007). On the other hand, this debate has also been fuelled by the fact that geographers have been facing an increasing need to explain social phenomena in the context of the study of spatial dimensions. Both research traditions (social sciences and geography) have had somewhat different, yet complementary, approaches to the problem. In this context, a distinction between place based and space based approaches has been made (Lobao, Hooks and Tickamyer, 2007).

Traditionally, social scientists have been more interested in a place based approach. The notion of place refers to finite locations that have a particular meaning that is attributed to them. This meaning emerges in the context of social interactions that take place within the boundaries of a particular place (Gieryn, 2000). Locations like parks, neighbourhoods, districts or other landmarks may configure spatial locations that are important for people, and therefore may also play an important part in social life. Places are usually seen as finite locations and studied through typologies that may help explain variations in other variables (Lobao et al., 2007). This is particularly the case with

neighbourhood effects research. Neighbourhoods have been conceptualised as key locations where meaningful social relationships may emerge. Typically, neighbourhood effect studies have taken a place-based approach. Neighbourhoods are believed to be meaningful places and their characteristics like social control, collective efficacy, or cultural variables may all serve to influence other behaviours.

On the other hand, geographers have been usually less interested in the meaning of places, and have approached the study of geographical landmarks as pure space. In this context, space is studied as material locations that are detached from particular cultural interpretations (Gieryn, 2000). Spaces are analysed in terms of abstract geometries, where the use of distances, directions, shapes and volume are the primary analytical tools. An interesting example of a space-based approach in the study of social phenomena is presented by Lockwood (2010). This study examined whether the physical distance between the residence of juvenile offenders and the location of their community-based treatment programme had an impact on programme dropout. The author found partial support for the idea that, after controlling for other predictors, increased physical distance between home and programme location also increased the likelihood of programme non-completion. Another example can be found in the geography of opportunity literature. Allard and Danziger (2002) were interested in studying the impact of space on lack of employment of welfare recipients. After controlling for individual characteristics, they found that a greater physical proximity to employment opportunities was associated with both a higher probability of working and a higher probability of leaving welfare support. Spatial perspectives have also been used to study social networks. For example, Glanville (2004) studied how the location of voluntary associations impacted the properties of social networks. She found that

organisations located inside the same neighbourhood as the place of residence (as defined by respondents) were related to increased network density and homogeneity, whereas the participation at voluntary associations located outside the neighbourhood (as defined by respondents) contributed to enhanced network diversity.

Spatial perspectives of social problems have also been criticised. It has been said that the use of physical distance as an analytical tool to explain social phenomena is a sterile measure that does not integrate information about the social milieu where studied events occur (Groff and McEwen, 2007). However, it can be argued that both place and space based perspectives present different emphases, which are by no means incompatible.

In a similar sense, environmental criminology, as a field, has also been split into two main research traditions. The first tradition, influenced by the early works of the Chicago school, focused primarily on the impact that environmental characteristics (e.g. urbanisation, segregation, poverty concentration, among others) might exert on the development of criminal motivation (see, for example, Shaw and McKay, 1969). This perspective has mainly been dominated by social disorganisation perspectives (Agnew, 1999), and has had a strong place-based orientation in its analysis of criminal phenomena. In response to several concerns regarding this research perspective (e.g. about ecological fallacy, confusion between offender residence and location of crime occurrence, problematic operationalisation of meaningful places), a second research tradition emerged, focusing primarily on the analysis of ecological factors influencing the occurrence and location of crimes in space (Brantingham and Brantingham, 1981, 1984, 1993a, 1993b). In opposition to place-based research, this tradition has been strongly focused on a space-based perspective studying the movement of motivated

offenders and victims through space, and how spatial distances between offenders, victims and their routine activities may help explaining the location of criminal events. From this perspective, individuals are viewed as active agents that use space in more complex ways than has sometimes been assumed within the traditional neighbourhood effects literature (see, for example, Van Koppen and Keijser, 1997; Tita and Griffiths, 2005; Groff and McEwen, 2007; Lockwood, 2010; Bichler, Schwartz, and Orosco, 2010). It will be argued that even though key theories and concepts of this perspective have been mainly developed to explain the location of crimes, they also can be reinterpreted as useful analytical tools within the neighbourhood effects research perspective.

3.2. Awareness and activity spaces

Awareness and activity spaces are two concepts that have been brought into environmental criminology and further developed by Brantingham and Brantingham (1993). Drawing on routine activity theory and rational choice perspectives (Clarke and Felson, 1993) Brantingham and Brantingham (1993a) developed and integrated these concepts into the latter proposed theory of crime patterns.

Early routine activity theory emerged as a way to understand crimes that involve direct contact between offender and victim (or target). It posed that, for a crime to be committed, three key elements must be present in space and time: a motivated offender, a suitable victim or target, and the absence of a capable guardian (Cohen and Felson, 1979; Clarke and Felson, 1993). According to this theory, people's daily routine activities¹⁹ create conditions for the occurrence of crimes. For example, daily work

¹⁹ It refers here to legal activities, like going to school or work.

activities take people away from their homes, leaving them without the presence of capable guardians. However, the key mechanism through which it is posed that routine activities operate is by bringing together persons in the presence of situations that influence the commission of illegal acts (Cohen and Felson, 1979). On the other hand, rational choice theory seeks to explain choice processes involved in the commission of a crime (Clarke and Felson, 1993).

As part of their crime pattern theory, Brantingham and Brantingham (1993a, 1993b) extended these propositions. They asserted that people's routine activities are one of the components of the "backcloth" on which the process leading to a criminal act rests. Routine activities refer to a set of repetitive processes occurring in time and space that organise everyday life actions, like going to work, to school, or visiting friends, among others. Given their repetitive nature, they shape what has been called "activity spaces". Activity spaces refer to both i) the spaces to which individuals travel to, and ii) those spaces individuals travel through. Activity spaces contribute to developing an "awareness space". The "awareness space" refers to the parts of the geographical space (e.g. the city) that are known to individuals. The awareness space is limited in space and time, thus people only have knowledge of a restricted part of the space surrounding their activity nodes. This is one explanation of the fact that criminal events tend to occur near offenders' nodal activity points or routine pathways (Brantingham and Brantingham, 1993b).

3.3. Incorporating distance in the study of the relationship between space and behaviour

Within the tradition of environmental criminology, one key methodological tool to study the location of criminal events has been the use of distance, as opposed to typologies such as neighbourhood. The study of geometric properties like “distance” may offer more flexibility to incorporate space as a relevant dimension in the explanation of behaviour. The use of distance has been successfully integrated in several subfields of environmental criminology. For example, travel distance has been used as a proxy to operationalise routine activities (Groff and McEwen, 2007). Another examples are the study of the “journey to crime”, and the “mobility triangle”.

The literature addressing the “journey to crime” has explored the distance travelled from home to the crime scene by offenders and victims. One of the main findings of this empirical literature is that most crimes are usually committed near some nodal activity point of the offender. For example, Baldwin and Bottoms (1976) found that up to three quarters of juvenile offenders operate within one mile of their home. Furthermore, it has also been found that the distance between the offender's home and a particular criminal event can be modelled as a distance decay function (Bichler, Schwartz and Orosco, 2010). Two theories have sought to explain this relationship. The first poses that distance decay is related to transportation barriers like costs and time involved in travel to (and exploration of) more distant locations. The second poses that offenders prefer familiar areas, in opposition to unfamiliar areas, in which to offend (Groff and McEwen, 2006). After a critical distance from offender anchor points or activity nodes, the

likelihood of an offence occurring at that location decreases sharply (Bichler, Schwartz and Orosco, 2010; Wiles and Costello, 2000).

Travel distances can vary by offence type and offender characteristics. For example, it has been shown that travel distance is higher for male offenders (Nichols, 1980; Phillips, 1980; Gabor and Gottheil, 1984), increases with offender age, (Baldwin and Bottoms, 1976; Nichols, 1980; Phillips, 1980; Gabor and Gottheil, 1984; Wiles and Costello, 2000), varies by offender race (black people travel less than white people) (Nichols, 1980; Phillips, 1980), is lower for crimes against persons than for crimes against property (Baldwin and Bottoms, 1976; Phillips, 1980), and decreases when co-offending (solo offenders travel more than co-offenders) (Baldwin and Bottoms, 1976; Gabor and Gottheil, 1984).

Other characteristics related to higher travel distances are offender recidivism (compared to first offenders, see Baldwin and Bottoms 1976; Gabor and Gottheil, 1984), season (higher distances travelled in the summer compared to the winter), and marital status (single offenders travel more than married ones) (Gabor and Gottheil, 1984). It is interesting to note that while an offender's social class seems not to affect travel distance, a higher neighbourhood concentration of offenders reduces the average distance travelled by those offenders (Baldwin and Bottoms, 1976)²⁰.

²⁰ More complex distant decay functions have also been described. For example, Bichler, Schwartz and Orosco (2010) found that distance decay can also be modelled as segmented non-linear models where decay has a buffer zone around the offender's home. For example, the likelihood of a crime is lower within the immediate home distance until a critical point where likelihood increases, then sharply decreases afterwards. This implies that offenders may tend to avoid areas within the immediate vicinity of an anchor point (the buffer is presumed to be around the home), yet they tend to select targets near home.

Travel distances have also been studied in more atypical offences like serial crimes (Warren, Reboussin, Hazelwood, Cummings, Gibbs, and Trumbetta, 1998; Snook, Cullen, Mokros and Harbort, 2005). In the case of serial murderers, Snook et al. found that 63% of such offenders lived within ten km of their victims. Finally, in the case of serial rapes, Warren et al. (1998) found that ritualised crimes (presumably more planned) were related to higher distances than non-ritualised ones.

A relevant concept that is related to journey to crime research has been the study of “*mobility triangles*”. The mobility triangle refers to the area formed by the offender’s home, the victim’s home and the location of the crime. In the same way as distance, there have been studies into how mobility triangles change according to diverse offence types and offender characteristics. Mobility triangles are used to understand the role of victims’ and offenders’ travel behaviour in the likelihood of a crime occurring. One key idea of mobility triangles is the notion of convergence. Likelihood of crime increases when victims’ and offenders’ activity spaces intersect in space and time (Groff and McEwen, 2007; Tita and Griffiths, 2005; McConnell, 2009).

Several typologies of mobility triangles that seek to describe the joint distribution of offender’s address, victim’s address, and crime location (Groff and McEwen, 2007) have been developed. For example, a “local triangle” is a triangle where the offender’s address, the victim’s address and the crime location all occur in the same neighbourhood (usually defined, again, by census tracts). Other triangles may involve, for example, the offender travelling to the victim’s neighbourhood or vice versa. One last type involves

triangles where the crime occurs outside of both offenders and victim's neighbourhood (McConnell, 2009). Other extensions have involved the definition of triangles in function of the distance between offender, victim, and crime location. In this case, "local triangles" refer to the case when all distances (offender-victim-crime location) are below a certain cut-off distance (Groff and McEwen, 2007).

3.4. Bridging the notions of “activity space” and neighbourhood effects research: shaping opportunities to experience social influence

Until now it has been argued that:

- i) Empirical research suggests that people, and especially juveniles, show complex movement patterns through a city, spending time at several locations, not only at home neighbourhoods.
- ii) That routine activities contribute to shape activity and awareness spaces, which in turn create opportunities for the occurrence of criminal acts.
- iii) Activity spaces of people in general, and offenders in particular, tend to be concentrated in areas surrounding routine activity anchor points. The use of distance between anchor points may be a good proxy to study routine activities and possible activity spaces.

Even though previous theoretical arguments have been developed primarily to explain the movement of offenders and victims through space, it could be argued that these concepts may also provide a useful tool to understand how contextual social influence may operate. It could be proposed that contextual social influence i) is more likely to occur within normal activity spaces, and ii) persons will be more likely to influence each other if their activity spaces converge. It follows that, in order to adequately address the study of potential neighbourhood effects (from now on “contextual effects”), the analytical focus would need to shift from neighbourhoods to activity nodes. A shift in this approach would allow reflecting more accurately the true exposure to relevant locations that people visits every day. People converging on the same

activity space are expected to be more likely to influence each other. In addition, since activity nodes may change (as a result of a change in school, change in home or change of friends or others), an activity space based approach may provide a more dynamic way to studying spatial and social influence on behaviour.

In the next section, three key criminological research traditions that address how social influence may impact antisocial behaviour will be presented. The key issue that will be discussed is how contextual characteristics may interact with these criminogenic processes.

4. Contextual disadvantage, activity spaces and criminogenic processes: discussion of empirical hypotheses

4.1. Main effect hypotheses: the influence of contextual disadvantage from an activity space perspective

As has been discussed, the traditional neighbourhood effects literature has mainly been interested in neighbourhoods of residence, which now seems to be a narrow and unrealistic representation of potential spaces where social influence may take place. If neighbourhood effects literature has largely ignored the issue discussed above, then it seems important to revisit some of the hypotheses on the effect of contextual concentrated disadvantage on antisocial behaviour that have been **studied**. It is also important to note that these hypotheses will also be tested using a new dataset, and referring to a country that is fundamentally different from the US or Europe.

As the results of the systematic review suggest, previous research has shown inconsistent results in relation to the possible existence of a contextual effect of

concentrated disadvantage on antisocial behaviour. These results may have been related to inconsistent model specification and conceptual shortcomings related to how to address spatial relationships. In spite of this, more consistent results have been found when exploring indirect effects.

Therefore, regarding empirical testing in Chile, it is initially expected that a contextual direct main effect of concentrated disadvantage on antisocial behaviour will be found. However, this effect is expected to be primarily indirect, and completely mediated by variables measuring relevant criminogenic processes (Hypothesis 00). Extending the previous arguments on activity spaces, it would also be expected that effects of different activity spaces on antisocial behaviour may vary depending on the type of activity space (Hypothesis 01). Hypotheses regarding indirect effects will be discussed in the next section.

4.2. Indirect effect hypotheses: contextual disadvantage and criminogenic processes

Throughout criminological literature, a group of three key contextual criminogenic processes have been repeatedly linked to deviant and antisocial behaviour in juveniles. These are strain, social control, and contagion related processes. All three refer to sociological theories, and thus seek to explain antisocial behaviour in terms of the individual's social relationships (Agnew, 1992). Since contextual effects are expected to be transmitted through social relationships among the people living or visiting those contexts, it would be reasonable to study how those social relationships might influence antisocial behaviour.

Strain, informal social control, and contagion effects are the most commonly studied criminogenic processes, not only in relation to juvenile antisocial behaviour in general, but also in relation to neighbourhood effects in particular. These three processes are sometimes referred to in different theories, and are operationalised in different ways. It can be argued that these processes are far from being exclusive (Hein, 2007). Extensive literature on antisocial behaviour suggests that no single one of these processes can by itself explain the emergence of antisocial behaviour, and thus their relative contribution to the emergence of antisocial behaviour needs to be considered. By considering all three of these processes, they can be empirically tested, their relationships can be studied, and their relative relevance can also be scrutinised. In the following section, all three processes will be defined, evidence supporting them will be briefly summarised, and hypotheses related to how they might interact with spatial variables will be discussed.

4.2.1. Strain and antisocial behaviour

In its modern formulation, strain refers to negative affective states, usually anger and related emotions. These negative emotional states result from frustration induced by negative relationships (Agnew, 1992) or perceived contradictions in the social structure (Merton, 1957) that prevent the achievement of positively valued goals. These negative emotional states are thought to create pressure in order to produce a corrective action. Under certain circumstances, this corrective action may lead to delinquent acts (Agnew, 1992).

The fundamental ideas of strain theory can be traced back to Emile Durkheim and

Robert Merton. These ideas were further developed by other authors like Richard Cloward and Lloyd Ohlin (1960), Messner and Rosenfeld (1997), and Robert Agnew (see, for example, Agnew, Cullen, Burton, Evans and Dunaway, 1996; or Agnew and Thaxton, 2004). In 1957, Robert Merton suggested that it would be possible to observe the existence of a meritocratic ideal in the US. This meritocratic ideal stated that universal economic success was possible through hard work and individual skill. However, while particular culturally desirable goals (e.g. economic success) are defined for all members of society, not all groups have an equal access to socially acceptable means of achieving those goals (access to high quality education). Following Grusky (2001), in a socially stratified system there are rules governing the distribution of goods across different positions in the social structure. These positions, usually defined by occupational prestige, are subject to a differential distribution of goods. According to Merton (1957), this contradiction between defined goals and available means generates a subjective tension, which he called strain. This subjective tension arising as a response to perceived contextual contradictions is a core element of strain (anomia) theory.

Merton (1957) argued that when this tension is sufficiently large, individuals will be faced with the need to assess which means or institutional process is more efficient for achieving the culturally valued goals. He adds that the most efficient means are typically preferred, independent of their legitimacy. Merton (1957) also argued that individuals could adapt to this in several different ways, depending on the level of acceptance of defined goals and the means available to reach them. The conformist adaptation, where people accept both goals and means is believed to be the most

common form of adaptation. On the other hand, innovative adaptation refers to people who maintain a commitment to socially valued goals (economic success), but reject socially prescribed ways (study, working regular hours). This is the adaptation strategy that can be related to delinquency. Despite the fact that Merton recognises that this mode of adaptation can be observed in people at any position in the social structure, he also thought that membership of a lower social class may be associated with higher pressures toward deviance and, therefore, a greater presence of people adapting in an innovative way. The individual subjective state of tension produced by structural contradictions was named as anomia.

As mentioned before, several extensions and adaptations to the theory have been proposed. For example, Cloward and Ohlin (1960) proposed that the existence of a discrepancy between means and ends was by itself not enough to influence deviance. In addition, the presence of illegitimate means also was needed to increase the likelihood of an innovative adaptation. Other extensions have sought to overcome the narrow explanatory focus of the theory. While Merton's anomia theory (1957) suggests that it can only explain deviant behaviour related to property offences, and thus provides no explanation for example of offences against persons (Simons, Gordon and Ebert, 2004), more modern contributions developed by Robert Agnew (Agnew, 1992; Agnew, et al., 1996; Agnew, 1999; Agnew and Thaxton, 2004) sought to overcome these limitations by defining a more general theory that could account for how strain might influence behaviour. Integrating advances from research into the effect of stress and frustration on aggression, and perceptions of equality, Agnew (1992) proposed the General Strain Theory. This theory focuses on how negative relations with others may influence deviance. As stated before, Agnew argued that juveniles are pressured into delinquency

by negative affective states (mainly anger and related emotions) that often result from negative relationships. This negative affect would create pressure for corrective action. One way to deal with this negative affect would be to make use of illegitimate means for goal achievement. Agnew (1992) identified three major sources of strain. Firstly, other individuals may prevent one from achieving positively valued goals. In this case, strain results from the disjunction between aspirations/expectations/ or perceptions of fair outcomes, and actual outcomes or achievements. Secondly, others may remove or threaten to remove positively valued stimuli that one possesses. In this case, strain results from events involving the loss of positively valued stimuli, and events involving the presentation of noxious or negative stimuli. Thirdly, others may present or threaten to present one with noxious or negatively valued stimuli. Juveniles may have recourse to illegal means in order escape, avoid or respond to (e.g. revenge) negative stimuli. Agnew also proposed that strain, by itself, would not lead to delinquency. Its effect were conditioned by other factors, such as values, individual coping resources, conventional social support, and other constraints to delinquency like social control. For example, in a longitudinal study developed by Mazerolle and Maahs (2000) the authors found that the impact of strain on delinquency was conditioned (moderated) by the exposure to delinquent peers, controlling for deviant beliefs, and having a behavioural propensity toward delinquency.

4.2.2. Contextual disadvantage and strain

Agnew (1999) extended his theory in order to explain differential crime rates in disadvantaged communities. The author argued that those communities would have increased levels of strained subjects. This would be the result of a selection effect,

where these communities would be more likely to select and retain strained individuals. However, these communities would also exert direct effects by increasing perception of goal blockage, perception of relative deprivation, sensitivity to the loss of valued stimuli, and exposure to negative stimuli. Other theoretical developments by Wilson (1987) and Anderson (1990) imply that a neighbourhood's concentrated disadvantage may have a primary role as a source and an amplifier of strain. For example, Wilson (1987) argued that concentrated disadvantage would facilitate the emergence of several social problems. Children being raised in deprived neighbourhoods would have access to poorer role models due to a higher concentration of people that are both unemployed and have a low educational level. It could be argued that frequent interactions with this type of poor role model would increase or reinforce the perception of blocked opportunities.

Results from a wide range of studies support to the idea of a positive correlation between economic deprivation and antisocial behaviour²¹ (Braithwaite, 1981; Sampson, 1986; Thornberry and Farnworth, 1982; Hirschi, 2004; Farnworth, Thornberry, Krohn and Lizotte, 1994; Weatherburn and Lind, 1997). Most of these studies, however, do not address contextual level measures, but rather use individual level measures. Another set of studies provide evidence that other contextual indicators related to economic deprivation, like contextual unemployment rates (see, for example, Weatherburn and Lind, 1997; Araya and Sierra, 2002) and the contextual availability of poor quality jobs (low wages and increased instability) (Thornberry and Farnworth, 1982; Crutchfield and Pitchford, 1997; Allan and Steffenmeister, 1989) may predict increased levels of delinquency. Also, Pratt and Godsey (2003) found that the relationship between

²¹ Poverty of low SES.

increased levels of inequality (country level) was related to increased levels of homicide rates. An interesting example of a study of the relationship between indicators of strain and deviant behaviour outcomes is that conducted by Collier-Goubil, 2010. The author found that neighbourhoods with a higher level of foreclosure rates, also showed higher levels of family violence.

A key issue with the abovementioned studies is that they rely on measures of external variables that are presumed to be stressful for the subjects. Thus, it is unclear if those external stressors (e.g. concentrated disadvantage, unemployment) transmit their effect through an increased level of subjective strain. Fewer studies have focused on directly measuring subjective strain and assessing whether it may be a mechanism mediating the relationship between external stressors and increased levels of antisocial behaviour.

Studies using measures of subjective strain have also found support for strain-related theoretical predictions. Subjective strain has been measured in many ways, including individual stress, perceived blocked educational or job opportunities²² (Farnworth and Leiber 1989; Menard, 1995), dissatisfaction with monetary incomes (Farnworth and Leiber 1989; Agnew, et al. 1996), believing that illegitimate means may be necessary to achieve personal goals (Menard, 1995), perceived negative relationships with parents (Spohn, 2004) or perceived negative relationships with teachers and friends (Bao, Haas and Pi, 2007). These measures have also been linked to increased levels of deviant behaviours.

Evidence also suggests that subjective strain may mediate the contextual disadvantage-antisocial behaviour relationship. For example, Warner and Fowler (2003) found that

²² E.g. how likely do you think it is that you will finish high school? / go to college? / get a good job?

the neighbourhood level of concentrated disadvantage and residential mobility were related to increased levels of strain (“receiving verbal threats, felt cheated, or harassed by police”). In another study, Boardman, Finch, Ellison, Williams and Jackson (2001) found that neighbourhood disadvantage was moderately associated with drug use. This relationship was partially mediated by increased stressful life events (illness, being a victim of crime, being robbed, serious financial problems), and increased psychological distress (indicators of frustration and depression). Neighbourhoods that are perceived as stressful (as a result of vandalism, litter or trash, vacant housing, teenagers hanging out, burglary, drug selling, and robbery) predict several negative health and behavioural outcomes (Curry and Latkin, 2003; Warner and Fowler, 2003; Spohn, 2004).

It may seem that evidence is generally supportive of the idea that strain variables may mediate the contextual disadvantage-antisocial behaviour relationship. Nevertheless previously cited research has been subject to the same methodological problems that were discussed in chapter 2 (e.g. same source bias, cross sectional design, among others)²³. In addition, most neighbourhood effects studies address social control and contagion processes, while only a few studies have focused on strain-related processes. Very limited longitudinal research exploring strain as a potential mediator between neighbourhood disadvantage and behaviour has been conducted²⁴. A final problem is related to how strain has been measured. Strain has been mostly measured in terms of exposure to noxious stimuli (exposure to violence and economic strain) and negative emotional states (psychological distress). Perceived goal blockage, which is a core feature of strain, has been rarely measured, and even reference to such blockage is rarely made in neighbourhood effects research. Researchers do not usually verify if

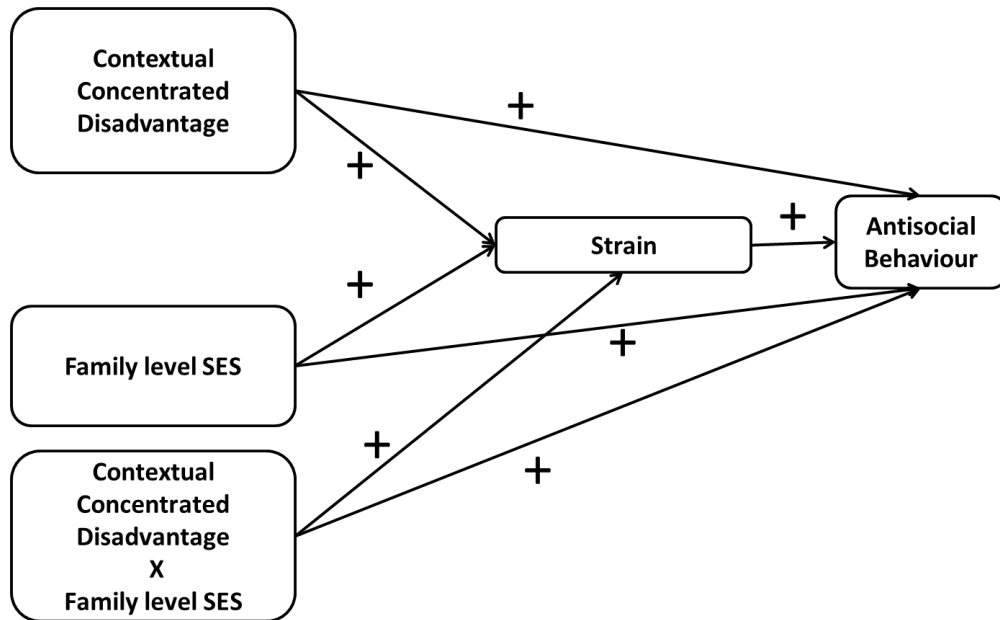
²³ For a detailed discussion please refer to Chapter 2.

²⁴ Drukker et al., 2010, focused only on parental stress.

subjective strain may mediate the effect of external factors on antisocial behaviour. It could be argued that this is an important omission because, conceptually speaking, strain is not equal to stress. An important component of strain is related to exposure to stressors and subjective stress, and reacting with anger. Strain, as criminogenic processes, implies (in a more Mertonian view) that the source of stress is related to a social state that is potentially perceived as being unfair (Bjarnason, 2009). Thus, measures assessing strain should emphasise this dimension. Otherwise, strain is treated exactly as if it were any kind of stress, and hence potentially unrelated to antisocial behaviour.

Given the literature that has been discussed, it is expected that subjective strain variables would predict increased levels of antisocial behaviours (Hypothesis 1). It is also expected that a significant interaction effect between contextual level concentrated disadvantage and family level SES predicting increased antisocial behaviour will be found (Hypothesis 2). Finally, it is expected that the relationship between “contextual disadvantage”, “family level SES” (and related interaction effects) and antisocial behaviour would be, at least partially, mediated by subjective strain (Hypothesis 3). See the summary of these hypotheses in figure 3.1.

Figure 3.1: Hypothesis on the Relationship Between Disadvantage, Strain and Antisocial Behaviour*



**Model will be adjusted by social control variables, social contagion variables, and controls.*

4.2.3. Informal social control and antisocial behaviour

A second relevant process relates to informal social control. The origins of the social control perspective can be traced back to Travis Hirschi, who developed the "Social Bonding Theory" in 1969 (Hirschi, 2004). The social control perspective focuses on explaining the role that informal social control plays as an inhibitor of antisocial behaviours. From this perspective, even though deviant means usually provide the most expeditious way of satisfying personal desires, people abstain from engaging in deviant behaviour because they do not want to disappoint significant others. According to Hirschi (2004) people conform when they have strong attachment, commitment, and involvement, to prosocial institutions and organisations like family, school, and work, among others. If those bonds break, people are believed to be free to misbehave. Individuals who do not have such ties are believed to have greater freedom to engage in deviant behaviour because they have less to lose (Brezina, 1998). Hirschi (2004) distinguished four key elements of the bonding theory, namely the attachment to others²⁵, commitment²⁶, involvement (degree of time invested in prosocial activities) and belief (belief in prosocial norms and values and that they are morally correct and should be obeyed).

One of the main (but not the only) applications of social bonding theory has been to provide an explanatory framework that allows researchers to interpret the relevance of the family as a factor that may influence deviant behaviour. Within this framework, parenting variables are thought to foster (or not) attachment to conventional social

²⁵ We accept norms of those we admire and identify with, like parents and teachers, among others.

²⁶ Commitment refers to the time and effort invested in building a conventional lifestyle. People with higher investment (e.g. those with higher educational status) will be more reluctant to engage in deviant behaviour. This is because they have more to lose.

norms. An extension to this perspective has been proposed by Sampson and Laub (1993) who suggest that criminal involvement is facilitated not only by indirect controls (attachment) but also by the exercise of direct controls such as monitoring and a disciplinary parental style. Indirect controls are primarily exercised through "responsiveness". Parents who are open, warm and responsive to their children's needs, will foster attachment, and thus promote indirect social control. On the other hand, direct control primarily depends on supervision.

A second application of social bonding theory relates to the role that schools may play in social control. Because schools are institutions that socialise conventional norms and values, attachment to school will foster conformity. If attending school becomes an unpleasant experience (degrading, demoralising, an experience usually associated with a poor academic performance), the attachment to this institution will deteriorate. Students with low school attachment are "free" to engage in deviant behaviour. Children with low attachment to school or parents will be more vulnerable to other deviant influences, for example peers (Hirshi, 2004).

Social control theory has received widespread support in empirical research which has demonstrated that its components are good predictors of a variety of deviant behaviours, ranging from property crime to truancy and drug /alcohol use (Hirschi, 2004; Junger and Marshall, 1997; Jenkins, 1995; Wiatrowski, Roberts and Griswold, 1981; Marcos, Bahr and Johnson, 1986; Alarid, Burton and Cullen, 2000; Costello and Vowell, 1999; Le Blanc, 1997; Chuem-JimSheu, 1988; Yuet-Wah and Cheung, 1988; Zhang and Messner, 1996). The component that receives less support in such research is the

involvement dimension (see, for example, Alarid, Burton and Cullen, 2000). This may be due to the fact that the involvement dimension has usually been operationalised as the participation in after-school activities like voluntary work, sports, and cultural groups (among others). Overall studies in the field have found mixed results that are either non-significant, or contrary to what was expected. For example, Mahoney, Stattin and Lord, (2004) found that participation in youth centres increased frequency of criminal offending in all types of participants (high and low risk). This increase in antisocial behaviour was attributed to peer effects occurring in an unstructured social context.

4.2.4. Contextual disadvantage and social control

Social control processes are among the most commonly tested variables in neighbourhood effects research. In the literature, three main sources of informal social control have been identified, namely family level social control (monitoring, parental attachment), informal social control promoted by other institutions like schools (e.g. school attachment), and community level social control (i.e. social capital and collective efficacy).

In the present section, the relationship between informal social controls will be discussed, focusing primarily on family level and school level informal social control. Even though social control is also thought to be achieved by other organisations, like neighbourhood level organisations, and through collective action (e.g. collective efficacy, Sampson, 1997; Kirk et al., 2008; Maimon et. al, 2010; Coster et al. 2006) this dimensions will not be addressed within this thesis²⁷.

²⁷ This is largely related to the unavailability of useful data to measure contextual level social control. In

Within the literature, informal social control, as a process, is thought to be a key mediating factor explaining the impact of concentrated disadvantage on antisocial behaviour. One key issue here is whether informal social control mediates the effect of contextual concentrated disadvantage after having controlled for family level disadvantage.

In the case of family level social control, concentrated disadvantage is thought to provide a context of stressful experiences that may result in deteriorating parenting, specifically monitoring and attachment (see, for example, Plunkett, 1999; McLeod and Shanahan, 1993; Takeuchi, Williams and Adair, 1991; Ross, 2000; Baumer 1999; Beyers, 2003; Beshears, 2005; Coster et. el., 2006). In turn, reduced family level social control is thought to leave children exposed to other influences, such as peers (see, for example, Baumer, 1999; Lloyd and Anthony, 2003; Simons, Simons, Burt, Brody and Curtona, 2005; Eamon, 2002).

Even though family level SES usually has been found to have the weakest effect on antisocial behaviour (Loeber and Dishion, 1983), evidence suggests that family level social control variables (parental management) mediate the effect of family level SES on antisocial behaviour (Larzelere and Patterson, 1990).

This also seems to be the case with contextual concentration of disadvantage. The available evidence suggests that its effect on antisocial behaviour may also be mediated by family level social control (Beshears, 2005). As in the case of family level disadvantage, contextual concentrated disadvantage has been usually conceptualised as

spite of this, a small fund has been secured in order to gather information on this subject.

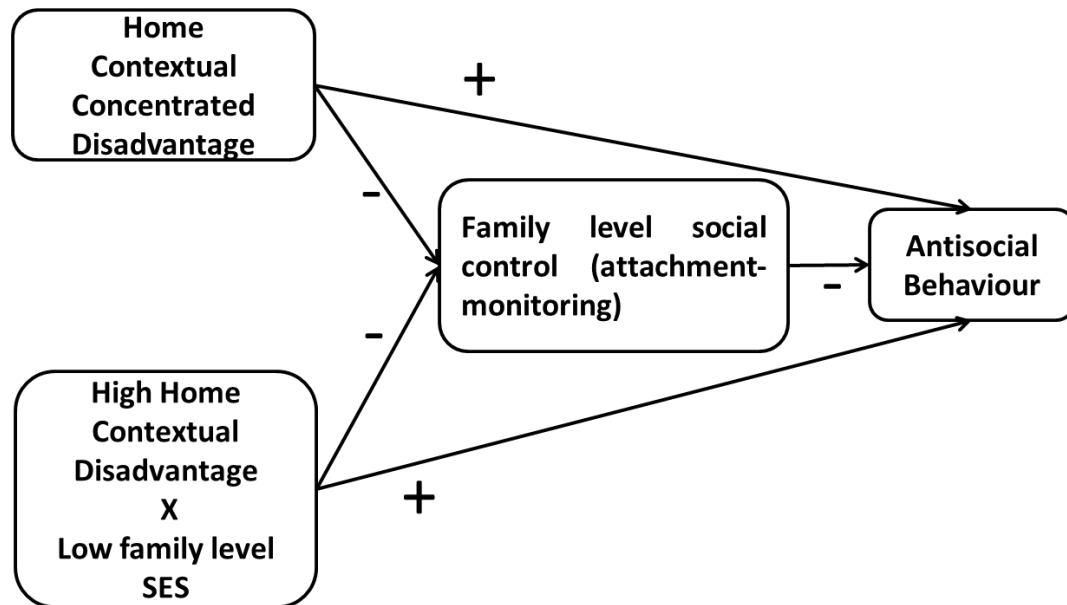
a source of stress for parents, impacting their capacity to promote good attachment and enforce discipline.

It is therefore reasonable to assume that both family level SES and contextual concentrated disadvantage might predict increased levels of antisocial behaviour through the deterioration of parenting (Hypothesis 4). In other words, parenting variables (i.e. monitoring and attachment) will mediate the effect of both contextual concentrated disadvantage and family level SES on antisocial behaviour. It is also seems reasonable to propose that individual level SES and contextual concentrated disadvantage may interact, amplifying their effect on family level social control and antisocial behaviour (Hypothesis 5).

As an extension of this line of thought, it is also possible to propose that, if family level social control variables are indeed affected by contextual disadvantage, then the effect of concentrated disadvantage surrounding the respondents' home (i.e. the home activity space) on informal social control should be stronger than the effect of contextual concentrated disadvantage surrounding other activity spaces (Hypothesis 6). If it is true that concentrated disadvantage impacts parenting, because it is stressful, the immediate home activity space should matter the most.

Hypotheses 4, 5, and 6 are graphically displayed in figure 3.2.

Figure 3.2: Hypotheses on the Relationship Between Family Social Control, Contextual Concentrated Disadvantage, and Antisocial Behaviour*



**Model will be adjusted by strain variables, other social control variables, contagion variables, and controls.*

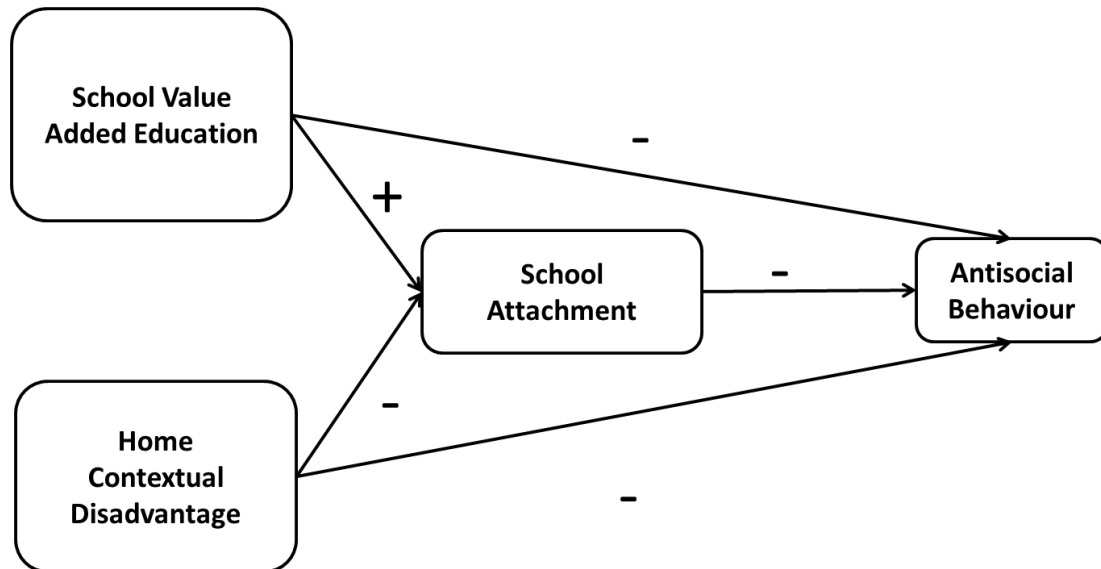
Regarding social control promoted by extra-familial institutions, school level social control emerges as one of the most relevant of such institutions (Hirshi, 2004). School attachment, as an expression of informal social control, has been linked to lower levels of antisocial behaviour (Hirshi, 2004). Some available evidence suggests that school attachment may also mediate the relationship between contextual disadvantage and antisocial behaviour (Baumer, 1998).

Avenyard (2004) proposed that schools providing value-added education given the social background of their pupils, are more effective in providing both support for learning and control that is perceived as appropriate by their pupils. In particular, “appropriate control” refers to control of behaviour (disciplinary matters), and results in

pupils learning appropriate forms of behaviour. Schools providing value-added education have been associated with lower rates in behaviours like smoking (Avenyard, 2004), marihuana use, stealing, and participating in group fights (Tobler, Komro, Dabroski, Aveyard and Markham, 2011). In regard to this finding, one pathway through which schools may be affecting reduced levels of antisocial behaviours is through fostering informal social control. It can be proposed, then, that an effective school would be expected to promote, among other things, school engagement (i.e. attachment). It would be likely that students attending schools providing value-added education would show lower levels of antisocial behaviours (Hypothesis 7). In addition, the effect of school based value-added education is expected to be, at least partially, mediated by school attachment (Hypothesis 8).

Previous evidence (Baumer, 1999) suggests that the effect of concentrated disadvantage surrounding a student's home on antisocial behaviour is expected to be at least partially mediated school attachment (Hypothesis 9). A summary of these hypotheses is presented in figure 3.3.

Figure 3.3: Hypotheses Regarding the Relationship Between School Effectiveness, Concentrated Disadvantage, School Attachment and Antisocial Behaviour



**Model will be adjusted by strain variables, other social control variables, contagion variables, and controls.*

In the case of community level social control, it is pertinent to note that traditional social disorganisation theory has conceptualised concentrated disadvantage as a factor that contributes to the breakdown of social control. Furthermore, evidence suggests that the effect of concentrated disadvantage on delinquency may be mediated by neighbourhood level informal social control (Sampson, Raudenbush and Earls, 1997; Raudenbush and Sampson, 1999; Wikstrom, Oberwittler, Treiber and Hardie, 2012). Given the important difficulties of producing data on neighbourhood level social control, most studies use concentrated disadvantage as a proxy for macro level social control. It should be noted that the present study does not have direct measures of neighbourhood level social control variables (e.g. collective efficacy), thus this particular mechanism will not be directly tested.

4.2.5. Contagion effects and antisocial behaviour

A third relevant set of criminogenic processes that has not been accounted for by the other two processes are those known as contagion effects in the neighbourhood effects literature. Mayer and Jencks (1989) and Furstenberg and Hughes (1997) proposed several mechanisms through which neighbourhood effects may explain negative outcomes. The authors posited that the “epidemic model” assumed that people living in the same areas will tend to share the same attitudes and beliefs, hence influence each other in adopting common ways of doing things. This model postulates that social “contagion” may explain the clustering of negative outcomes. A key contagion mechanism was thought to be related to peer influences.

While strain perspectives focus on the role of structural contradictions and emergent subjective tensions, and social bonding perspectives study the breakdown of attachment and informal social control, contagion effects perspective focuses on how problematic and deviant behaviours are learned and reinforced. Contagion effects refer to the idea that antisocial behaviour might spread, just as diseases do. The contagion effects perspective builds on theories like “differential association” or “social learning” in order to explain how neighbourhood composition or characteristics may foster learning and reinforcement of antisocial behaviours. This perspective stresses the need to study the role of social influence mechanisms in adopting deviant behaviours.

The first criminologist to theorise about contagion effects was Edwin Sutherland, in 1947 (Sutherland, Cressey and Luckenbill, 1992). He argued that deviant behaviours were learned, mainly in the context of interactions with others and usually within

intimate personal groups. In addition to specific knowledge people also learn drivers, motivations, attitudes and rationalisations (called “definitions”). Sutherland postulated the principle of differential association. Usually people will relate to both deviant and non-deviant others. The principle of differential association states that delinquent behaviour is learned because of an excess of definitions favourable to law violation over definitions not favourable to law violations. This may happen when individuals come into contact with people upholding deviant definitions and are isolated from other non-criminal affiliations. From this perspective, those social relationships that start early are more durable, occur more frequently and occupy a greater degree of personal time (intensity), will have a greater influence on behaviour.

The learning of both criminal and conformist behaviour is thought to be governed by the same mechanisms (Sutherland, Cressey and Luckenbill, 1992). The choice as to which behaviours are learned ultimately depends on the context and the people with whom individuals interact. Later reformulations of the differential association theory incorporated the contributions of learning principles developed by behavioural psychology (Akers and Sellers, 2004). For example, Akers (Akers and Sellers, 1994) proposed that social learning of deviant behaviours rested on four principles, namely differential association (i.e. direct and indirect affiliation with groups promote learning of behaviours and values), definitions (i.e. attitudes and meanings are assigned to certain behaviours), differential reinforcement (anticipated positive and negative consequences of an action)²⁸ and imitation (i.e. engaging in behaviour after observing that behaviour in others). Primary groups, such as family and friends, provide the most

²⁸ Reinforcements or punishments (consequences) can be both social (e.g. approval or disapproval) and non-social (e.g. pleasurable effects of drug use).

important social context in which social learning mechanisms operate. Akers and Sellers (1994) suggest that secondary groups, such as neighbours, teachers, authority figures, peer groups and virtual media (internet, telephone, television movies) may also have a significant influence on learning behaviour. Differential association (i.e. affiliation with deviant peers) is a key aspect of the contagion perspective, and thus one of its most tested aspects.

In this context, differential affiliation with deviant peers has been regarded as a key predictor of juvenile antisocial behaviour. Given the relevance that peer relationships have in youth development, peers are believed to provide a key context that promotes learning and reinforcement of antisocial behaviours facilitating, for example deviancy training (Dishion and Tipsord, 2011). It is thought that exposure to deviant peers may, by itself, constitute a risk factor because it facilitates differential association.

Estimated effects of peer differential affiliation are typically among the strongest predictors of antisocial behaviours (see Alarid, Burton and Cullen, 2000; Costello and Vowell, 1999; Le Blanc, 1997; Akers, Krohn, Kaduce and Radosevich, 1979; Skinner and Fream, 1997, Maume, Ousey, and Beaver, 2005; Dishion and Tipsord, 2011).

Even though evidence suggests that affiliation with deviant peers predicts future antisocial behaviour (Keenan, Loeber, Zhang, Stouthamer-Loeber and VanKammen, 1995; Sieving, Perry and Williams, 2000), other studies suggest that peer effects cannot be explained only by influence effects. For example, in the case of drug use, Valenzuela and Ayala (2011) found evidence suggesting that juveniles tend to befriend peers that are similar to them. Only after friendship has been established, can influence effects be found. Still, not all studies find predictive peer effects. For example, Wiesner,

Silbereisen and Weichold (2007) found concurrent but not time lagged effects on alcohol use.

It should be added that many studies addressing peer effects are subject to same source bias. Studies of juvenile antisocial behaviour typically request the same interviewee to report on both his antisocial behaviour and the antisocial behaviour of his friends. This may lead to an inflation of the peer effect because juveniles tend to believe friends are more alike than they actually are (Valenzuela and Ayala, 2011).

Therefore, a key issue in the study of neighbourhood effects is related to the problem of distinguishing between selection and influence effects. Two key research traditions have addressed the problems of selection and influence of deviant peers: the study of co-offending and the homophily-contagion effects tradition.

One key repeated finding regarding delinquency and deviant behaviour is that it tends to occur in groups, often at a higher rate than does offending alone (Weerman, 2003). This tendency is referred to as co-offending. Several studies have addressed co-offending and how its incidence varies by demographic factors, offence type, and previous offending experience. First, incidence of co-offending decreases with age. Younger offenders are more likely to co-offend than older ones (Reiss and Farrington, 1991). Second, co-offending groups tend to be of similar age, sex and race (Reiss and Farrington, 1991; Weerman, 2003). Third, the incidence of co-offending seems to vary by type of offence: for example, burglary and robbery are especially likely to involve co-offenders, while the incidence is lower in the case of violent offences (Reiss and Farrington, 1991; Weerman, 2003). Fourth, co-offending groups seem to be unstable: that is, they do not tend to offend more than one time together. This group instability seems to be more

usual in frequent offenders (Sarnecki, 2001; McGloin, Sullivan, Piquero and Bacon, 2008; Andresen and Felson, 2010). Finally, in terms of offending experience, first time offenders are more likely to recidivate if their first offence was committed with others (Reiss and Farrington, 1991; Weerman, 2003; Conway and McCord, 2002). This last finding suggests some kind of influence mechanism.

Co-offending literature assumes that the offender is already motivated and is actively seeking delinquent opportunities. To commit an offence he/she will associate with others as needed in order to engage in deviant acts. Based on this view, Andresen and Felson (2010) found that the presence of youth hangouts and physical locations where offender activities converge can assist the search for suitable co-offenders. In fact, Reiss and Farrington (1991) found that offenders were most likely to live within the same postal district or within one mile of each other. This suggests that spatial proximity may be a relevant factor in explaining co-offending (Sarnecki, 2001).

A broader focused research tradition (usually operating within the social network analysis framework) has been more concerned with understanding how friendships are formed and how this type of social influence might lead to offending. To this end, the processes of homophily and influence have been studied (see, for example, Burk, Kerr and Stattin, 2008; Cohen and Prinstein, 2006).

Homophily refers to the fact that friendships are formed between people that are similar in several traits. As in co-offending, the literature suggests that friendships are formed between persons sharing common characteristics like sex, age, race²⁹, nationality, religion, residential stability, attitudes, beliefs, and values similarity. However,

²⁹ Strongly influenced by SES. SES also seems to strongly affect the neighbourhood of residence.

behavioural similarity seems to be the strongest influence (McPherson, Smith-Lovin and Cook, 2001; Kupersmidt, DeRosier and Patterson, 1995; Tolson and Urberg, 1993).

In spite of this, there is growing support for the idea that both selection (Homophily) and contagion effects play a relevant role in delinquency and deviant behaviour (see, for example, Kandel, 1978; William, Steglich and Snijders, 2007; Mercken, Candel, Willems and De Vries, 2007; Poulin, Kiesner, Pedersen and Dishion, 2011; Simons-Morton and Farhat, 2010; Haynie, 2002; Baerveldt, Volker and Van Rossem, 2008).

4.2.6. Contextual disadvantage and contagion effects

As it has been argued before, differential association with deviant peers may play a key role in explaining neighbourhood level contagion effects.

In the context of neighbourhood research, peer effects have been usually conceptualised as a mediator variable. From this perspective, direct effects of area level variables like concentrated disadvantage are expected to be reduced or explained away by introducing peer effects into the models (see, for example, Haynie, Silver and Teasdale, 2006). Other studies seek to address how peer effects might also be related to parenting. For example, area level variables (e.g. disadvantage) are expected to impact family parenting variables, which in turn increase opportunities for affiliation with deviant peers. Through this path adolescent outcomes are expected to be affected (see, for example, Lloyd and Anthony, 2003; Simons, Simons, Burt, Brody and Curtona, 2005; Eamon, 2002). Neighbourhood disadvantage is also conceptualised as a context that provides more opportunities for unstructured socialising with peers (Maimon and Browning, 2010) or intensifying the relationship between gang membership and violence (Bellair and McNulty, 2009).

Two important limitations of the research addressing peer and neighbourhood effects should be mentioned. The first is related to the problem of same source bias. With few exceptions (see, for example, Haynie, Silver and Teasdale, 2006), most studies rely on juveniles to report on the antisocial behaviour of their friends. For this reason, peer effects might be inflated (Valenzuela and Ayala, 2011). An independent measure of peer outcomes would be necessary if any type of mediational effect is to be tested. The second problem is related to the operational measures of peer variables. Almost no study (a notable exception is Maimon and Browning, 2010) actually distinguishes between peers living inside and outside of the neighbourhood where the interviewed juveniles live. Failure to differentiate this makes it impossible to know if significant peer effects should be interpreted as a compositional or a contextual factor. For example, when analysing pairs of friends engaged in antisocial behaviour Dishion, Andrews and Crosby (1995) found that there was a tendency of close friends to live in the same neighbourhood. In spite of this, 73% of these friends met in school or some other organised activity, and only 17% met in their neighbourhood or in an unsupervised community setting.

If “peer differential association” is a key mechanism explaining contagion effects, then is it possible that contextual characteristics (i.e. concentrated disadvantage) may facilitate this process? Two main mechanisms may be proposed. Firstly, contexts can be conceptualised as facilitators for friendship formation. The relevance of distance as an important determinant of friendship formation has been well established in the literature (Festinger, 1950; Steward, 1941; Ebbsen, 1975; Caldeira and Patterson, 1987; Latané, Liu, Nowak, Bonevento and Zheng, 1995). People are more likely to have regular contact with those who are spatially closer than those who are distant (McPherson,

Smith-Lovin and Cook, 2001). As has been noted above, the selection of co-offenders is also influenced by spatial proximity. From this perspective, even if neighbourhoods with a high concentration of poverty were formed entirely through self-selection of vulnerable families, the geographical concentration of at risk youth within limited geographical areas could still facilitate co-offending. The same mechanism could apply to schoolmates. Therefore, after selection, antisocial behaviour could still be facilitated through contagion effects.

Secondly, concentrated disadvantage has been conceptualised as a facilitator of opportunities for unstructured socialisation between peers. Evidence suggests that concentrated disadvantage may play an important role in deteriorating the capacity of residents of an area to exert informal social control (Sampson, Raudenbush and Earls, 1997; Sampson, 1999; Wikstrom, Oberwittler, Treiber and Hardie, 2012). Therefore, concentrated disadvantage has usually been considered as a proxy of low levels of informal social control. Contexts with low levels of supervision and social control have been thought to provide opportunities for unstructured socialising, thus facilitating occurrence and reinforcement of antisocial behaviours (Maimon et al., 2010). For example, evidence suggests that concentrated disadvantage may intensify the relationship between peer effects and antisocial behaviour (Bellair and McNulty, 2009).

Even though peer differential affiliation has been considered as a key factor in explaining antisocial behaviour, the systematic review results suggest that peer effects have been frequently omitted from models estimating the impact of neighbourhood disadvantage. In addition, with a few exceptions (for example, Haynie, 2006), peer effects have been inadequately measured; using only interviewees' self-reports to assess

deviant peer affiliation. In addition, few studies have taken into account whether peers actually live within the same neighbourhood or not, which is a critical issue if the effect of neighbourhoods are to be explained. It is interesting to note that whether neighbourhood influence on antisocial behaviour can be explained by contagion effects is still a contested issue (see Ludwig and Kling, 2007).

Available evidence suggests that the effect of contextual poverty may importantly depend on peer networks living within the same neighbourhood (Oberwittler, 2007). As Oberwittler suggests, and given the fact that juveniles with arrest records tend to concentrate within areas with high concentrated poverty (Shaw and McKay, 1969), peer effects might very well explain away effects of concentrated disadvantage. Peer effects could then be considered as a key variable that may be conceptualised as a contextual factor in its own right.

In sum, previously cited literature suggests that the effect of peer differential association on antisocial behaviour may be structured through three spatial processes. The first process relates to the geographic propinquity effect. Geographic propinquity refers to how families, organisations (e.g. schools) and social positions create contexts where homophilous relationships develop (McPherson, Smith-Lovin and Cook, 2001). As described earlier, Homophily refers to the tendency to form relationships with people that are similar (e.g. in terms of sex, age, race, education). Homophily is also a key determinant of friendship formation. Geographic propinquity refers to the fact that people whose activity spaces converge (i.e. overlap) will have a higher chance to develop a tie. Living nearby may be a determinant of tie formation (friendship or acquaintance), as is attending the same school. Thus, it might be thought that

overlapping activity spaces may increase the chances of tie formation. It is then reasonable to propose that higher concentrations of same-aged deviant peers (either self-reported or with arrest records) in key activity spaces may increase the likelihood of affiliation among them.

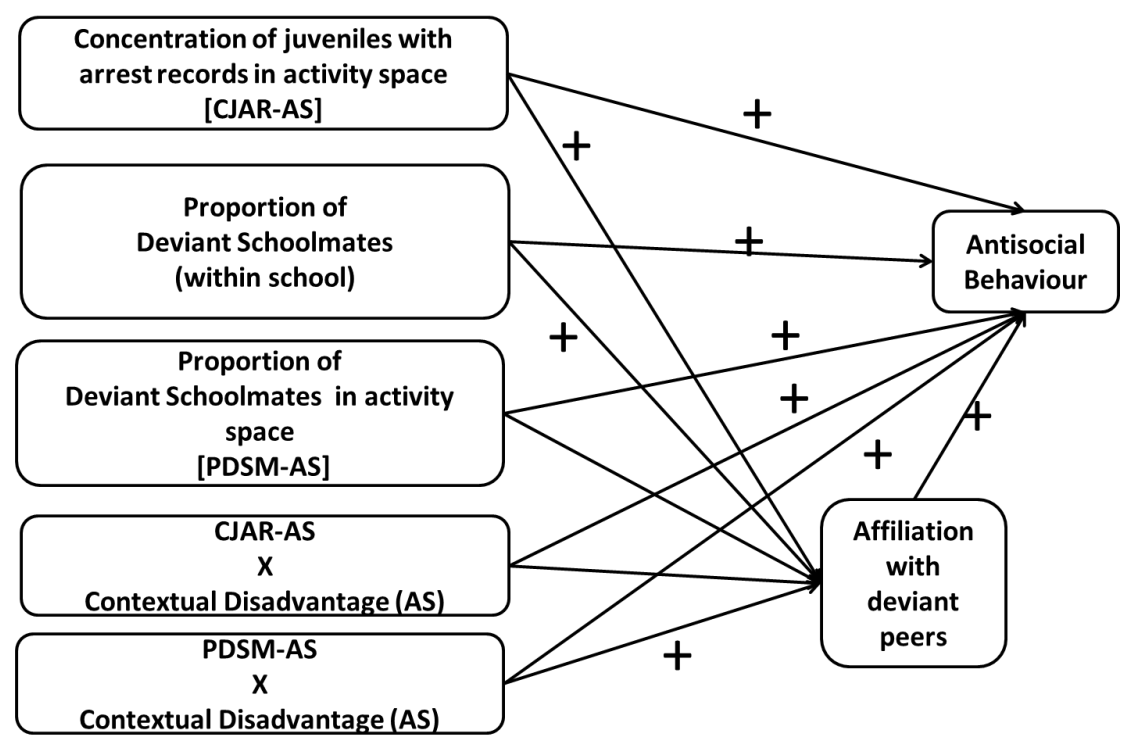
The second spatial process has been addressed in co-offending literature. This process relates to the fact that delinquent acts tend to be committed in groups, and co-offenders are likely to live close by (Reiss and Farrington, 1991). It follows that once a tie is established, offending may be facilitated by living in close proximity.

The third spatial process relates directly to concentrated disadvantage. Given the fact that routine activities are usually structured around key activity nodes, it is reasonable to propose that the characteristics of those contexts might facilitate or inhibit antisocial behaviours. Contexts with low levels of supervision and social control are thought to provide opportunities for unstructured socialising activities (Maimon et. al, 2010), thus facilitating occurrence and reinforcement of antisocial behaviours. Evidence also suggests that concentrated disadvantage may play an important role in reducing the capacity of residents of an area to exert informal social control (Sampson, Raudenbush and Earls, 1997; Sampson, 1999; Wikstrom, Oberwittler, Treiber and Hardie, 2012). Therefore, concentrated disadvantage has usually been considered as a proxy for low levels of informal social control. In the case of peer effects (as noted before), evidence suggests that concentrated disadvantage may intensify the relationship between peer effects and antisocial behaviour (Bellair and McNulty, 2009).

Following the previous discussion, it can be proposed that the overall concentration of delinquent juveniles (i.e. with arrest records) living within activity spaces will have a

direct effect on increased levels of antisocial behaviour (Hypothesis 10). Since additional school related propinquity effects should also be accounted for, it would also be expected that concentration of deviant schoolmates within a school would also have a direct effect on increased levels of antisocial behaviour (Hypothesis 11). In addition, it can be predicted that the concentration of deviant schoolmates living across juvenile activity spaces will be found to also have a direct effect on increased levels of antisocial behaviour (Hypothesis 12). These direct effects are expected to be at least partially mediated by antisocial peer affiliation (Hypothesis 13). The hypotheses from Hypothesis 10 to Hypothesis 12 explore contextual effects that might facilitate co-offending and differential affiliation. Hypothesis 13 explores whether the effect of these variables on antisocial behaviour (activity space concentration of juveniles with arrest records, proportion of deviant schoolmates, and proportion of deviant schoolmates in activity space) will at least be partially mediated by antisocial peer affiliation. The last prediction states that contextual concentrated disadvantage will interact with contextual concentration of deviant peers, intensifying the effect on antisocial behaviour. The effects of these interactions are also expected to be at least partially mediated by antisocial peer affiliation (Hypothesis 14). Hypotheses are summarised in 3.4.

Figure 3.4: Hypotheses Relating to the Relationship Between Concentrated Deviant Peers, Concentrated Deviant Schoolmates and Antisocial Behaviour.



**Model will be adjusted by strain variables, social control variables and controls (see Table 2)*

5. Summary of key discussion points

Until now it has been argued that:

-Support for the idea that neighbourhood level variables like concentrated disadvantage have a direct effect on antisocial behaviour is limited, and that methodological problems might explain the heterogeneity of results across studies. Nevertheless, some evidence of indirect effects can be found.

-Regarding indirect effects, there is still a limited understanding of the mechanisms that might explain the link between contextual variables and behaviour. This is particularly so in the case of neighbourhood concentrated disadvantage.

-Pervasive problems of neighbourhood effects research are not only methodological. Conceptual issues related to how spatial dimensions like neighbourhoods are assumed to impact behaviour are also problematic. These assumptions could also be responsible for the mixed and sometimes contradictory results found in neighbourhood effects research.

-Surprisingly, neighbourhood effects research has evolved as an “under-spatialised” field, and more research that explicitly considers how key developmental domains (schools, peers, homes) are distributed across space, and how this distribution might impact behaviour, is needed. In this context, the construct of activity spaces seems to provide conceptual tool that should offer advantages over a traditional census tract approach in order to address typical neighbourhood effects research problems.

-Neighbourhood effects research literature has been primarily focused on social control and differential association processes. Even though this has been considered theoretically relevant, little research has been conducted on strain related processes.

-Although peer differential association is among the most relevant predictors of antisocial behaviour, systematic review results suggest that there has been little research on the role of peers as a relevant contextual effect. This variable is frequently omitted or poorly measured within the context of research on contextual disadvantage. Available evidence suggests that the effect of contextual poverty may importantly depend on peer networks living within the same neighbourhood (Oberwittler, 2007). Insufficient research has addressed how contextual concentration of deviant peers may interact with contextual concentration of disadvantage.

-There is a lack of longitudinal studies testing potential explanations of how spatial dimensions might interact with behavioural outcomes.

-Most of the current evidence relating to the relationship between contextual variables and antisocial behaviour comes from studies that have been conducted in the US. It is necessary to expand this research beyond this geographically limited area into other as yet un-researched contexts, including low and middle income countries.

Part III: Empirical Examination

Chapter 4: Empirical Methods Overview

The present chapter will provide a general overview of the methodological approach that was chosen in order to test empirical hypotheses that were proposed in chapter 3. Some aspects will be revisited and reviewed in more detail in each of the following chapters.

Based on both literature reviews (systematic and non-systematic, please see chapters 2 and 3), a series of hypothesis regarding contextual main effects, interaction effects and mediation effects were proposed (Chapter 3). Mediation and interaction effects are directly related to testing propositions derived from three key criminological theoretical perspectives namely strain, informal social control and contagion (peer) effects.

The present section will describe three key aspects of the empirical methodology, namely the data sources, the procedure followed to construct the main dataset, and the general analysis strategy.

1. Data and measures

It was considered that in order to adequately test for contextual effects, the used data should ensure that most common methodological weaknesses identified in the literature could be addressed. Therefore, the employed data should be longitudinal, representative of a general juvenile population (not only disadvantaged juveniles), and would need to allow to generate independent measures for individual level and contextual level variables, this in order to avoid same source bias. In addition, the data should be able to ensure variability between contexts and to allow gathering measures on small sized areas. To build such a dataset, four different data sources were used, namely census

level data, standardised educational achievement tests, police records, and a longitudinal self-report survey.

a) Census data: In order to obtain information on contextual disadvantage, data from the Chilean National Census (2002), was used. The Chilean census dataset makes it possible to count numbers of people, families and households by reference to specific demographic and socioeconomic characteristics and for different levels of spatial aggregation (region, district, census tract and block). It should be noted that the 2012 census was due to be available by mid-2013. However, due to important methodological issues during its application, the 2012 census was officially declared as unusable. Therefore, only 2002 census data was used. Census level data was used to measure contextual level concentrated disadvantage. The construction procedure of this variable is described in detail in Chapter 4.

b) SIMCE: Data from the National Education Quality Measurement System (Sistema Nacional Para la Medición de la Calidad de la Educación or SIMCE) was used to calculate an indicator of school level value-added education. SIMCE comprises a series of standardised tests that assess educational achievement. For the present study, results from the maths and language tests from the 2010 wave were used. The 2010 wave provides information on all tenth grade students in the country. For the present analysis, only data for the city of Santiago was used. This dataset included information on 88,698 students nested in 2,825 classrooms and 1,002 schools. The variable construction procedure is described in detail in Chapter 4.

c) **Police records:** The third dataset includes a list of all under-aged children and juveniles (0 -18 years) that have had contact with the police between the years 2004 and 2007. This dataset was used to build variables measuring contextual level concentration of juveniles with police records. The construction procedure regarding this measure is also described in detail in Chapter 4.

d) **Longitudinal self-report survey on drug use and other antisocial behaviours:** A three-wave dataset from an on-going self-reported longitudinal study in Chile was used. This study has been following up a representative sample of seventh grade students (in 2008) attending schools in districts that have over 30,000 inhabitants, in the city of Santiago. The study over sampled low socioeconomic status (SES) juveniles (11% of the population, 40% of the sample) and under sampled mid-SES youth (66% of the population, 40% of the sample). High SES youth were proportionally sampled (22% of the population, 20% of the sample). The study also increased the estimated overall sample by 10%, in order to compensate for potential loss of cases.

Youths were selected using a two-stage random sampling procedure. In the first stage a representative sample of 72 schools was selected (roughly, 12% of all eligible schools). The selection procedure was random, stratified by school level SES, and selection probability was weighted by total school size.

In the second stage, 161 seventh grade classrooms were randomly selected within those 72 schools. These correspond to 73.9% of all eligible classrooms. An average of 2.1 classrooms per school were selected. Within a given school the proportion of selected

classrooms could vary between 50% and 100%. In 48% of the selected schools, the entire seventh grade was surveyed. Within a selected classroom, all students attending a regular school day were asked to fill out a self-report survey. Considering that the design effect had a 95% confidence interval, the estimated sampling error (maximum variance) was 0.0146. This is an on-going study where measures are conducted yearly.

The present study uses data from the first three waves (2008, 2009 and 2010). The effective sample was 4,997 (2008), 5278 (2009) and 4,554 (2009). In total, 5,928 different juveniles participated in at least one wave of the study. Table 4.1 summarises the distribution of cases according to the number of waves in which they participated.

Table 4.1: Distribution of Original Sample by Wave Participation

	N	%
One Wave	632	10.7
Two Waves	1691	28.5
Three Waves	3605	60.8

The self-report survey was used to gather individual level data, including antisocial behaviour (general delinquency index), demographic data (gender, baseline age, family level SES, baseline antisocial behaviour), and measures of three different criminogenic processes, namely strain (educational expectations/aspirations), informal social control (parental attachment, parental monitoring, school attachment) and contagion (peer) effects (best friends' antisocial behaviour) (see Chapter 6). Since this dataset also incorporated network information it was also used to construct contextual measures related to concentration of deviant schoolmates and concentration of deviant schoolmates living within interviewees' relevant out of school contexts (see Chapter 5).

Table 4.2 provides a summary of developed measures. As mentioned before, the detailed variable construction procedures will be described in chapters 5 and 6.

Table 4.2: Overview of Study Variables

Variable type	Variable name	Source	Aggregation	Measurement level
Antisocial behaviour	General Delinquency Index (GABI)	Self-report	Individual	Scale
Informal social control	Family structure	Self-report	Individual	Dummy
	Parental monitoring	Self-report	Individual	Scale
	Parental attachment	Self-report	Individual	Scale
	School attachment	Self-report	Individual	Scale
Strain	Educational aspirations	Self-report	Individual	Scale
	Educational expectations	Self-report	Individual	Scale
	Strain (expectations X aspirations)	Self-report	Individual	Scale
Contagion	Affiliation with deviant peers	Peer self-report (network data)	Individual	Scale
Contextual factors	Contextual concentrated disadvantage	Census	Aggregated population	Scale
	Contextual concentration of juveniles with arrest records	Police records	Aggregated population	Scale
	Proportion of deviant schoolmates	Peer self-report	Aggregated surveyed individuals	Scale
	Contextual concentration of deviant school mates in census tract/activity space	Peer self-report	Aggregated surveyed individuals	Scale
	School effectiveness	Standardised school achievement tests (SIMCE)	Aggregated population	Scale
Controls	Family SES	Self-report	Individual	Scale
	Gender	Self-report	Individual	Dummy
	Baseline age	Self-report	Individual	Scale
	Baseline general delinquency	Self-report	Individual	Scale

2. Construction of an integrated data set and analytical sample

Linking information from surveys with external contextual data (e.g. census information or other independent surveys) has become a common strategy within studies addressing longitudinal neighbourhood effects (see, for example, Wikstrom, Oberwittler, Treiber and Hardie, 2012; Drukker, et al, 2010; Maimon et al, 2010; Wight et al., 2006; Thornberry, 2005; Reijneveld, et al, 2010; Kirk, 2008; Haynie et. al., 2006; Beyers, et al, 2001, among others). This can be considered as an adequate strategy to study neighbourhood effects, as long as neighbourhood measures are free from same source bias (Duncan and Raudenbush, 1999; Sampson and Raudenbush, 1999), and can ensure sufficient “between neighbourhood” variability (see Snijders and Bosker, 1999; Raudenbush and Sampson, 1999).

These four datasets were matched using ArcGIS Desktop 10.1. ArcGIS is a geographic information system that allows a researcher to link tables of information with specific shapes or points on a scaled digital map. For example, census block level data can be linked with shapes representing particular blocks or areas in a digital map. ArcGIS also allows the geocoding of places, for example by inserting a dot on a map where a particular address is located. This software enables a researcher to run several geo-processing operations, like joining up into one data set information on individuals, block level census characteristics, or counts of people living within an area. It also allows to carry out other relevant operations, like measuring distances and areas, among others.

In the first stage, before geocoding, cases participating in only one wave were eliminated (N=632) from the dataset. In addition, a further 314 cases were removed because their addresses were incomplete and could not be geocoded. These cases also included 14 students that had changed school. Those students were excluded because it would not have been possible to compute information on peer effects.

In a second stage, each case for each wave of the previously described self-reported survey was geocoded on a digital map representing the city of Santiago. Addresses were standardised and fed into the geocoding tool provided by ArcGis. For each wave, approximately 50% of survey respondents' addresses could be automatically geocoded. The rest of the addresses had to be manually reviewed because of issues such as misspelling, street name changes, non-existent addresses, and others. During the geocoding process, it was possible to identify a group of “hard to geocode” cases. Most of these cases were predominantly nested within seven schools that received students living in predominantly rural areas. In some cases digital maps for those areas were not available for use by the author. In other cases addresses were too imprecise to be reliably geo coded (e.g. lives at farm number 12 located at some point on a five mile long road). Therefore, these seven schools (comprising 245 students) were dropped from the analysis.

Finally, in total 4737 cases participating in two or more waves and living in one of 35 selected municipal districts of Santiago City were carried on for geocoding³⁰. Table 4.3 shows the distribution of this sample across wave participation.

³⁰ This includes 33 districts pertaining to Santiago City (Gran Santiago) plus two urban districts called Puente Alto and San Bernardo.

Table 4.3: Distribution of Geocoded Survey Respondents Across Waves.

Wave Number	Cases	
	N	%
1-3	185	3.9
2-3	580	12.2
1-2	666	14.1
1-2-3	3306	69.8

Between 85.2% and 94.9% (see table 2.3) of the 4737 eligible cases could be successfully placed on a map in each wave (table 4.4).

Table 4.4: Distribution of Geocoded Survey Respondents across Waves

Wave	Cases Geocoded	
	N	%
2008	4113	86.8
2009	4495	94.9
2010	4036	85.2

Figures 4.1, 4.2 and 4.3 show the spatial distribution of successfully geocoded survey respondents across a digital map of the city of Santiago. Figure number 2.4 also shows the spatial distribution of survey respondents' schools. A visual inspection of both figures suggests that the sample home and school addresses have a high level of territorial dispersion across the city of Santiago. This observed spatial spreading ensures an adequate contextual level of “between neighbourhood” variability, allowing a wide range of neighbourhood types to be represented.

Figure 4.1: Spatial Distribution of Survey Respondents' Home Addresses (2008, 2009, 2010) Across the City of Santiago

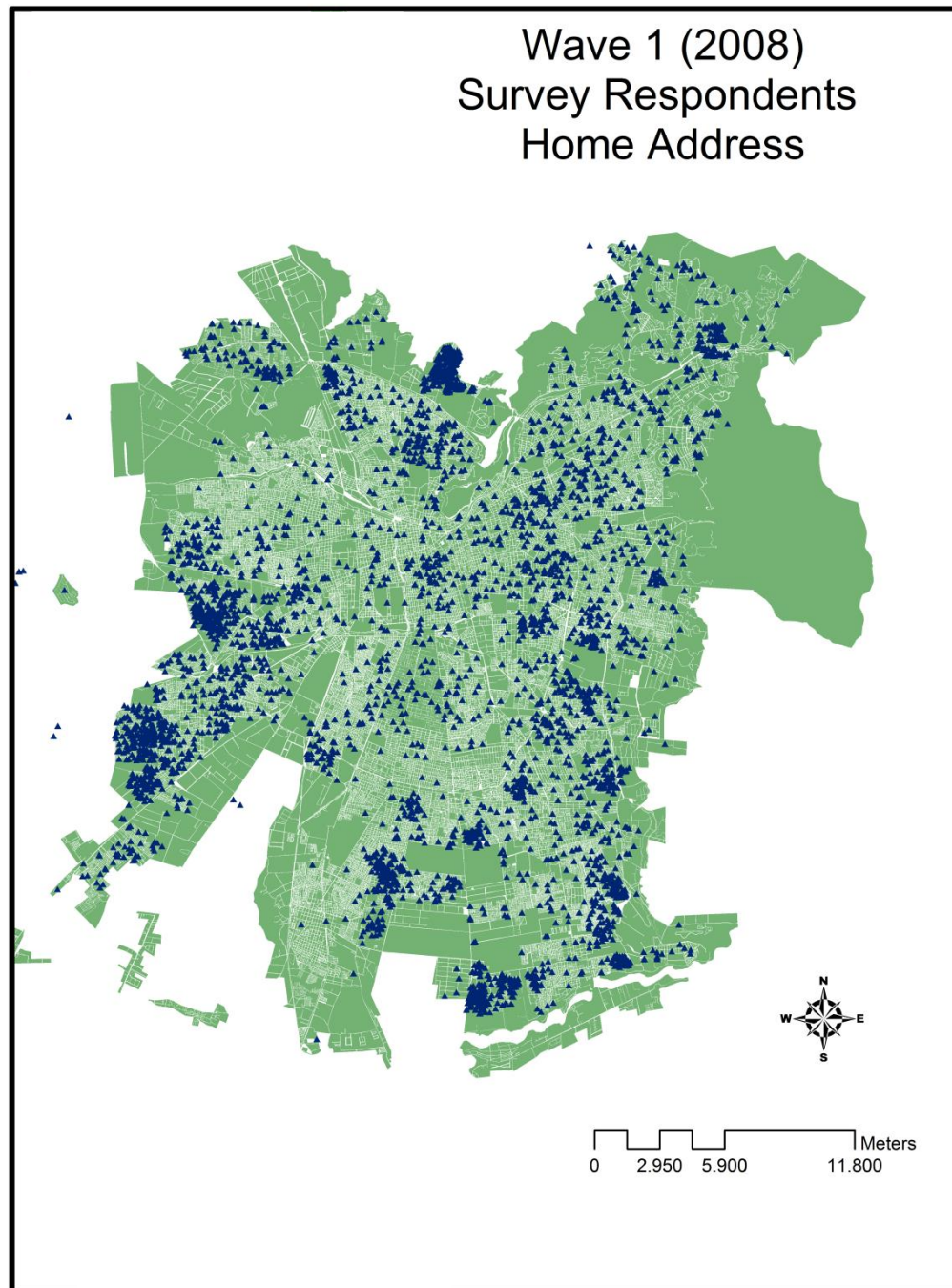


Figure 4.2: Spatial Distribution of Survey Respondents' Home Addresses (2008, 2009, 2010) Across the City of Santiago

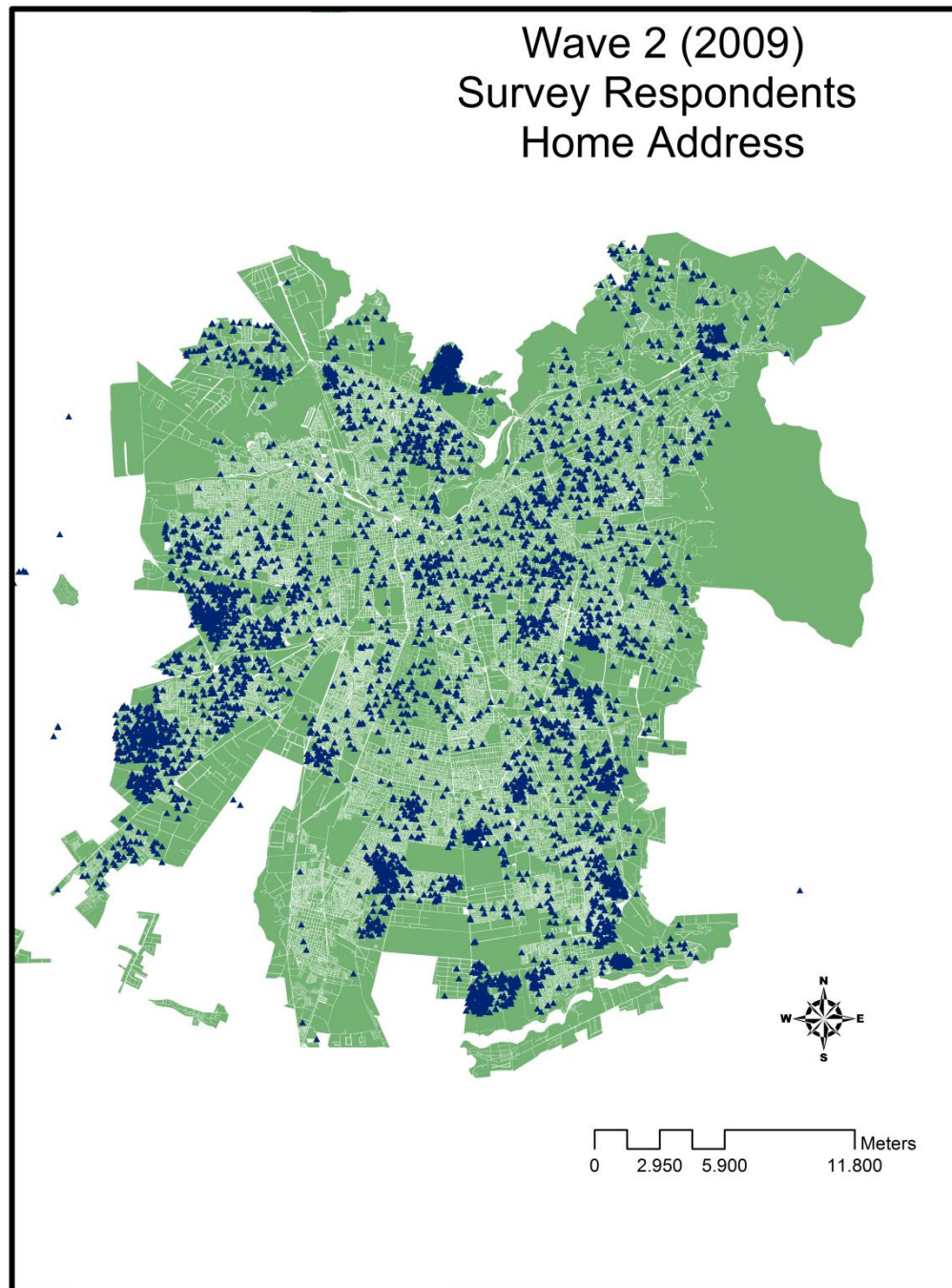


Figure 4.3: Spatial Distribution of Survey Respondents' Home Addresses (2008, 2009, 2010) Across the City of Santiago

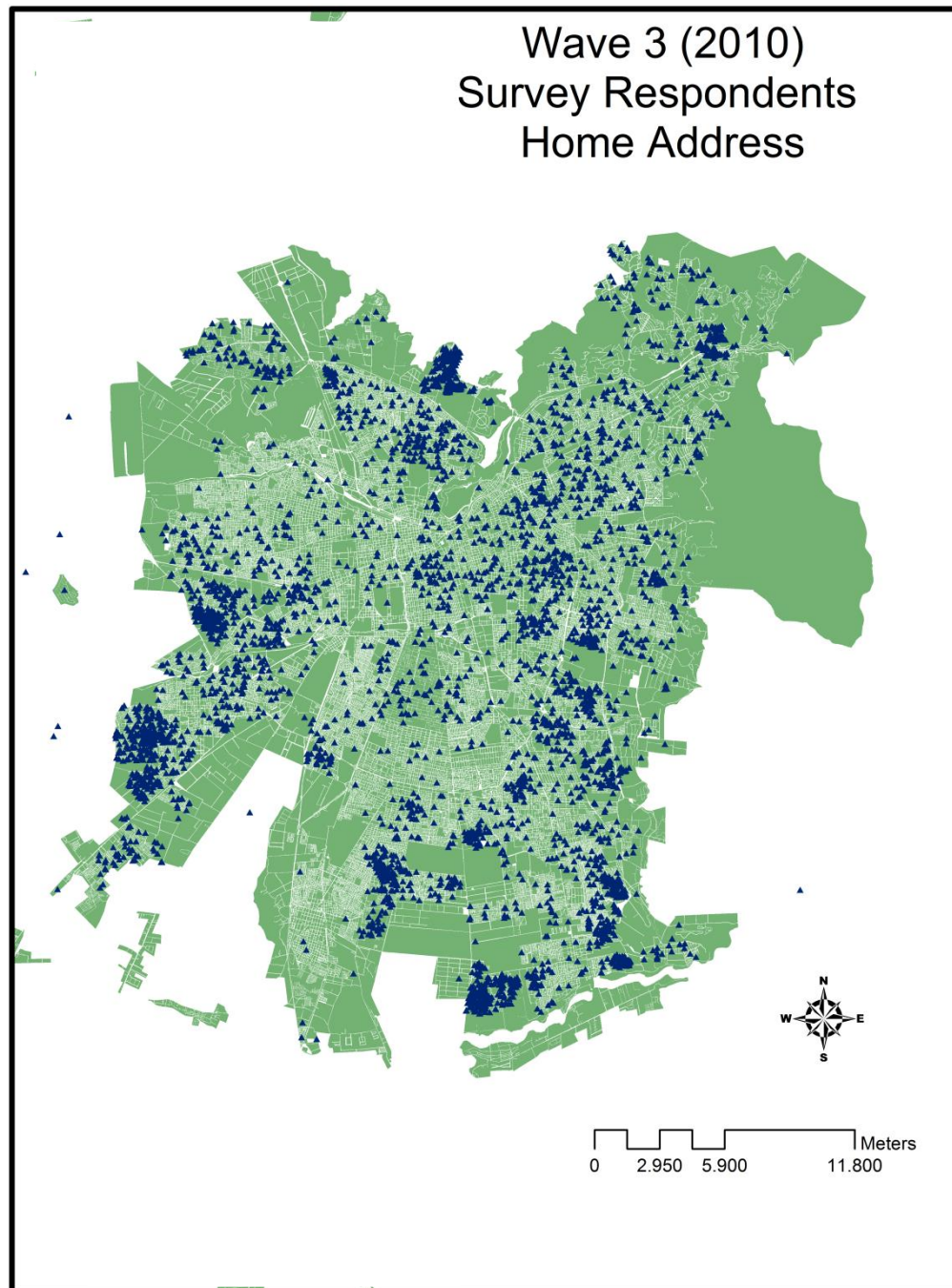
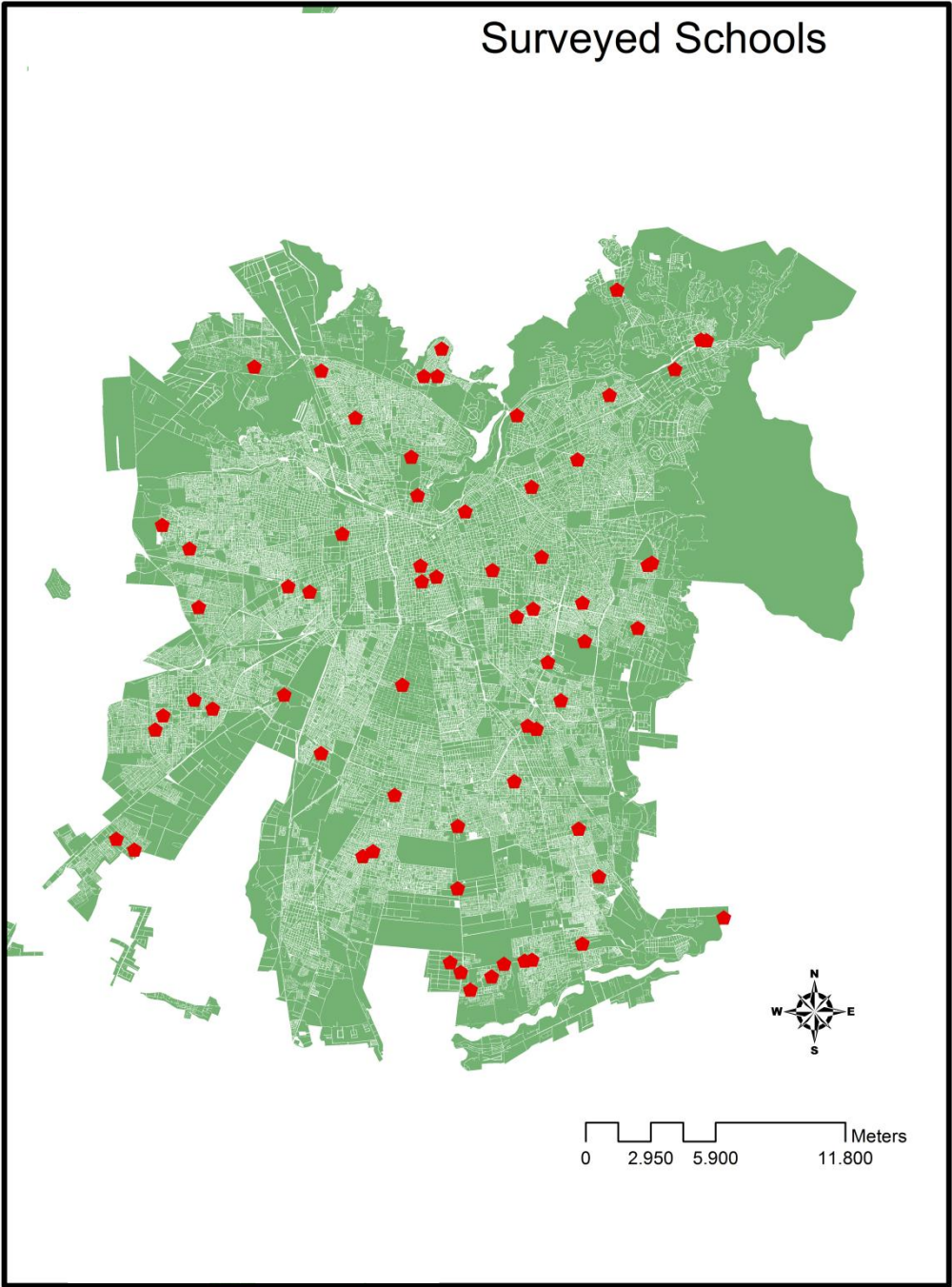


Figure 4.4: Spatial Distribution of Survey Respondents' Schools' Locations across the City of Santiago



Once different data sources have been geocoded they can be related to each other based on spatial proximity or overlapping features. For instance, survey respondents can be classified into census tracts, allowing to conduct correlational analysis between individual and contextual level characteristics. Characteristics of other features on a map may also be related based on the relative distances between them. For example, the number of juveniles with police records living within a one mile radius of the survey respondents' home can be calculated. Other relevant attributes that can be measured are, for example, the existing geographical distance between friends.

Most of the selected measures showed a low proportion of missing values ranging between 0 and 5%. However, variables measuring parental attachment and parents' education did show missing data for up to 12%. In this case, non-response was higher in the case of questions addressing the status of the father rather the status of the mother. Those missing values were related to the persons with whom the adolescent was reportedly living. Higher levels of missing values measuring the relationship with the father are present in cases of juveniles that are no longer living with their father. Detailed percentages of non-response for selected questions and measures are given in appendix 2.

A somewhat higher percentage of missing values was observed in relation to variables measuring contextual characteristics. Network data, i.e. the measure where the survey respondent has to identify his/her best friend in school showed non-response levels that were notably higher than the rest. The proportion of missing values for this variable was in the range of between 9% (for 2008) and 26% (for 2010). This high level of non-response was at least partially attributable to the loss of other cases that were previously

dropped, or that could not be geocoded. Since this variable is used to compute other variables (e.g. distance to best friend's home) it amplified the impact on non-response of other variables through the dataset.

Consequently, when list-wise deletion was used, the effective sample size (analytical sample) used in longitudinal analysis was 3,272 cases.

In light of these results, it was considered necessary to perform an analysis of the pattern of missing data. The current dataset presents missing data due to dropped cases (level 2 missing data: cases lost to follow up and/or missing measurement occasion) and missing data due to non-response (level 1 missing data).

In order to address the potential impact of missing data patterns on estimated results, a series of auxiliary multilevel regressions were performed. It was assessed if predicted probabilities of dropping a case or presenting non response on specific variables might depend on other measured variables. Following on the recommendation of Bartlett & Carpenter, 2013, level 1 and level 2 weights were constructed. A sensitivity analysis was conducted in order to assess the impact that the use of weights might have on the estimation of the model of interest. A full description of these procedures has been included in appendix 3. Results of the sensitivity analysis suggest that only marginal differences among weighted and un-weighted models were found. In addition, weighted models also showed a poorer adjustment (significantly higher -2 log likelihood). Evidence supported the idea that lost data were missing at random (MAR). In other words, data supported the idea that the dependence of the chance of missing data on the value of the studied variables may be broken once the rest of the fully observed variables of interest would be taken into account. More sophisticated imputation

strategies (e.g. geographical imputation methods) were considered but ruled out. Imputation strategies would have had to deal with a twofold complexity: imputing variable values (e.g. level of reported antisocial behaviour) and estimating a possible location a particular subject in space. In face of this complexity, it was preferred to accept the potential limitations related to generalizability of the present study results.

On the other hand, missing data due to non-response (level one) was addressed variable by variable. For example, for time invariant variables some data could be recovered by taking advantage of the multi-wave nature of the sample. Regarding time varying variables, different strategies were developed. These strategies are described in chapters 5 and 6, for each constructed variable.

If non-response could not be recovered or reasonably imputed, complete records analysis was used. The selected data analysis strategy (see next section) is able to accommodate data with this type of missing data, as long as missing data pattern may be considered random (Snijders and Bosker, 1999).

3. Data analysis strategy

3.1. Descriptive analysis

In the first part, descriptive analyses were performed in order to examine variable distribution (frequency tables and histograms) and relationships between variables through (cross tabulations and correlational analysis). Particular attention was paid to assessing the relationship between contextual level factors.

3.2. Model estimation and hypothesis testing

Given the nature of the dataset, (three-wave panel data with a nested data structure within schools) linear multilevel growth models were selected as the main analysis strategy³¹. In addition, since the self-reported survey was designed to follow up children and youth during an age period in which a sharp increase of antisocial behaviour is usually observed, the selected analysis technique should also be able to model individual change. Linear multilevel growth models are able to deal with the present presented data structure and take advantage of it.

Multilevel models (also known as hierarchical linear models, nested models, mixed models, random coefficient or random-effects models) are statistical models that can allow estimated parameters to vary across different levels of aggregation. Multilevel models are particularly appropriate for research designs where data for participants are nested, i.e. the units of analysis at a lower level (usually individuals) are nested or grouped within contextual/aggregate units at a higher level (Snijders and Bosker, 1999). While the lowest level in a multilevel model usually refers to an individual, repeated

³¹ Given the nature of the data using a Poisson link function was also considered. However, a sensitivity analysis for the full model showed that using a linear or Poisson regression rendered the same results (results not shown).

measurements for a group of individuals (measures nested within individuals) may also be accommodated. In this case, individuals may also be nested in higher level structures like classrooms and schools (Snijders and Bosker, 1999; Shaw and Liang, 2012; for an example see Bellair and McNulty, 2009). In the present study, each measurement occasion is conceptualised as being nested within a particular individual. In turn individuals are nested within schools. Multilevel data may also accommodate more complex data structures, such as, for example, cross classified³² (Leckie and Bell, 2013) or multiple membership classifications³³ (Leckie and Owen, 2013).

In the case of panel data, multilevel growth models allow average within-person trajectories to be described, while accounting for between persons (and also between schools) variations. They can also handle both time constant and time varying covariates (Shaw and Liang, 2012). Another distinctive feature of multilevel growth models is their ability to handle unbalanced panel data sets, which are datasets where some individuals present missing measurement occasions (Snijders and Bosker, 1999).

Multilevel models allow to test a wide range of hypotheses on both the fixed and random parts of the model. It should be noted that the present study will be mainly focused on fixed effects and cross-level interactions, rather than the random parts of the model. In this case the key reason for using hierarchical models is related to the nested structure of the data.

³² Level one units may be simultaneously grouped in two or more level two groups. This is the case for schools and neighbourhoods. Subjects nested in the same school may live in different neighbourhoods.

³³ Level one units are members of multiple and different grouping structures. For example, educational outcomes of students (level one unit) may depend on their schooling history. Their schooling history may involve attending more than one school. Each level one unit may have attended different schools for differing lengths of time.

For the present thesis, hypothesis testing was conducted in two stages. In the first stage, main effects linear multilevel growth models were estimated (Chapter 7). In the second, stage an analysis of interaction effects and mediating processes was performed (Chapter 8, 9, 10).

a) Main effects multilevel growth model

Two types of main effects models were estimated: the *traditional model* and the *potential activity space model*. Both are three level models where measurement occasions are nested in persons, which in turn are nested in schools.

The fundamental difference between both models is related to how contextual variables have been aggregated. The *traditional* models include contextual variables that have been aggregated based on census tracts of residence. On the other hand, the potential activity space based models will include contextual variables that have been aggregated based on potential activity spaces. Since both models have the same nesting structures (measurement occasions, nested within persons, and persons nested in schools) it will be possible to formally compare them. Differences between both aggregation strategies will be described in Chapter 4.

All models were estimated using MLWin, IGLS (Iterative Generalised Least Squares) estimation method. Details of model specification and regression equations will be described in chapters 7 to 10³⁴.

³⁴ Several analysis strategies were considered but not used. Since all models that were based on a *traditional census tract aggregation strategy* had a cross-classified data structure, the use of *cross-classified multilevel models* was considered (see Leckie, 2013) and tested. All attempts to estimate cross classified models using MLwiN resulted in problematic random coefficients for the census tract level (random effects were unusually high, did not reach statistical significance and resulted in non-normally distributed census tract level residuals). Furthermore, estimations conducted in Stata 13 did not converge. Since the main interest of this thesis was focused on fixed effects, the decision was made to revert to

b) Testing of interaction effects and mediating processes

Tests for interaction and mediation effects were also conducted. In order to carry out these tests, a conventional three step process was followed (Baron and Kenny, 1986). Each mediational path was tested independently (Roth and MacKinnon, 2012), as described below.

Step 1: First, the total effect, c , of the independent variable X on Y (outcome) is estimated (see equation 4.1 and figure 4.3). Even though this effect is adjusted by all other covariates of the main effects model (covariates), it excludes the mediator variable M . It includes an error term, e .

$$Y = i + cX + (\text{covariates}) + e \quad [\text{Equation 4.1}]$$

Step 2: Then the effect of X on the Mediator M is established (equation 2.2).

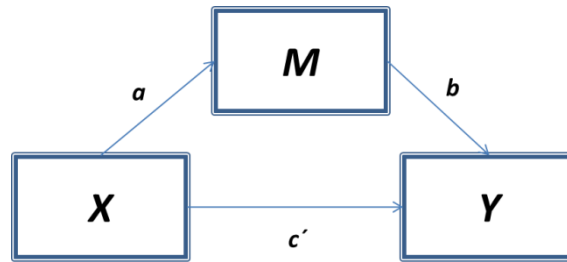
$$M = i + aX + (\text{covariates}) + e \quad [\text{Equation 4.2}]$$

simpler longitudinal three level models (time-person-school) as suggested by Leckie and French (2013). In addition, the use of *spatially lagged independent variables* was tested in order to address potential problems related to activity spaces overlapping in space. Spatially lagged variables were constructed (concentrated disadvantage and contextual concentration of deviant peers) based on a spatial dependence matrix (Ward and Gleditsch, 2008; Anselin, 1999). A spatial dependence matrix is an $N \times N$ matrix specifying for each area or individual, which areas or individuals are spatially connected (Ward and Gleditsch, 2008; Stopher et. al, 2012). In theory if there is spatial dependence, once spatially lagged independent variables are introduced, contextual variables based on activity spaces may be treated as independent. Sensitivity analysis were conducted in order to assess if introducing information on the spatial proximity of census tracts (*traditional model*) or the overlap between activity spaces (*potential activity space model*) may have an impact on model outcomes. It was concluded that the introduction of spatially lagged variables did not affect the substantive interpretation of the estimated main effects models. In addition, after consulting with several academics (Dr. George Leckie from the Centre for Multilevel Modelling, University of Bristol; Dr Thees Spreckelsen from the Department for Social Policy and Intervention University of Oxford; Dr. Ingo Outes , Research Fellow at Wolfson College; Dr. Francisco Martinez, Said Buisnes School, University of Oxford; and Christopher DiFelicianantonio, Senior Analyst at Compass Lexecon), it was decided that introduction of spatial effects may be beyond the scope of the present thesis. Therefore these variables were dropped from the analysis.

Step 3: In the final regression, the full model, including X and M, is estimated. This is the same as the fully specified main effects model.

$$Y = i + bM + c'X + (covariates) + e \quad [Equation 4.3]$$

Figure 4.3: Single Mediation Model



Source: MacKinnon, 2008

Usually the mediating effect is calculated by multiplying $a*b$ or subtracting $c-c'$. Even though within an OLS (Ordinary Least Squares) regression $a*b = c-c'$, when mediating effects are estimated in the context of hierarchical models the estimation may be slightly different, depending on whether the involved variables refer to individual or group level variables. Even though $a*b$ and $c-c'$ may give different results, discrepancies are usually small (MacKinnon, 2008).

Following MacKinnon (2008), there is no straightforward method for calculating standard errors for the “ $c-c'$ ” approach to estimating the mediated effect in the context of multilevel models. Therefore, the author suggests using the “ $a*b$ ” method in the case of the multilevel models used. For a single mediation effect, the standard error for $a*b$, is calculated using the equation 4.4.

$$S.E._{a*b} = \frac{ab\sqrt{t_a^2 + t_b^2}}{t_a t_b}$$

[Equation 4.4]

Where a and b are regression coefficients, t_a and t_b are t scores given by the division of the regression coefficient by its standard error (a/se_a) and (b/se_b).

On the other hand, interaction effects are produced by a multiplication of the relevant variables. The product of the two variables is added to the equation which introduces an additional non-linear effect.

The next two chapters (5 and 6) will focus on describing how contextual and individual level measures were constructed.

Chapter 5: Building contextual level measures

The main purpose of the present chapter is to describe the procedures for constructing each of the contextual measures that will later be used for empirical testing. This chapter will be divided into four sections. Firstly, the two different spatial aggregation strategies that will be used in this thesis will be described. In order to explore the implications of using an activity space approach, some of the contextual measures will be aggregated based on a traditional approach (census tract based) and also will be aggregated based on an activity space approach. Secondly, a detailed description of how the “Contextual Concentrated Disadvantage Index” was constructed is provided. Thirdly, the construction of several variables measuring “Contextual Concentration of Deviant Peers” will be detailed. Finally, the construction of a “School Added Value Index” will be described.

1. Spatial aggregation strategy: census tracts vs. activity spaces

As has been explained, a key argument of this thesis is that one reason behind the contradictory and sometimes confusing findings of neighbourhood effects research may be related to how the boundaries of geographical units have usually been defined. The traditional approach (most frequently used) has been to calculate contextual variables by aggregating individual level characteristics based on census tracts where the subject of interest lives. However, as has been discussed, a more actor-centred approach based on the spaces people visit every day should be considered as an alternative approach to aggregating contextual measures.

In order to assess the relative merits of both approaches, contextual measures of concentrated disadvantage and contextual concentration of deviant peers will be

aggregated based on both approaches: census tract approach and activity space approach.

The *traditional approach* (census tract) aggregates indicators calculating rates (for example, percentage of people having a certain characteristic) or averages (average poverty level across census blocks) for each census tract where the subject of interest lives. Then, individual level information is linked to information on one or more characteristics of the census tract.

As has been discussed before, this approach has important theoretical limitations. The most complete research conducted on this subject has been carried out by Wikström and colleagues (2012). Wikström and his colleagues studied which types of areas juveniles visited during their normal routine activities. Subjects taking part in his study reported where they went and how much time they spent in those places. Using this “time-budget” approach, Wikström was able to address the level of exposure each subject had to different contextual characteristics. His findings suggest that the three most common activity spaces for juveniles (i.e. where they spent most of their time) were the surroundings of their homes, the surroundings of their schools, and the surroundings of the homes of their friends.

Since activity spaces are an actor-centred approach, the delimitation of such *activity spaces* has to be made for each subject of interest. The most notable difference between this approach and the traditional approach is that activity spaces can vary in number and location between different subjects of interest. Thus, in order to aggregate contextual characteristics based on an activity spaces perspective, the activity spaces must be delimited for each case.

One important difficulty regarding the present study was related to how to define potential areas to which individuals are more likely to be exposed to. In order to identify each individual's activity spaces, it would have been ideal to have information expressing the real exposure to different contexts. Since "time-budget" information is not available for the present study, *potential activity spaces* were defined for each case.

Based on Wikström's study on juveniles living in Peterborough (UK), it was considered reasonable to assume that, as in the case of Peterborough, Chilean school attending juveniles would mostly spend their time in the same key places: areas surrounding home and school. It was also considered reasonable to assume that the location of their best friend's home could be a relevant area to which juveniles may frequently be exposed to. Thus, for the present thesis the *potential activity spaces* for each case include the areas surrounding their homes (HAS), schools (SAS) and best friend's home (BFH). The word "*potential*" highlights the idea that this spatial aggregation strategy is based on an assumption.

In Wikström et. al's study (2012) activity spaces were equated to postal codes, i.e. the boundaries of an activity space were delimited by the boundaries of this particular zip code. Contextual characteristics were aggregated based on postal codes. Contextual characteristics for each case were averaged across all zip codes that were part of the subject's activity spaces.

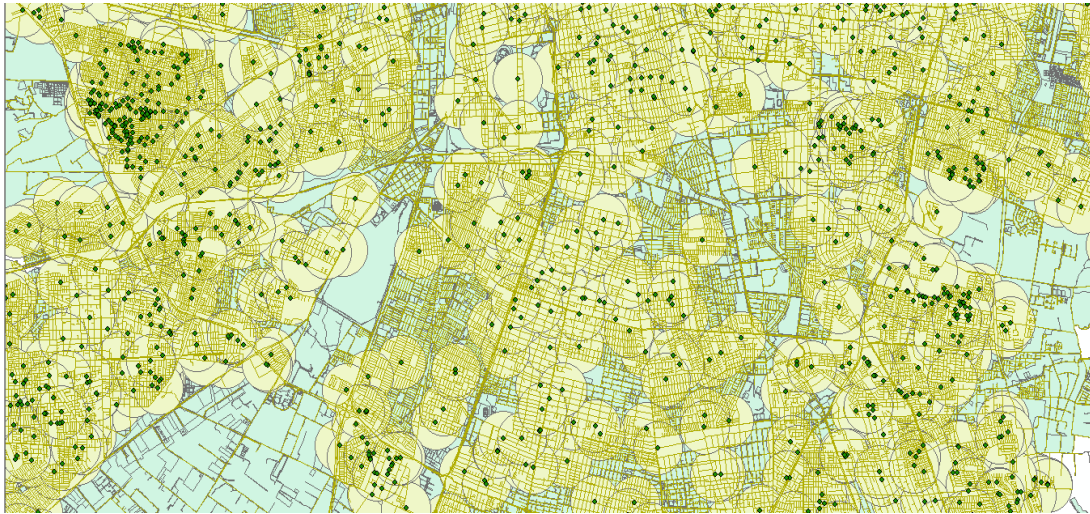
For the present thesis, it was a different approach was followed. Based on a distance perspective, *potential activity spaces* were defined as the area falling within a radius of 0.3 miles (roughly 500 meters) from each of the three-abovementioned activity nodes

(home, school, best friend's home). Thus, each respondent may have three potential activity spaces.

This radius was also defined based on Wikström et. al (2012) findings. In their study juveniles spend 92% of their time awake in activities located within 500 meters of their home, school and best friend's home, including the nearest local and city centres. However the vast majority of this time was spend in activities located primarily within 500 meters of home and school. It was considered that this specification would maximize the possibility to capture real exposure to contextual characteristics. In addition small area sizes contribute to maximising the between area variability and increase the chance that the social characteristics of this area will be relevant for the surveyed youth (Wikström, 2009). The value of a variable measuring an overall contextual characteristic for a specific subject will be the product of a simple un-weighted average across all three activity spaces. In addition, the defined distance represents approximately the distance a walking person can cover in five minutes.

Figure 5.1 shows how home based activity spaces look on a map. The figure allows one to appreciate how this approach may introduce more variability as regards measures of contextual characteristics because it allows the heterogeneity of social conditions across space to be reflected. On the other hand, figure 5.2 shows how home and school activity spaces look on a map. Red areas show potential school activity spaces, and blue areas depict potential home activity spaces. The figure shows how school activity spaces are shared across students, but potential home activity spaces are scattered across the city. Since locations like home address may change, the contextual exposure may vary across time.

Figure 5.1: Home Activity Space for Survey Respondents (r=500 meters)



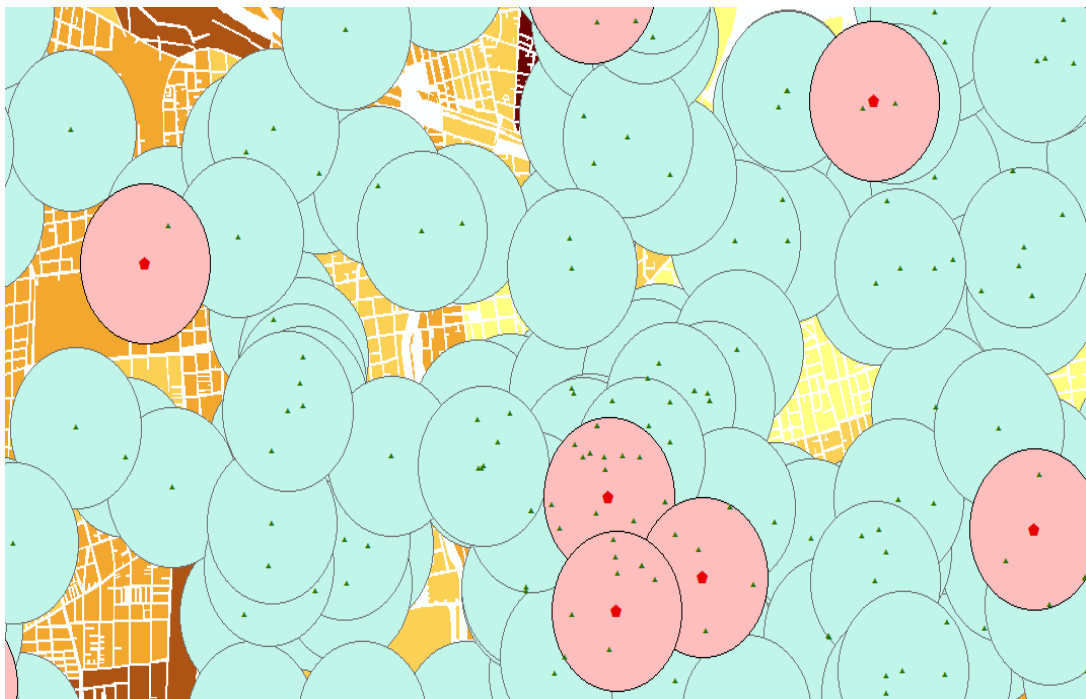
The main limitation of this approach is that, since no time budget data is available, real exposure to those areas cannot be established. Also, no information is available on the time dimension of exposure (e.g. frequency, duration of exposure to different potential activity spaces). In spite of that, it could still be argued that using a census tract approach is also based on assumptions that are being increasingly contested by research. Even though there are theoretical and empirical justifications to use this approach, results should be interpreted with care. One issue that will be explored in this thesis is if this approach may provide an useful alternative to the traditional approach. It is assumed that this aggregation strategy should be better at capturing a dynamic exposure to contextual characteristics than a census tract approach.

A second limitation refers to the fact that the choice of “*potential activity spaces*” is based on the assumption that British and Chilean youth will show similar spatial behaviours. Since the study is focused on school attending juveniles, it was judged reasonable to assume that most of their time would be spent between school, home and friends’ home based activities.

In this context, a third limitation needs to be considered. This limitation is related to data availability. Currently, the minimum aggregation level of structural and disadvantage indicators, is the census block. Thus, for each individual, measures on structural characteristics like concentrated disadvantage in activity spaces are based on a variable number of census blocks. This may change the results just because of an inconsistent aggregation strategy. How this issue may be affecting results is discussed across the thesis, particularly later in this chapter (section 2.4) and chapters 7 and 11.

Because it is acknowledged that this is a tentative approach, these assumptions will be explored and tested in Chapter 7. Particular attention will be placed on comparing models using different spatial aggregation strategies (traditional versus potential activity space based) and by investigating if characteristics of specific activity spaces may have differential effects on behavioural outcomes.

Figure 5.2: Home Activity Space For Survey Respondents (Blue) and School Activity Space (pink) ($r=500$ meters)



In the following sections, the construction of contextual variables will be described, including the employed spatial aggregation strategies.

2. Construction of an Index of Contextual Concentration of Disadvantage

It is common that in neighbourhood studies, research is presented on the impact of neighbourhood poverty and structural characteristics. This may be partially because of the availability of census and other official datasets that provide easy access to information on characteristics of geographical units (blocks, census tracts). Commonly studied indicators include variables like “percentage of families under the poverty line”, “racial heterogeneity”, “percentage of single parents”, “percentage of children under 15 years”, “percentage of concentration of specific racial groups” like Latino, African American or white; percentage of unemployed, percentages of foreign born, percentage of unmarried couples, percentage of families receiving welfare support, among others.

Census data sets usually provide a large number of indicators that could be considered as indicators of disadvantage. Many of those disadvantage indicators tend to be correlated with each other (Sampson et al., 2002). This poses a problem for the construction of disadvantage indicators: the way in which indicators are chosen and eventually aggregated is not a clear cut issue. Neighbourhood effects are not usually strong, thus the inclusion or exclusion of certain variables may have a marked impact on the conclusions drawn from research.

Three main approaches have been developed to deal with this problem. The first approach has been to select and aggregate indicators based only on their face validity and the logical link to theoretical constructs. Face validity is usually defined as a subjective judgment on the operationalisation of a construct. Establishing “face

validity” usually involves reading through a given measure (e.g. survey questions) and then deciding if it seems like a good measure given its logical link to the underlying construct (Drost, 2011).

An example of this perspective is Congdon's (1996) study of the impact of contextual characteristics on suicide trends in London. The author builds two summary indexes, one capturing *deprivation* (standardised levels of unemployment, household renting, no-car households, and household overcrowding) and one capturing *anomia or social fragmentation* (standardised levels of non-married adults, one-person households, population turnover and private renting). According to Fagg, et al. (2008), even though both constructs are correlated, they also show different spatial distributions. It is important to highlight that Congdon (1996) recognised that efforts to build scales in this way is always somewhat arbitrary.

The second approach has its roots in the factorial ecology approach and draws on empirical strategies to build reliable disadvantage measures. An example of this approach is that used by Duncan and Aber (1997). Given the fact that several dimensions of contextual disadvantage tend to be correlated, the authors use a factor analytical approach in order to detect underlying latent constructs that may help reduce the number of included variables. The authors chose 34 indicators that were reduced, via factor analysis, to six factors named i) *Low SES* (poor, black, female-headed families), ii) *High SES* (high income, educated and managerial workers), iii) *Male joblessness*, iv) *Ethnic diversity*, v) *Family concentration* (crowded housing, young population) and vi) *Residential stability*. Variables loading (i.e. correlating with) on more than one factor were dropped. As opposed to Congdon's (1996) method, the

authors recognise that this approach has been criticised because it avoids theoretical considerations during the empirical analysis. This perspective may be at risk of producing meaningless analytical categories.

A third approach falls somewhat in the middle of the two previous ones. For example, Sampson et al. (1997) used a more restricted method, selecting a limited number of theoretically relevant variables (only ten) that are later included in a factor analysis. This study led to one of the most well-known factor solutions of neighbourhood level structural characteristics: *i) concentrated disadvantage* (% below poverty line, % on public assistance, % female-headed families, % unemployed, % with less than years 18, and % black) *ii) Immigrant concentration* (% Latino, % foreign born) and *iii) Residential stability* (same house as in 1985 and owner-occupied house).

In spite of the fact that the theoretical underpinnings are the same, the empirical solutions vary widely in terms of resulting dimensions and in terms of the dimension in which a particular variable will be included.

Nevertheless, factor analytic empirical studies conducted in different contexts and countries usually result in a solution where the first extracted factor includes one or more of the following variables: percentage of poor or percentage of families below the poverty line, percentage of unemployed, percentage of female-headed households, percentage with low educational level, percentage of families living on public assistance, and being part of an ethnic minority (e.g. African American) (see for example Schneiders et al., 2003; Hay et al., 2006; Beyers, et al., 2001; Bellair et al., 2009; among others).

This first factor seems to be the most stable dimension in neighbourhood effects research and it refers directly to concentrated disadvantage as Wilson (1987) conceptualised it. The subsequent extracted factors usually vary in how several indicators are combined. These variations seem to respond to the number of variables included in the analysis and to the particularities of each different context (e.g. different countries). Given the stability of the first factor, it is not uncommon that studies concentrate only on testing hypotheses related to this dimension (see, for example, Ayer et al., 2011, Bellair, et al., 2005, Beshears et al., 2005; Beyers et al., 2001; Farrington et al., 2002; Hay et al., 2006; Lynam et al., 2000; Wight, et al., 2006).

As has been argued, constructing a concentrated disadvantage scale may not be considered as a completely straightforward task. The process may involve both theoretical reasoning and empirical verification of results. Empirical results may in turn influence decisions related to change in included variables or to modify empirical verification procedures. It is important to acknowledge this, and to be transparent about the decisions that guided the construction of composed variables.

In order to construct an indicator of concentrated disadvantage for Chile, the following procedure was followed:

2.1. Indicator selection

Based on theoretical reasoning, available variables in the Chilean census (2002) data were screened and selected based on their perceived capacity to measure relevant aspects of concentrated disadvantage and social disorganisation. Particular attention was paid to selected indicators reflecting more severe levels of disadvantage (e.g. overcrowding, inability to read or write). This is because the literature suggests that

antisocial behaviour does not seem to be linearly related to socioeconomic status, but is more likely in the presence of disadvantages related to the lowest positions of the social structure (e.g. persistent unemployment, dependence on social services, among others) (Farnworth et al., 1994). This may be the reason why in studies based on self-reported measures, the relationship between disadvantage and antisocial behaviour diminishes or disappears (Braithwaite, 1981; Hirschi, 2004). Initial indicators were calculated using REDATAM SP, specialised software designed to analyse census data. The following indicators were selected:

- a) *Proportion of rented houses (owned houses)*: This variable has been included in several previous studies and is expected to be an indicator of social disorganisation, reducing the capacity of the community to exert social control.
- b) *Proportion of households presenting overcrowding*: This variable measures the number of households where the number of inhabitants divided by number of inhabitable rooms (excluding the kitchen) is equal to or higher than three. This is a relevant disadvantage indicator in Chile. Shortage of privacy in the home has been related to a higher probability that juveniles will spend their free time on the streets and in unstructured settings (Maimon et al., 2010).
- c) *Proportion of female-headed single parent homes*: This indicator has also been included in several studies, as an indicator of disadvantage. This is because single parent homes tend to earn less than families where two parents are present. It has also been considered as an indicator of social disorganisation. Single parent houses have been related to having a lower capacity to monitor

behaviour; thus a high concentration of single parent homes has been related to the community having a lower capacity to exert social control.

Initially the variable “*proportion of divorced*” and “*proportion married*” were also considered. However, those dimensions have been less used in the literature. In addition, they were also correlated with “*percentage of female-headed houses*”, and thus excluded in order to favour a clearer factorial solution.

- d) *Proportion of people belonging to ethnic minorities*: This variable counts the proportion of inhabitants pertaining to one of the indigenous tribes of Chile, namely Aimara, Atacamenó, Alacalufe, Mapuche and Quechua. Previous literature suggests that, if included in the analysis, this type of indicator usually loads on the first disadvantage factor, which is a characteristic of minorities in general. However, whether concentration of ethnic minorities is in itself a disadvantage may be regarded as a matter of controversy.
- e) *Percentage foreign born*: This factor has been historically related to social disorganisation. However, whether concentration of immigrants is a factor that deteriorates or strengthens social control is also a matter of controversy (Desmond and Kubrin, 2009).
- f) *Percentage of persons living in this district for less than five years*: This indicator has been related to social disorganisation, and specifically to residential instability. Residential instability is thought to deteriorate social control. It should be noted, however, that the way in which this question is phrased may not make it the best indicator of residential instability. It asks if a

person has moved between districts (not address or neighbourhood), thus people changing neighbourhood within a district are unaccounted for by this measure.

g) Percentage of people that cannot read or write: As far as the author is aware, this indicator has not been previously used in the literature. It was included because it uncovers a form of potentially extreme disadvantage, and is directly relevant to the Chilean context.

h) Percentage of people aged over 20 having failed to complete secondary education: This is considered as an indicator of disadvantage. Individuals belonging to a lower social class tend to have a greater struggle to finish secondary education because of the competing need to work. Finishing secondary education is compulsory in Chile and it is normally completed by age 18 or 19. Assuming a potential gap of two years to account for late school entry or grade repetition, it is considered that not having completed secondary education by age 20 is an indicator of disadvantage. This will probably be a product of living in a disadvantaged context and will also be related to lower incomes, if the juvenile works.

i) Percentage of people (18 years or older) that are not working or studying: This is also considered as an indicator of disadvantage. Preliminary factor analyses were performed exchanging this indicator with the proportion of 18+ males that are not working or studying. This, however, resulted in a theoretically unclear

solution. Therefore, the more general variable (including males and females) was used.

j) Percentage of under-aged (15-17 years) youth that are not working or studying:

This is also considered as an indicator of disadvantage and it is of direct theoretical relevance to the hypotheses of this thesis. As in the previous indicator, a preliminary factor analysis was performed alternating this indicator with two separate indicators differentiating between males and females not working nor studying. This also resulted in an unclear solution where both inactive males and females loaded on a single factor. In order to simplify the factorial solution, only the overall variable (males and females) was retained.

k) Percentage of people in low occupational positions (unqualified): This variable accounts for the proportion of workers in unqualified occupational positions.

It has to be acknowledged that no direct measures on income are available in the census information. Thus, the employed measures may not be capturing relevant information regarding material deprivation, hence limiting the conclusions regarding the link between concentrated disadvantage and antisocial behaviour. Nevertheless, every effort was made to include measures that have been linked to more extreme forms of disadvantage and deprivation in the Chilean context like “failing to complete secondary education”, “work in unqualified positions” or “being unable to read or write” (Casen, 2011).

2.2. Factor analysis

The selected variables were included in an exploratory principal component factor analysis performed using PASW³⁵ 18. The analysis was based on census block level aggregation and used a direct oblimin rotation. This strategy has been previously used by Sampson et al. (1997) and Duncan and Aber (1997) because it allows the extracted factors to be correlated among them. This seems to be a sensible choice given the fact that ecological measures are expected to be significantly inter-correlated.

It was attempted to reproduce observed results, this time using larger aggregation units, namely census tracts. While results of the census block factorial solution behaved as expected according to previous research (three factor solution), the census tract solution did not. The census tract level factor analysis resulted in an unclear four factor solution. Half of the indicators loading on the first factor on the census block solution now loaded on a new second factor. In addition, most of those indicators significantly loaded on more than one factor. Following on Wikström, (2009) it was also considered that smaller area sizes would help to maximize between area variability and thus increase the chance that the social characteristics of this area will be meaningful for people exposed to them. For these reasons, the census block solution was preferred. Results from the census tract level factor analysis are not presented.

Before performing the factor analysis, the Kaiser-Meyer-Olkin (KMO) and Bartlett's test of Sphericity were calculated. Both tests examine if included variables may have an underlying structure and are thus suitable for factor analysis. If they are, the KMO is expected to be higher than 0.5 and the Bartlett's test is expected to be significant.

³⁵ SPSS changed its name in versions 18 and 19 to PASW, later returning to be called SPSS.

Results of both tests suggest that the included variables can be subjected to factor analysis (table 5.1).

Table 5.1: KMO and Bartlett's Test

KMO Measure of Sampling Adequacy.		.616
Bartlett's Test of Sphericity	Approx. Chi-Square	49852.651
	df	55
	Sig.	.000

In table 5.2 the correlation matrix between the included variables is presented. As can be seen, almost all correlations are significant.

Table 5.2: Correlation Matrix Between Included Variables (Block Level)

	1	2	3	4	5	6	7	8	9	10	11
1. Proportion rented houses	1										
2. Proportion overcrowded homes	.095*	1									
3. Proportion female-headed single parent homes	-.130*	.002	1								
4. Proportion ethnic minority	.023*	.126*	-.002	1							
5. Proportion foreign born	.157*	-.059*	-.066*	-.056*	1						
6. Proportion living less than five years in district	.153*	-.098*	-.189*	-.009*	.254*	1					
7. Proportion cannot read or write	-.021*	.189*	-.029*	.105*	-.152*	-.055*	1				
8. Proportion aged over 20 with incomplete secondary education	.050*	.332*	.023*	.211*	-.249*	-.285*	.413*	1			
9. Proportion in low occupational positions	.094*	.160*	-.026*	.143*	-.042*	-.078*	.167*	.464*	1		
10. Proportion aged over 18, not working studying	.029*	.035*	.122*	-.005*	.018*	-.130*	-.093*	.124*	-.072*	1	
11. Proportion between 15-17 years not working or studying	-.011*	.093*	.049*	.042*	-.036*	-.025*	.057*	.133*	.063*	.036*	1

*p<0.01

As stated before, the first factor solution was estimated using principal components extraction and direct oblimin rotation strategies, in order to allow for correlated factors. Only factors with eigenvalues higher than “1” were extracted. As a result, three factors

explaining 43.8% of the initial variance were extracted (see table 5.3). The first factor explained almost 20% of the initial variance. Using different extraction methods (alpha factoring) or rotation strategies (e.g. Varimax) led to slight changes in factor loadings, but had no meaningful implications for the interpretation of the factor solutions (results not shown). Final factor loadings are presented in table 5.4.

Table 5.3: Extracted factors (Block Level)

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings ^a
	Total	% of Variance	Cumulative %	Total
1	2.193	19.934	19.934	2.099
2	1.472	13.381	33.315	1.473
3	1.154	10.489	43.804	1.318
4	.983	8.939	52.743	
5	.926	8.421	61.165	
6	.877	7.970	69.135	
7	.846	7.689	76.824	
8	.780	7.089	83.914	
9	.759	6.900	90.813	
10	.652	5.931	96.745	
11	.358	3.255	100.000	

Most of the factor loadings behaved as expected. Low education, low occupational positions, overcrowding, being unable to read or write, concentration of ethnic minorities and the proportion of juveniles not working or studying loaded on the first factor, which can be named the *concentrated disadvantage factor*.

The second factor resembles Sampson's *residential instability factor*, including residential instability and percentage of rented houses. The fact that the "proportion of foreign born" did load on this factor is intriguing. However, this might be related to

specific neighbourhoods in the central and northern parts of Santiago that have received immigrant communities from Peru, Bolivia and Asian countries. This could be verified by visual inspection of the spatial distribution on a digital map (Figure 5.4). Darker shades suggest a higher concentration around the central district of Santiago city.

The third factor is a little more difficult to interpret. It seems to refer to *inactivity* (proportion not working or studying) and *female-headed homes*. This factor seems to address a variable that has a low but positive correlation with concentrated disadvantage (table 5.5). Examination of the variable “*Prop. 15-17 years not working /studying*”, suggests that it equally loads on the first and third factor, with which it seems to have a higher conceptual proximity.

Table 5.4: Factor Loadings

	Component		
	1	2	3
Proportion aged over 20 years with incomplete secondary education	.810*	-.179	.126
Proportion in low occupational positions (unqualified)	.653*	.057	-.098
Proportion overcrowded homes	.569*	.113	.130
Proportion cannot read or write	.553*	-.283	-.324
Proportion ethnic minority	.409*	.036	-.050
Proportion 15-17 years not working or studying	.208*	.005	.183
Proportion rented houses	.279	.707*	.052
Proportion foreign born	-.175	.664*	.017
Proportion living less than five years in district	-.161	.490*	-.454
Proportion aged over 18 years, not working /studying	.007	.196	.790*
Proportion female-headed single parent homes	-.121	-.279	.524*

*p<0.05

Table 5.5: Correlation Matrix Among Factor Scores (Census Tract Level)

	CD	RI	INACT
Concentrated disadvantage (F1)	1	-.080*	-.144*
Residential instability/immigrant concentration (F2)	-.080*	1	-.190*
Inactivity/female-headed single parent homes (F3)	-.144*	-.190*	1

*p<0.01

Based on these results, standardised regression-based factor scores were calculated for each census block, and later aggregated (averaged) at the census tract level or activity space level.

Tables 5.6, 5.7, and 5.8 display information on metric properties of the derived scales. The *concentrated disadvantage* (table 5.6) factor has an internal consistency (Cronbach's alpha) of 0.545. Eliminating the variable "Proportion of 15-17 years not working /studying" from the scale would result in a slight improvement of internal consistency. The Cronbach's internal consistency coefficient could be judged as rather low. Since this variable will be used as a group level indicator (i.e. at census tract level), the Cronbach's model may not be the best way to assess reliability in this case. This is because Cronbach's model is focused on studying reliability at the lowest level of data aggregation (in this case census blocks³⁶), ignoring that there may be significant group level (census tract) variation. According to Bonito, Ruppel & Keyton (2012), items that capture group members' outcomes from group level processes (e.g., concentrated disadvantage) are often non-independent. Therefore, it is thought that applying such models to group-outcome data measured at the individual level of analysis may produce inaccurate estimates. A solution to the measurement of non-independent data involves the use of multilevel modelling to study "ecometric" rather than "psychometric" scale properties (Raudenbush and Sampson, 1999; Snijders and Bosker, 2012). Using estimates of variances at item, individual, and group levels, it is possible to calculate the group level reliability. Based in the procedure described by Snijders and Bosker (2012, pg. 25-26), it was possible to estimate that the group level reliability was as high as 0.745, suggesting that the scale may actually be more adequate to measure concentrated disadvantage at the census tract level than at the census block level.

The observed difference between the reliability estimated by the use of Cronbach's alpha and an ecometric approach seems to be related to the fact that most of the

³⁶ Given restrictions regarding data confidentiality, information on actual individuals was not available.

variability is observed at census tract level and not at the census block level. In addition the average number of census blocks per census tracts is high (25), leading to increased reliability levels.

In the case of *Residential instability/immigrant concentration* (table 5.7), internal consistency is 0.280. Eliminating any variable would not result in any improvements in the alpha coefficient. This internal consistency is judged to be unacceptability low. However ecometric reliability of the scale is 0.780, which is substantially higher than the reliability calculated based on the alpha model.

Regarding *inactivity/female-headed homes* (table 5.8), the Alpha is 0.215. Deleting any item would lead to it ceasing to be a scale. Again this reliability is rather low. However a substantial increase is observed when the scales reliability is estimated based on the ecometric model (0.860).

Table 5.5 presents inter-correlations among the extracted factors. All correlations are significant, but low. It is interesting to note that the scales on residential instability and inactivity are negatively correlated with concentrated disadvantage. Low and negative correlations suggest that adding these variables into a single scale would not be advisable.

Table 5.6: Scale Properties: Concentrated Disadvantage

Cronbach's Alpha= 0.545 Ecometric Reliability³⁷=0.945	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Proportion overcrowded homes	0.5310	0.084	0.334	0.482
Proportion ethnic minority	0.5411	0.098	0.228	0.531
Prop. cannot read or write	0.4710	0.091	0.389	0.484
Prop. 20 + incomplete secondary education	0.2808	0.029	0.597	0.388
Prop. in low occupational positions	0.4680	0.084	0.429	0.454
Proportion aged between 15-17 years not working or studying	0.5701	0.108	0.133	0.563

Table 5.7: Scale Properties: Residential Instability/Immigrant Concentration

Cronbach's Alpha= 0.280 Ecometric Reliability³⁸=0.913	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Proportion rented houses	0.2087	0.038	0.175	0.206
Proportion foreign born	0.4613	0.093	0.261	0.260
Proportion living less than five years in district	0.2876	0.054	0.193	0.111

³⁷ Group level

³⁸ Group level

Table 5.8: Scale Properties: Inactivity/Female-Headed Homes

Cronbach's Alpha= 0.215 Ecometric Reliability³⁹=0.924	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Prop, female-headed single parent homes	0.1412	0.007	0.122	--
Prop, 18+ not working /studying	0.1436	0.010	0.122	--

2.3. Spatial distribution across Santiago City

Using ArgGis Desktop, the factor scores calculated for each block can be matched with its geographical representation on the map. Figures 5.3, 5.4 and 5.5 graphically represent the factor scores on a digital map of Santiago City. Darker colours indicate higher factor scores (above average), while lighter colours suggest lower factor scores (below average levels of concentrated disadvantage).

³⁹ Group level

Figure 5.3: Spatial Distribution of Concentrated Disadvantage Factor Scores across Santiago City

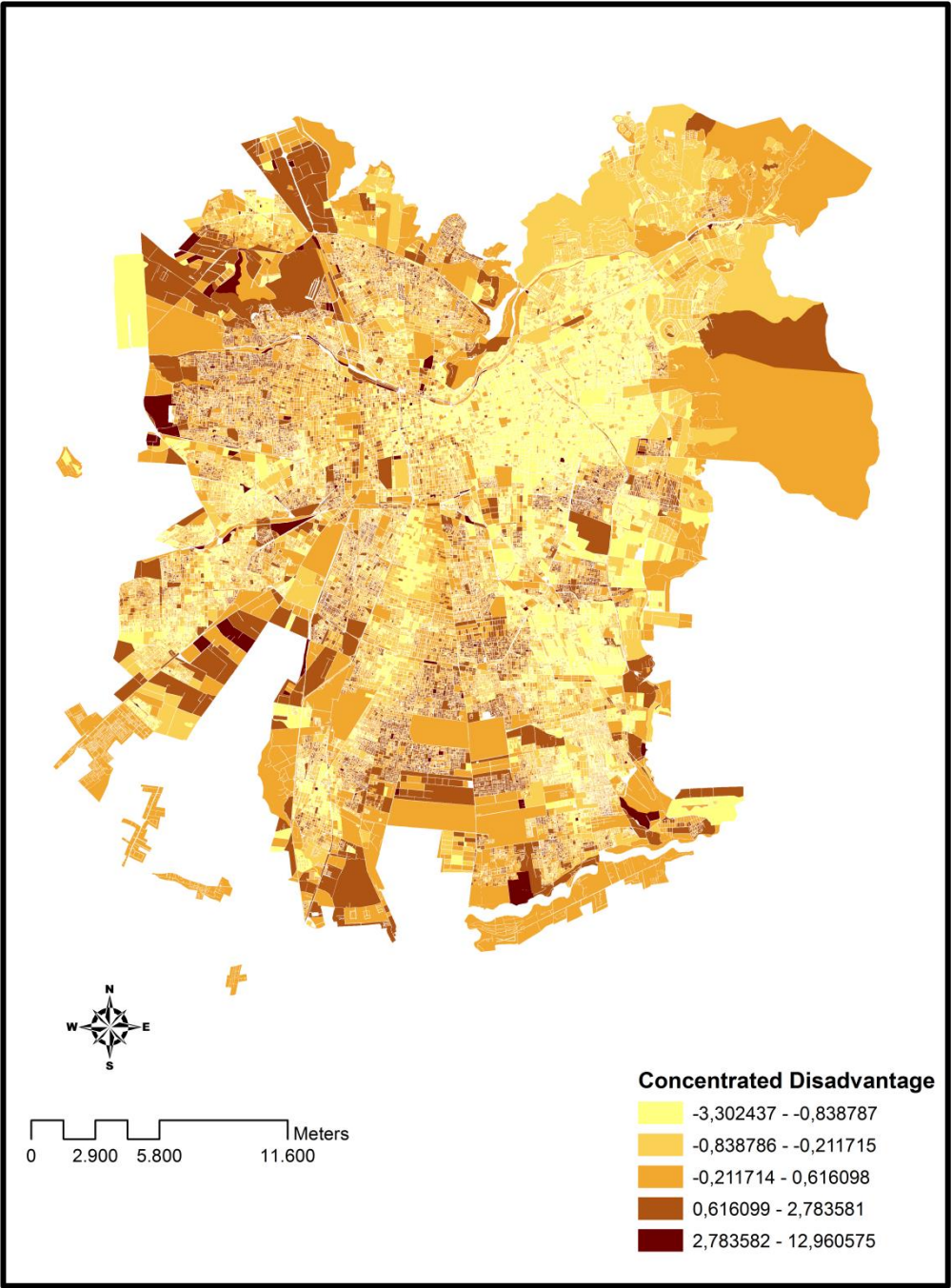
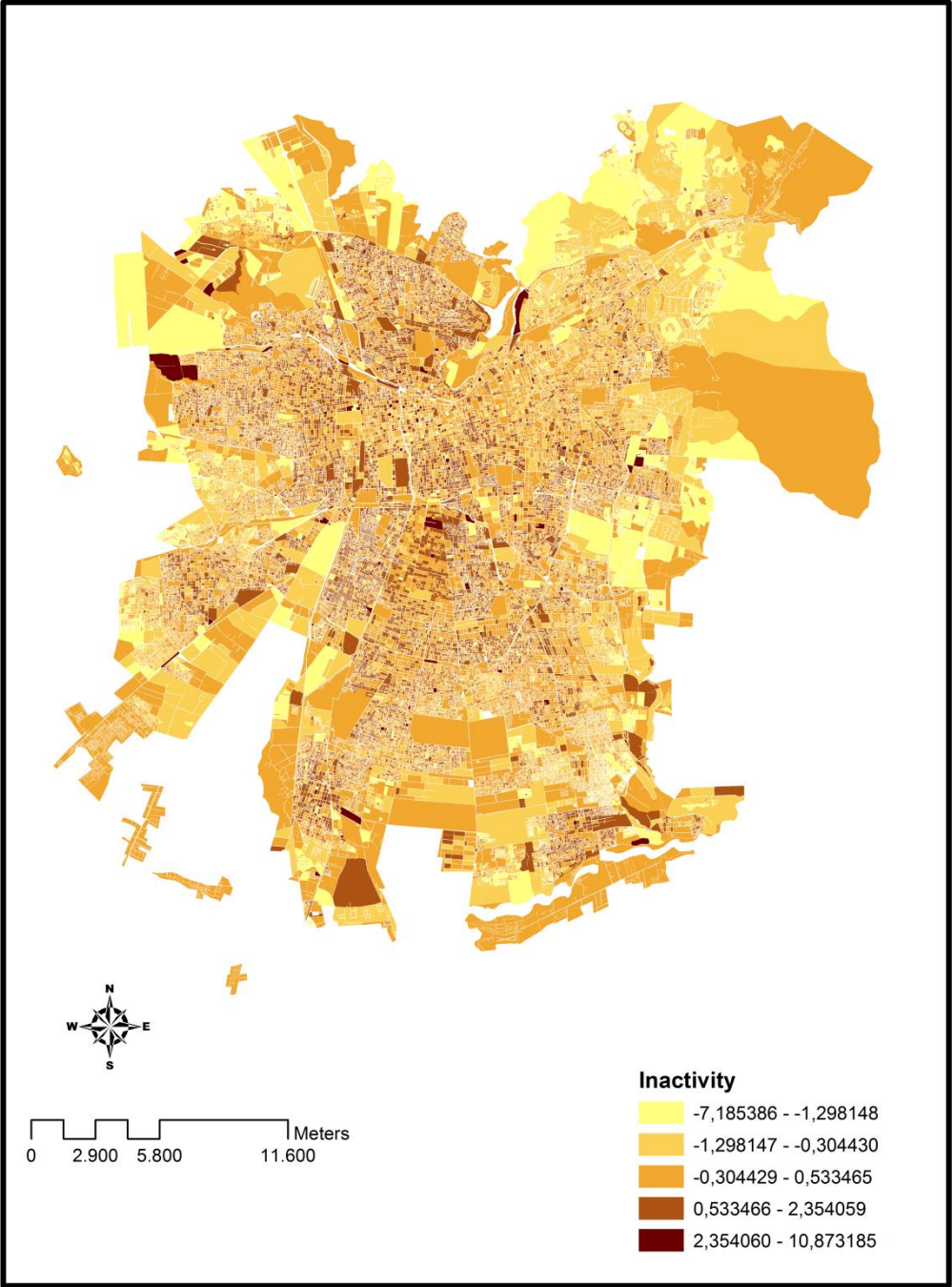


Figure 5.4: Spatial Distribution of Residential Instability Factor Scores across Santiago City



Figure 5.5: Spatial Distribution of Inactivity Factor Scores across Santiago City



While representations of concentrated disadvantage and residential instability factors suggest spatial clustering, the inactivity factor displays a less clear spatial pattern.

In order to assess if these patterns can be considered to be spatially clustered, Moran's I statistic was calculated for each factor score. The Moran's I is a measure of spatial autocorrelation. It measures the degree in which high-low values of a variable in one location are correlated with high-low values in nearby locations (Ward and Skrede, 2008). Negative or positive values indicate negative or positive spatial correlation. Tests were run using ArgGis Desktop. Results (presented in table 5.9) suggest that all three variables show a spatial distribution pattern that can be considered to be positively clustered. In spite of this fact, concentrated disadvantage shows the strongest spatial autocorrelation. However, visual inspection of the maps permits of the conclusion that all three variables have a different spatial pattern, which would explain the low correlation found among factors.

Table 5.9: Results of Global Moran's I for Census Based Variables

Global Moran's I	Conc. Disadvantage	Res. Instability	Inactivity
Moran's Index:	0.473861	0.35604	0.375449
Expected Index:	-0.000019	-0.000019	-0.000019
Variance:	0.000004	0.000004	0.000004
z-score:	226.28602	170.05435	179.28577
p-value:	0.0000	0.0000	0.0000

In summary, it can be concluded that:

All three variables show a distinct spatial pattern. In addition, low inter-correlations among factors suggest that they should not be aggregated as only one variable.

Changing the factor analytic method only results in a slight change in factor loadings, having no consequence as regards their interpretation. On the other hand, changing aggregation scale (using census tracts instead of blocks) results in an unclear factor solution (result not shown).

As expected, exploratory factor analysis provided a clear first factor that could be interpreted as measuring *concentrated disadvantage*, as has usually been the case across the literature. This factor obtains the highest alpha and a high ecometric reliability coefficient. In addition, this factor has the clearest theoretical interpretation and is usually the first extracted factor in the overall literature.

The second factor resembles the *residential instability* factor but also includes immigrant concentration. It seems that, contrary to, for example, the US, in Chile poor neighbourhoods tend to be rather stable, having lower turnover rates. This seems to be related more specifically to Asian and Peruvian immigration located in the central and northern districts of Santiago. The third factor, although showing a low positive correlation with concentrated disadvantage, is theoretically less clear.

For the present thesis only the “*Concentrated disadvantage*” factor will be carried on for analysis. This decision is based on several theoretical and empirical arguments. Firstly, across the factor analytical literature, while “*concentrated disadvantage*” has been consistently appears as the first extracted factor, this has not been the case with other extracted factors. Concentrated disadvantage seems to be the most commonly extracted first factor. Secondly, previous literature also suggests that “concentrated disadvantage” is the structural factor that shows a more consistent relationship with delinquency. Preliminary correlational analysis conducted with the Chilean data

suggests that this factor has the highest correlation with census tract level “percentage of adolescents with arrest records”⁴⁰ ($r_{xy}=0.448$)⁴¹. As expected, this is not the case with “Inactivity”, which shows a low (albeit significant) correlation with “percentage of adolescents with arrest records” ($r_{xy}=0.116$), while “Residential Instability” shows no significant correlation ($r_{xy}=-0.046$).

Based on these arguments, and to provide a clearer analytical focus of this thesis, only the first factor, namely “concentrated disadvantage” was carried forward for analysis.

⁴⁰ Construction procedure of this variable is described in section 3.1.

⁴¹ This correlation based on the full information on all census tracts of Santiago City (N=1930). This correlation differs from the correlation that is calculated based on census tracts that are actually linked to survey data (see Chapter 7, table 7.8), which is actually stronger.

2.4. Spatial aggregation strategies of the Index for Contextual Concentrated Disadvantage

The Index for Concentrated Contextual Disadvantage will be calculated based on two spatial aggregation strategies: the traditional and the activity space perspective.

In the case of the *traditional approach*, the Index of Contextual Concentrated Disadvantage will be averaged across census blocks for each census tract. Contextual concentrated disadvantage of the census tract where the respondent lives, will be linked with the subject's survey responses. It should be remembered here that each census tract is composed of several census blocks, and that the Index of Contextual Concentrated Disadvantage has been estimated based on census blocks.

Concentrated disadvantage was also calculated based on a *potential activity space approach*.

For a particular anchor point (home address, school address, or best friends address), a circular buffer zone with a radius of 500 meters was drawn. In order to calculate the potential activity space level concentrated disadvantage, concentrated disadvantage scores for all census blocks intersected by the buffer of a particular anchor point, were averaged.

Through this procedure each subject obtains a *Concentrated Disadvantage Index* for each of his/her potential activity spaces (HAS, SAS and BFAS). In addition, an overall *Activity Space Based Disadvantage Score*, was obtained by calculating an simple average of the disadvantage index across potential activity spaces for each particular subject.

Theoretically speaking, a key advantage of activity spaces is that they may be sensitive to home change by the survey respondent. 12.5% of included cases changed home at least one time during the study. Thus, variables calculated based on the activity space based aggregation strategy can be conceptualised as time varying.

A potential limitation has to be noted. It has to be acknowledged that the lowest available aggregation level of census data was the census block. Because of this limitation, the construction of activity space based concentrated disadvantage scores may draw on a number of census blocks that differs across participants. As a consequence, observed results might be influenced by this lack of consistency. In order to address this issue, models based on a traditional aggregation strategy and models based on an activity space approach will be compared. It is expected that this comparison will help to assess whether a change in aggregation strategy introduces meaningful differences in the model interpretation.

3. Contextual concentration of deviant peers

In order to test hypotheses regarding peer differential association, three measures regarding contextual concentration of deviant peers were constructed. These are *a) contextual concentration of peers with police records; b) Contextual Concentration of Deviant Peers within School* and *c) Contextual Concentration of Deviant Peers within the Census Tract (Residence) or Within Potential Activity Spaces*.

The first measure was constructed based on official police records regarding the residence of under-aged children with police records. The second and third measures were derived from the self-reported survey. One key advantage of the survey data is that it incorporated social network information. Interviewed subjects could nominate up to

three friends within their school level. This allowed peer effects to be directly estimated, based on a friend's actual report of antisocial behaviour. This also made it possible to locate and geocode peers' home addresses.

Hence, peer effects could be treated as an independent contextual variable, which is an uncommon methodological strength in neighbourhood effects research. Traditional studies typically request the interviewed adolescent to report on deviant behaviours of their friends. This approach generates endogeneity problems related to same source bias. Previous research suggests that this may lead to an inflation of the peer effect because juveniles tend to believe friends are more alike than they actually are (Valenzuela and Ayala, 2011). This problem seriously weakens causal inferences made in other studies about peer effects and how they may relate to neighbourhood level effects.

3.1. Contextual Concentration of Juveniles with Police Records

The construction of this variable was based on information in police records for the full population of under-aged children and youth that had had a police contact between the years 2004 and 2007.

Cases were included if they had had at least one police contact related to delinquent acts between the years 2004 and 2007, and if their last known address during the years of 2006 and 2007 was located within one of the 35 municipal districts included in the present study. Especially in the case of the higher risk cases (higher number of police contacts), their home addresses were highly mobile. The years 2006 and 2007 were selected in order to improve the chance of capturing their real address and thus to increase the chances that their home activity space could be accurately located. These

years were also selected so that the data would be temporally close to the time where the first wave of self-reported data was collected (2008). The addresses of residence of the selected cases were then mapped using ArcGis.

From the original police record dataset, 25,866 cases (persons) qualified to be geocoded. Of those cases, 713 were excluded because the address was missing from the record. Hence, 25,153 records were carried forward for geocoding. Addresses were standardised and fed to the geocoding tool provided by ArcGis. Of those records, 55% were automatically geocoded; the rest had to be manually checked.

At the end of the procedure, 80% of all addresses were successfully geocoded. It should be noted that this percentage is far higher than the percentages of contextual variables successfully placed on the map reported in other studies, if they are reported.

This variable is expected to measure exposure to deviant peers. It is thought that exposure to deviant peers may increase the risk of differential association. This measure has some advantages over previously used measures. Previous neighbourhood effects research studies addressing contagion effects have usually correlated neighbourhood level concentration of criminal events (not location of addresses of persons with arrest records) with antisocial behaviour indicators (see for example Ludwig and Kling, 2007). For reasons explained before, this is not a good proxy. This is another methodological strength of the present study.

Figure 5.6 overlaps the map of concentrated disadvantage aggregated at the census tract level, with the layer of home addresses of juveniles with police records. The dots vary in size, representing the number of police contacts each juvenile had between 2005 and 2007. Visual inspection (Figure 5.6) of the data suggests that there is an important

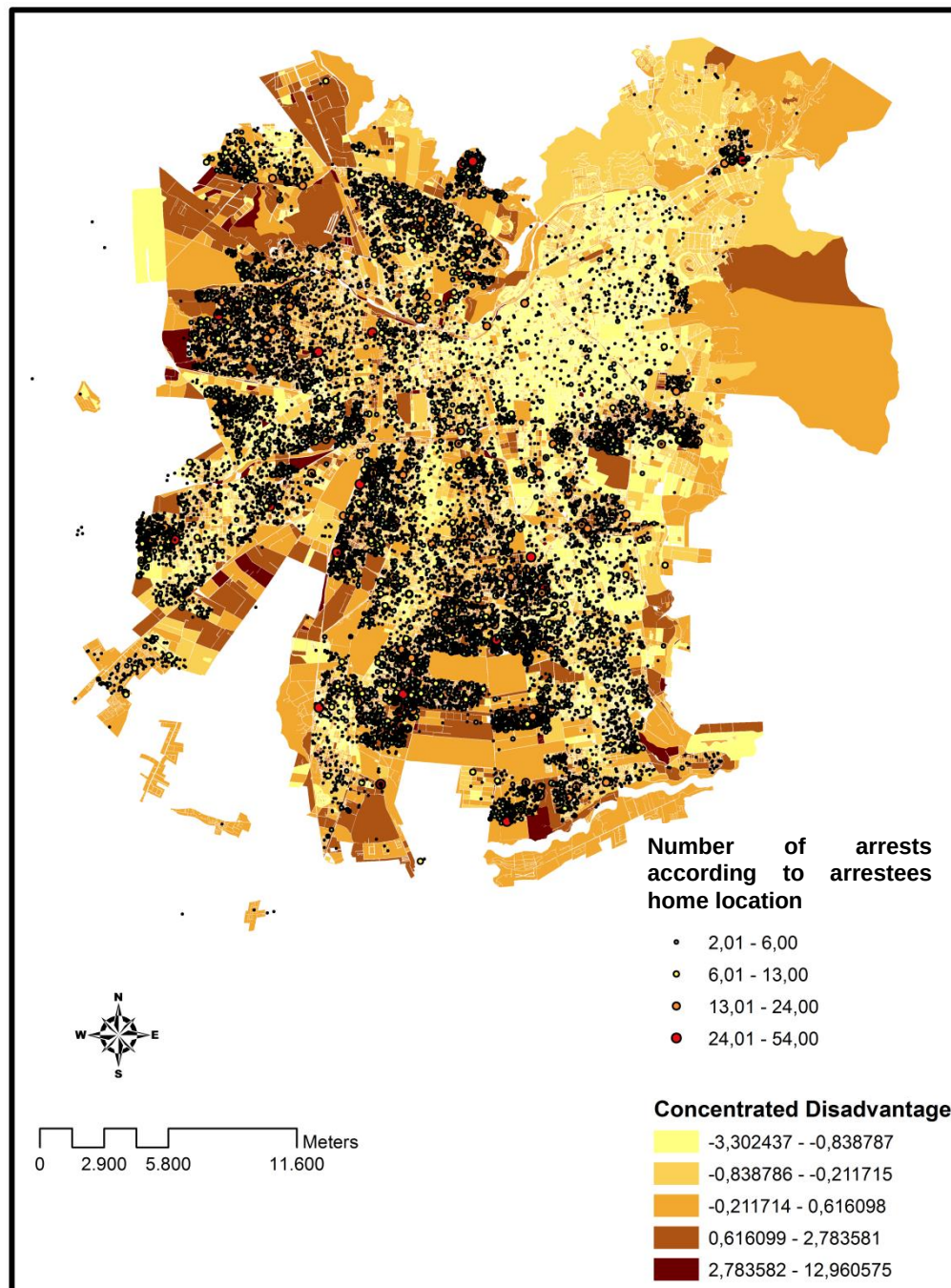
spatial association between juveniles with frequent police contacts and the average level of census tract concentrated disadvantage.

Regarding the spatial aggregation strategy this variable was calculated for *census tracts* (% of cases with arrest records in relation of total under-aged population for the census tract) and for *potential activity spaces* (mean percentage of juveniles with arrest records across all three potential activity spaces).

Regarding the reliability of police records, since 2002 these have been recorded digitally in a standardised format. Specialised software prevents misclassification by the introduction of automatic data validation procedures. In addition, police officers attend yearly special training in order to improve and maintain adequate knowledge of how to accurately describe and classify police contacts involving under-aged children.

This measure has however some limitations. When using police records as a proxy measure of antisocial behaviour, researchers have to be cautious regarding the interpretation of their findings. This because police records do not only measure juvenile behaviour, but also reflect how the police operate. Police administrative decisions (for example when and where to patrol) may have an impact on shaping the probability of police contact occurring (George, 1995). Higher concentrations of juveniles with arrest records in certain neighbourhoods may not only express concentration of antisocial behaviour, but also concentrated police action on certain places. One reason to include the two additional self-reported measures is to help overcome this limitation by using information from another source. These are described in the next two sections.

Figure 5.6: Spatial Distribution of Home Addresses of Juveniles Having Had a Delinquency Related Police Contact (2004-2007) and Whose Last Address (2006-2007) is Located within One of the 35 Selected Districts.



As in the case of concentrated disadvantage, this variable was also tested for autocorrelation effects. See table 5.10.

Table 5.10: Results of Global Moran's I for Spatial Distribution of Home Addresses of Juveniles with Police Records

Global Moran's I	Conc. Disadvantage
Moran's Index:	0.010986
Expected Index:	-0.000050
Variance:	0.000000
z-score:	15.699503
p-value:	0.000000

As in the case of concentrated disadvantage, results suggest the presence of spatial autocorrelation.

3.2. Proportion of Deviant Schoolmates

This variable was calculated based on the survey data, and attempts to measure the concentration of school mates that report levels of antisocial behaviours that are above the sample average⁴². The percentage of schoolmates reporting high levels of antisocial behaviours was calculated for each survey respondent. Given the nature of the variable, it was only aggregated at the school level. This variable was constructed to address a variable that might eventually confound potential contextual effects that are supposed to happen outside of school.

Since this variable is based on an aggregated measure of antisocial behaviour (see chapter 6, section 2), econometric reliability was also calculated. Using the same procedure that was previously described, econometric reliability for this scale was 0.55

⁴² Antisocial behaviour was measured using the General Delinquency Index, the development of this measure will be described in Chapter 6.

(2008 wave), 0.66 (2009 wave), and 0.57 (2010 wave), which is slightly lower than the individual level reliability.

3.3. Contextual Concentration of Deviant Schoolmates

This variable seeks to address to what extent deviant schoolmates also live within the significant out-of-school contexts of the survey respondent. This variable was calculated based on the available survey data. As in the case of *Contextual Concentration of Juveniles with Arrest Records*, this variable was calculated based on both a census tract and an activity space approach.

Regarding the *census tract* approach, the percentage of schoolmates with high levels of antisocial behaviour⁴³ living within the same census tract as the respondent was calculated. In the case of the *potential activity space* approach, the percentage of deviant schoolmates living in each of the three *potential activity spaces* was averaged.

As regards to school level indicators, since this variable is based on an aggregated measure of antisocial behaviour (see chapter 6, section 2), ecometric reliability for the census tract level was also calculated. Using the same procedure that was previously described, ecometric reliability for this scale was 0.29 (2008 wave), 0.34 (2009 wave), and 0.33 (2010 wave). Unfortunately, this reliability has to be considered low. The lower ecometric reliability is related to the smaller average number of cases per census tract in comparison to the average number of cases per school. Lower ecometric reliability suggests that this aggregated variable may be less accurate in measuring variations in antisocial behaviour between census tract levels than it is at the individual

⁴³ Ibid.

level. Thus, results regarding this measure need to be interpreted with care and regarded as tentative.

Other limitations of the currently employed data sources should be noted. The first is the fact that, importantly, out of school friends cannot be incorporated into the analysis. Even though this is limiting, it could be argued that the nature of the proposed hypothesis still allows for testing the impact of spatial variables on affiliation to deviant school friends. Other potential contextual peer effects will be controlled through the use of measures of neighbourhood level concentration of under-aged children with arrest records (see section 3.1).

4. School Level Value-Added Education

As with family functioning (see further on) it was considered necessary to construct a proxy variable that would be able to provide information on school functioning as a relevant developmental context. Thus, a measure of school effectiveness was constructed.

There are two key reasons why it is necessary to construct such a measure. The first is the fact that effective schools have been associated with lower rates of behaviours like smoking (Avenyard, 2004), marihuana use, stealing, and participating in group fights (Tobler, Komro, Dabroski, Aveyard and Markham, 2011). Therefore it is a relevant contextual confounder that has to be controlled for. The second reason is the fact that none of the reviewed neighbourhood studies controlled for school effectiveness, thus it can't be ruled out that some of the observed neighbourhood effects may be attributable to school effects. This is a particularly relevant problem when it is considered that public education policies of countries like the US or UK (the source of many

neighbourhood studies) involve incentives that encourage children from particular neighbourhoods to attend to particular schools. This is not the situation in Chile.

Although parents tend to live near their children's schools (Flores 2008), the Chilean system is based on a voucher system where parents may choose between public (free schools), subsidised public schools (jointly funded by government and families) and private schools (fully funded by families). Since there are no explicit incentives to lead students from particular neighbourhoods to attend particular schools, it is expected that more variability in this respect will be observed in Chile than in other countries.

Constructing a measure of school effectiveness is a complex issue. A key reference regarding the complexities of assessing school effectiveness is the "Coleman Report" (1966). Coleman addressed the problem of studying the determinants of school achievement in the US and found that factors like race, peers and family history were more powerful influences than school level characteristics. This revealed that the characteristics of the student intake are powerful determinants of educational outcomes. As a result, clarification of how much schools contribute to children's outcomes, once background variables of their students have been controlled for, was needed. While a vast amount of contemporary literature has focused on estimating diverse education production functions, current approaches have focused on value-added modelling approaches.

Value-added models seek to estimate a "value-added score" for each school. They do so by estimating the contribution of schools to student gains in school achievement, while controlling for students' relevant background characteristics (e.g. race, SES). Typically longitudinal data is used to assess student progress and to estimate the role that schools

play in contributing to student academic progress. However, due to data access restrictions, the present study followed a simplified estimation process based on the one developed by Avenyard (2004). In his paper Avenyard found that raw averages of school results were not correlated with behavioural outcomes, but with school effectiveness (value-added scores). He estimated a multilevel model regressing individual level educational outcomes of student characteristics that had a known impact on student outcomes, like sex, race, and SES. He then estimated an index of value-added education based on the school level residuals. The residuals showed the deviation from the school mean that was not accounted for by characteristics of the student intake. Thus, schools that obtained a positive residual were performing better than would be expected by their intake characteristics, while schools obtaining negative residuals were performing below what would have been predicted based on the intake. The unexplained difference was attributed to school level characteristics.

Following this method, in the present study the school value-added index was estimated as the school level residual obtained after running a three level hierarchical model (88,698 students nested in 2,825 classes that are in turn nested in 1,002 schools) using SIMCE data for all schools in Santiago City. The model regressed results of educational achievement standardised test scores on sex, school type (public, subsidised, private), and school level SES. The constant of the model was allowed to vary by class (v_{0k}) and by school (u_{0jk}). Random effects and error term (e_{0ijk}) are expected to follow a normal distribution.

The following model was estimated for all tenth grade students who participated in the 2010 standardised assessment:

Equation 5.1

$$\text{PRSIMCE}_{ijk}^{44} \sim N(\mathbf{XB}, \Omega)$$

$$\text{PRSIMCE}_{ijk} = \beta_{0ijk} \text{cons} + \beta_1 \text{Male}_{ijk} + \beta_2 \text{Public}_k + \beta_3 \text{Subsidised}_k + \beta_4 \text{Low SES}_k + \beta_5 \text{Low-Middle SES}_k + \beta_6 \text{Middle SES}_k + \beta_7 \text{Middle-High SES}_k + e_{ijk}$$

$$\beta_{0jk} = \beta_0 + v_{0jk} + u_{0jk}$$

$$[v_{0jk}] \sim N(0, \Omega_v) : \Omega_v = [\delta^2_{v0}]$$

$$[u_{0jk}] \sim N(0, \Omega_u) : \Omega_u = [\delta^2_{u0}]$$

$$[e_{0ijk}] \sim N(0, \Omega_e) : \Omega_e = [\delta^2_{e0}]$$

Table 5.11 shows the results of this model.

Table 5.11: Results of Auxiliary Regression (N=88,698)

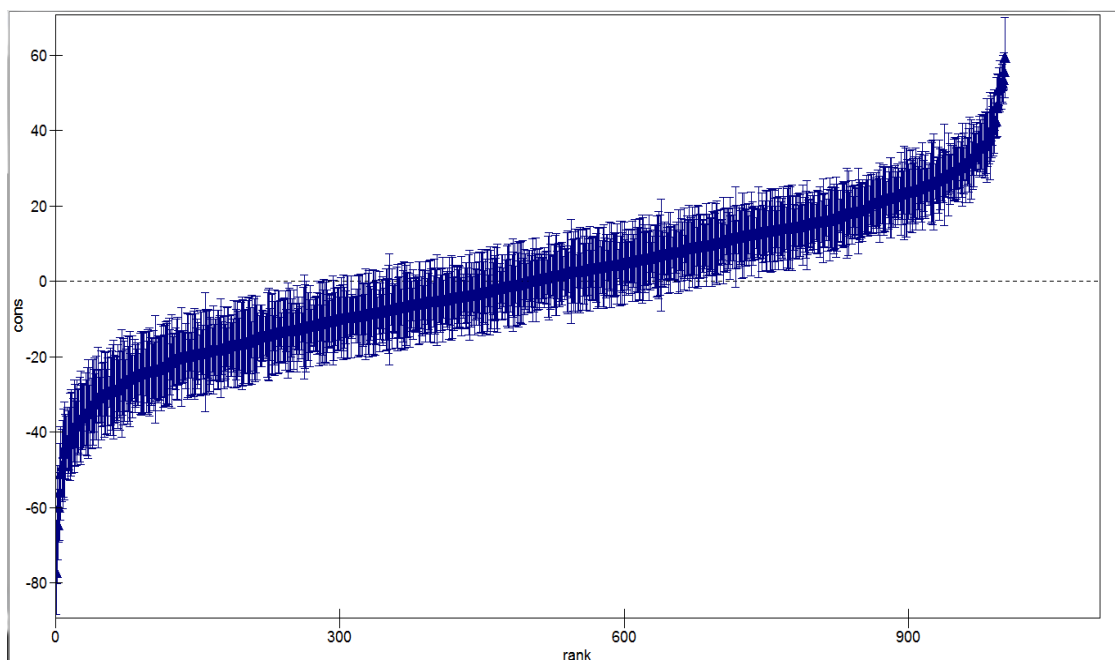
	M1	S.E.	M2	S.E.
Response	PRSIMCE		PRSIMCE	
Fixed Part				
Cons	304.339	2.285	308.526	1.664
Male	4.516	0.287	4.526	0.287
Public	-71.503	3.363	21.442	5.279
Subsidised	-46.493	2.632	20.059	4.864
Low			-117.201	5.48
Low-Middle			-92.072	5.157
Middle			-63.14	5.165
Middle-High			-36.086	4.833
Random Part				
Level: SCHOOL				
cons/cons	981.359	47.86	429.675	23.072
Level: CLASS				
cons/cons	113.21	5.168	114.603	5.209
Level: Individual				
cons/cons	1335.663	6.446	1335.892	6.447
-2*loglikelihood:	896385.5		895691	

⁴⁴Average between math and language standardised achievement test score. National assessment system.

In order to obtain school value-added scores, level three residuals were estimated (see figure 5.7).

In the next chapter, the construction of the individual level measures based on the self-reported survey will be described.

Figure 5.7: Plot of School Level Residuals with 95% Confidence Intervals



The school level residual represents the difference between the predicted score, given the school's intake, and its real average score. Positive values are interpreted as indicating schools that obtain higher average scores than expected, given their intake. Negative values indicate schools that obtain lower than expected average values, given their intake. In particular, since intake characteristics have already been taken into account, this value is said to represent the added-value that schools can provide. School effectiveness (value-added education) refers to indicators that measure if students'

academic progress is higher than expected given their background variables (e.g. SES). Students at a school that provides “value-added education” achieve better results than would be expected.

Calculated added-value scores are then matched with the schools included in the longitudinal survey. Since the subjects in the sample do not change school, this variable can be considered as time invariant.

Unfortunately simple reliability for SIMCE scores has not been reported for the 2010 assessment. However reports for the 2012 and 2013 (Agencia de Calidad de la Educación, 2012, 2013) assessments consistently show that simple reliability for the employed scales for tenth graders ranges between 0.9 and 0.92. Since access to disaggregated data on item responses is unavailable to the author (confidentiality), no econometric reliability indicators could be calculated.

Chapter 6: Building individual measures to address criminogenic processes and control variables

The present chapter will describe how individual level measures were constructed. As it has been explained before, the primary data source for individual level measures was based on the self-report survey described in Chapter 2. This survey provided key information on antisocial behaviour, criminogenic processes and other statistical controls. The present chapter will be divided into six sections. The first section will provide a brief discussion of the validity of self-reported surveys including available evidence for the present survey questions. Following this, sections 2 to 6 will discuss construction methods for measures of antisocial behaviour, strain, social control, and affiliation with antisocial peers and statistical controls.

One key limitation of some of the measures developed in this chapter that are related to parental and some school aspects is that they will be based on adolescent self-reports; thus, potential endogeneity may emerge.

1. A note on the validity of the employed measures

There are usually only two available alternatives to gather data on antisocial behaviour and related processes for this type of study: either measures rely on official records or on self-reported (survey) information. Both types of measures have advantages and disadvantages, in terms of usefulness and validity. Official data (e.g. arrest records) have been commonly used in the field of criminology for hypothesis testing. The use of administrative data is convenient because of its objectivity⁴⁵, low cost and usefulness in reflecting longitudinal population trends. However, the use of this data may also involve some problems. As it was discussed earlier, official or administrative data like arrest

⁴⁵i.e. are generated independently from the subjects

records may also be subject to bias (George, 1995)⁴⁶. In essence, due to the fact that not all offences are detected, arrest records also reflect how police forces operate. For example, regarding the validity of arrest records, self-reported studies in Chile suggest that only one third of juveniles that report an offence actually get into trouble with the police (Hein and Barrientos, 2004). In addition, official records only register information that is relevant for the functioning of the organisations collecting it. Therefore, official records are not always useful for testing a theory.

Given the problems that have been previously discussed, many modern criminological studies rely on self-reported measures. This seems to be related to their usefulness for testing theoretically meaningful propositions. Studies have been generally supportive of the external and predictive validity of self-report methods in criminology (see for example Paschall and Flewelling, 2001). In terms of internal validity, self-reported indicators have been consistently associated with theoretically relevant constructs that explain criminal involvement (Thornberry and Krohn, 2003). Self-report methods typically obtain satisfactory indicators of internal consistency (Cronbach's alpha method) and test-retest reliability (Thornberry and Krohn, 2003).

Given the specific items employed in the present survey, evidence is generally supportive of their validity and reliability. The included questions have been used as part of the national school survey on drug use. This survey is carried out every two years since 1995. The particular questions considered for the present study have been included in the survey since 2005. National studies (Conace 2003, 2005, 2007 and 2009), graduate students' theses (see, for example, Hein, 2007; Neckelmann, 2009) and

⁴⁶ As is the case of the measure of concentration of juveniles with arrest records discussed earlier in chapter 5, section 3.1.

internal reports (See, for example, Araos, Cea and Valenzuela, 2008) suggest that these indicators have been consistently associated with drug use, school violence, and school theft. Only one study, conducted by Droppelmann and Hein (2010), has addressed the external validity of self-reported questions on drug use. The authors found that youths reporting drug use (questions on marihuana, cocaine and/or cocaine paste base) also scored significantly higher in all scales of the Chilean revised version of the Problem Oriented Screening Instrument for Teenagers (POSIT) (Radhert, 1995). Since POSIT was also able to significantly discriminate between the general adolescent population and juveniles in treatment because of drug use, it was considered an adequate instrument for assessing external validity.

Even though not all questions and scales have been tested for external validity, the studies referred to above suggest that the selected indicators are suitable for use in the present thesis.

2. Construction of the General Antisocial Behaviour Index

In order to simplify the analysis strategy and to keep it focused on contextual effects, it was decided to construct only one main dependent variable, measuring general delinquency involvement. The General Self-Reported Antisocial Behaviour Index (GABI) was derived from nine questions from the self-reported survey. Selected questions related to drug use and general antisocial behaviour.

For the final delinquency scale, the following questions were included (translated by the author):

Drug use

- ✓ How many times have you smoked marihuana in your life? (None, one or two, three to nine, ten to 19, 20 to 39, more than 40)
- ✓ How many times have you used cocaine or “coca paste” in your life (None, one or two, three to nine, ten to 19, 20 to 39, more than 40)
- ✓ How many times have you drunk alcohol in your life (None, one or two, three to nine, ten to 19, 20 to 39, more than 40)

General delinquency

How often in your life have you done these things (never, one time, two times, three or four times, five or more times)?

- ✓ Painted graffiti or signs on someone's property or in a public place
- ✓ Intentionally damaged another person's property (broken a house window, thrown stones at a car, damaged a public location or lamp)
- ✓ Taken something from a store or supermarket without paying
- ✓ Broken into a house or building to steal something
- ✓ Threatened someone with a weapon to get something
- ✓ Used a knife or gun to threaten or attack someone

Initially, including items measuring school violence and self-reported arrests in the GABI was also considered. They were, however, dropped for theoretical reasons. Items related to school violence were considered not adequate for the present study. This is because they may not necessarily be logically linked to neighbourhood effects. Since these events happen within school, school effects are expected to be more relevant in

explaining them. On the other hand, arrest experiences were considered to be a consequence of problem behaviour, rather than being themselves an indicator of problem behaviours. In addition, the arrest experience not only depends on the behaviour of the subjects but also on the behaviour of the police (see, for example, Engel and Calnon, 2004; Demuth, 2003). For these reasons the questions on school violence and arrest experiences were excluded.

One important problem with the selected questions relates to the phrasing regarding the time frame. The questions asked about life-time events (“have you ever”) instead of asking about events happening within the last year (i.e. 12 months). This was problematic because it was impossible to assess for certain if the juveniles had, or had not, reported events during a particular year. However limiting, this was not considered to be an insurmountable problem.

In order to address this issue, the questions were dichotomised and recoded. Items got a “1” if the particular behaviour had been ever reported, and a “0” if not. Within each wave, items were summed, building a scale that could take a value between 0 and 9. The indicator represents a simple sum score of lifetime involvement in diverse types of antisocial behaviours. Once the dataset was reshaped to conduct a longitudinal analysis, the resulting scale could be interpreted as an indicator of growth in the lifetime participation in diverse types of antisocial behaviours across time.

For example, if one respondent did not declare any lifetime antisocial behaviour measured in the scale in 2008 he would get a score of 0 for that particular year. If in 2009 he reports having smoked marihuana, his score would then be 1 for that particular year. If in 2010 the respondent does not report any different antisocial behaviour, his

score would still be 1. This because the scale will signal that the lifetime use of marihuana has not changed. If on the other hand the respondent would have reported having used a knife or gun to threaten someone in 2010, he would have scored 2 for that year. If one respondent would report one antisocial behaviour type in 2008, and the same in 2009 and 2010, the his/her score would be 1 for waves 2009 and 2010.

The obvious disadvantage of this approach is that this scale can only measure a stable trajectory (no change) or an increasing trajectory, but not a decreasing trajectory. The scale cannot account for cases that show decreased diversity of antisocial behaviour nor decreased levels of a particular behaviour. Thus, negative coefficients need to be carefully interpreted. In this case, negative coefficients would suggest the existence of stabilisation effects, rather than decreasing effects. This would be analogous to the study of determinants of growth in height. Once a particular stature has been reached it cannot decrease, it can only remain stable or increase.

In spite of this limitation, the makeup of the scale suits the purposes of the present study where interest lies in capturing the effects of contextual characteristics on acceleration or stabilisation growth over time⁴⁷. By using this specification, deceleration effects cannot be captured. This will be the aim of future studies focusing on particular questions that, because of their phrasing, are able to capture deceleration effects.

Inspection of internal consistency of the scale using Cronbach's Alpha, shows the scale obtains 0.669 (2008), 0.718 (2009), 0.693 (2010). These coefficients are considered acceptable. For all analysis purposes, this variable was assumed to be measured at an

⁴⁷ Multilevel survival models were also considered. However, they were ruled out because they require suppressing from the sample all cases that had already reported antisocial behaviours by wave 1. It was decided that this may present an unacceptable risk of biasing the results.

interval scale level, allowing the use of linear analysis models. Table 6.1 details percentages of lifetime incidence reported on selected questions by wave.

Table 6.1: Self-Reported Life-time Incidence of Antisocial Behaviour⁴⁸

Reported Life-time Incidence	2008	2009	2010
Painted graffiti	26.5	39.8	40.2
Damaged property on purpose	21.6	32.3	37.7
Taken something without paying	26.1	35.5	40.9
Broke into a house	2.1	4.0	3.9
Threatened someone with a weapon	3.4	6.2	3.6
Used a knife to threaten or mug	3.2	5.8	3.6
Alcohol use	30.3	48.2	62.8
Marihuana use	6.2	12.5	18.0
Cocaine paste or "Cocaine Paste" use	1.3	3.0	3.6

In order to test if this measurement strategy may have an impact on the analysis results, separate cross sectional models were estimated for each wave. Results were generally similar to longitudinal models and no strange or unexpected results were found (results not shown).

3. Indicators of strain

Indicators of strain were derived from the longitudinal survey. Strain was operationalised through three questions addressing:

High Educational Aspirations

-How important is it to get good grades at school? (very important, important, somewhat important, not important, not at all important).

⁴⁸Only selected and complete records used.

Low educational expectations

-How likely do you think it is that you will study at a university? (Very likely, likely, somewhat likely, unlikely, very unlikely)⁴⁹

Strain was defined as the interaction term between aspirations and expectations. Scales were arranged in such a way that higher scores reflect higher educational aspirations but lower educational expectations, thus reflecting potential subjective tension. This was calculated by assigning a "1" to subjects having high educational aspirations (very important, important) and low educational expectations (somewhat likely, unlikely, very unlikely), and "0" otherwise.

4. Indicators of informal social control

Indicators of social control were also constructed using questions from the self-reported survey. Social control variables included parental attachment and parental monitoring, family structure and school attachment.

Parental attachment was measured based on the following items:

- How would you describe your current relationship with your father/mother? (Excellent, very good, good, not very good, bad).
- As a child, did you feel loved by your mother/father? (very much, enough, something, little, nothing).

⁴⁹ Another question was considered "How likely do you think it is you will finish secondary school?" Sadly this question was dropped from the survey in 2010; thus it could not be used in the analysis.

Since these questions were supposed to address social control mechanisms in the juvenile's home, the scale was calculated differently depending on with whom s/he was living. If s/he was living with both parents, all four items were averaged. If s/he was living only with her/his mother, the mother's questions were averaged, and so on. In a case where s/he declared s/he was not living with any parent, available information was averaged in order to "impute" missing values. It was tested if using this "imputed information" would affect model estimation. The correlation between the attachment variable using and not using available information to impute this cases was as high as 0.85. Thus it was decided to use the imputed values in the regression models.

Reliability showed acceptable Cronbach's Alpha coefficients: 0.663 (2008), 0.710 (2009) and 0.709 (2010).

Parental monitoring was measured by a scale composed of the following items:

- How aware are your parents (or one of them) of what you do in school?
(much, quite, little, not at all)
- How well would you say that your parents (or one of them) know your closest friends? (much, quite, little, not at all)
- How aware are your parents of what you watch on TV? (much, quite, little, not at all)
- When you leave the house in the afternoon (after school for example) or on weekends, do your parents know where you're going? (Always, usually, sometimes, never or almost never)
- When you are going out, do your parents know with whom you're going out? (Always, usually, sometimes, never or almost never)

- When you are going out, do your parents know what time you are coming back? (Always, usually, sometimes, never or almost never)

Cronbach's Alpha coefficients were higher for this variable: 0.7 (2008), 0.755 (2009) and 0.76 (2010).

In addition, an indicator of family structure (lives with both, one or none of his/her parents) was incorporated.

School attachment was measured using only one question addressing the following:

- How happy/content do you come to school? (very happy/content, happy/content, somewhat happy/content, not happy/content, not at all happy/content).

5. Indicators of contagion effects

-Affiliation with deviant peers:

Taking advantage of social network information, affiliation with deviant peers was defined as having friends reporting antisocial behaviour. Given restrictions related to missing data (described in Chapter 2), affiliation with deviant peers was measured as the antisocial behaviour score reported by the subject's best friend. A GABI score of 0 would be interpreted as having no deviant friend. Since the GABI score is the same as the dependent variable, reliability indicators are the same as the delinquency scale.

It should be noted that three other contextual variables that are relevant to this process have already been described (proportion of deviant schoolmates, contextual concentration of deviant schoolmates within census tract/activity spaces, and contextual concentration of juveniles with arrest records within census tract/activity spaces).

6. Controls

Models will control for sex, baseline age (measured at wave 1), baseline antisocial behaviour (measured at wave 1), and family level SES. Family level SES will be based on father's educational level, unless the respondent lives only with his mother, in which case mother's educational level will be used to estimate SES.

Educational level was selected as an indicator of SES because of its strong relationship with future income. As an example, table 6.2 presents the results from the 2011 Chilean National Socioeconomic Characterization Survey (CAsEN). This table shows how the highest completed educational level achieved by the household head is strongly correlated with its income quintile membership.

Table 6.2: Household Head's Autonomous Income Quintile by Highest Completed Educational Level

Highest completed educational level	Autonomous ⁵⁰ income quintile				
	I	II	III	IV	V
Primary Education	54.6	38.6	3.9	2.9	0.0
Secondary Education	25.7	25.0	19.1	18.3	11.9
Secondary Technical Education	26.3	20.9	25.5	14.8	12.5
Post-Secondary Technical Education	5.5	10.5	17.9	30.7	35.4
University Education	1.0	1.8	4.7	11.2	81.4

Source: Casen, 2011

Table 7.1 (chapter 7) provides an overview of all measures.

⁵⁰“Autonomous” refers to the fact that the calculation only takes into account earnings and not welfare benefits.

**Chapter 7: Contextual effects on antisocial behaviour: estimating main effects
models**

The present chapter will address two main aims. The first aim is to assess if the available evidence supports the idea that there is a main contextual level effect of concentrated contextual disadvantage on antisocial behaviour. It will also be explored whether this effect could be regarded as direct or indirect. The second aim of this chapter is to assess whether a *potential activity space approach* may be useful appropriate to study contextual effects. In order to do so, model results from the traditional approach and potential activity spaces approach will be compared.

In formal terms, the present chapter will explore the data in order to address the first two proposed hypotheses (Hypothesis 00 and Hypothesis 01). As mentioned before, it is initially expected to find a contextual direct main (unconditional) effect of concentrated disadvantage on antisocial behaviour. However, this effect is expected to be primarily indirect, and completely mediated by relevant criminogenic processes (Hypothesis 00) and other controls. It was also explored if effects of contextual variables on antisocial behaviour may vary by type of activity space (home, school or best friend's home) (Hypothesis 01).

This chapter will proceed in four sections. In the first section, the main modelling strategy will be described and all used measures will be briefly revisited. In the second section, variables are described by using descriptive statistics. Besides describing the available data, the presented analysis also intends to inform modelling decisions. Among other things, it was assessed whether independent variables and antisocial behaviour had a linear relationship. Also, correlation matrixes were estimated in order to assess potential risk of multicollinearity (Dougherty, 2007). In the third section, main effects for all included variables will be examined. Main effects are estimated for both,

a traditional approach and a potential activity space approach. It will also be explored whether different activity spaces (home, school and best friend's home) may have differential effects on antisocial behaviour. In the fourth section, chapter conclusions are discussed.

1. Method

In the present section, measures will be revisited, and model specification and modelling strategy will be described.

1.1. Measures

Table 7.1 provides a summary of the study variables. The construction procedures study variables has been described in chapters 4 and 5.

Table 7.1: Overview of Study Variables

Variable Type	Variable Name	Description
Antisocial behaviour	GABI	Scale measuring involvement in different types of antisocial behaviour (drug use, alcohol use, painting graffiti on someone's property, property damage, shoplifting, break in, threatening someone, using a weapon to attack someone). It measures life-time events and thus, over time, it can only increase or remain stable.
Informal social control	Family structure	Dummy variable identifying if the interviewee lives with both parents, one parent (mother only, father only or with step parents) or none of his/her parents.
	Parental monitoring	Scale measures several perceived parental behaviours expressing their awareness of their child's whereabouts, knowledge of their child's friends, and general school and out of school activities.
	Parental attachment	Scale measuring how the interviewees rate the relationship with the parents with whom they live.
	School attachment	Scale measuring how happy/content the interviewee feels when he/she goes to school.
Strain	Educational aspirations	Scale measuring how important it is for the interviewee to get good grades
	Educational expectations	Scale measuring how likely the interviewees think it is that they will be able to study at university.
	Strain (expectations*aspirations)	Represents an interaction effect between aspirations and expectations. It identifies subjects with high aspirations but low expectations.
Contagion	Affiliation with deviant peers	Measures the best friend's GABI score.

(Continues)

Table 7.1: Overview of Study Variables (Continued)

Variable Type	Variable Name	Description
Contextual factors	Contextual concentrated disadvantage (traditional approach)	Scale, derived through factor analytical techniques. It measures the degree of concentration of people with incomplete secondary education, in low occupational positions (unqualified), living in overcrowded homes, that cannot read or write, pertaining to an ethnic minority, and concentration of people aged 15-17 years that are not working or studying. In the traditional approach the index is calculated for each census tract. Each interviewee is linked to the disadvantage score of the census tract where they live.
	Contextual concentrated disadvantage (potential activity space approach)	In the potential activity space approach the index is calculated for each area surrounding key activity points of each subject. Disadvantage index is averaged across potential activity spaces.
	Contextual concentration of juveniles with arrest records (traditional approach)	Calculates the percentage of juveniles with arrest records per census tract. In the traditional approach the index is calculated for each census tract. Each interviewee is linked to the disadvantage score of the census tract where they live.
	Contextual concentration of juveniles with arrest records (potential activity space approach)	In the potential activity space approach the percentage is calculated for each area surrounding key activity points of each subject. Disadvantage index is then averaged across potential activity spaces.
	Proportion of deviant schoolmates	It calculates the proportion of schoolmates obtaining a GABI score that is above sample average.
	Proportion of deviant schoolmates in census tract	Calculates the percentage of schoolmates obtaining a GABI score above average that also live within the same census tract.
	Proportion of deviant schoolmates in activity space	Calculates the percentage of schoolmates obtaining a GABI score above average that also live within the interviewee's potential activity spaces.
	School value added education	Standardised school level (level 2) residual resulting from the prediction of individual level educational achievement. Achievement was measured by standardised tests (SIMCE). Relevant individual level characteristics were controlled for.
Controls	Family SES	Father's educational level, unless the respondent only lives with his/her mother.
	Gender	Male or female.
	Baseline age	Age measured at wave 1.
	Baseline general antisocial behaviour	GABI scores measured at wave 1.

1.2. Model specification

Given the nature of the dataset (repeated measures of individuals that are also nested in schools) the selected modelling strategy should be able to deal with and take advantage of these characteristics. In addition, since the self-reported survey was designed to follow up children and youths during the age period in which a sharp increase in antisocial behaviour is usually observed, the selected analysis technique should be able to model individual change. Therefore, multilevel linear growth models were selected as the primary analysis tool. Multilevel linear growth models conceptualise each measurement occasion as nested within a particular individual. In addition, individuals may also be nested in other structures, like classrooms and schools (Snijders and Bosker, 1999; Shaw and Liang 2012; for an example, see Bellair and McNulty, 2009).

Multilevel growth models allow a researcher to describe average within-person trajectories, while accounting for between persons (and also between school) variations. They also can handle both time constant and time varying covariates (Shaw and Liang, 2012). Another distinctive feature is the capability of handling unbalanced panel data sets: that is, data with missing measurement occasions for some individuals (Snijders and Bosker, 1999).

In the present section, model specification for both the *traditional model* and the *potential activity space model* will be presented. The key difference between both models relates to how contextual variables have been aggregated (please see Chapter 5 for more details). The traditional model will include contextual variables that have been aggregated based on census tracts, while the potential activity space model will include contextual variables that have been aggregated based on activity spaces. Since both

models have the same nesting structures it will be possible to compare them by examining fit statistics (-2 log likelihood).

a) The traditional model specification

As has been explained, the traditional main effects model includes measures of contextual effects that were aggregated based on census tracts. Information on census tract level characteristics were linked with the census tract of the residence for each survey respondent. The model will have a three level structure, where measures have been defined as nested in persons and persons are nested within schools.

Equation 7.1 describes the linear model specification. The response variable GABI represents the General Antisocial Behaviour Index. The model includes a random intercept (β_{0ijk} cons) that was allowed to vary between schools (k) and between subjects (j), where v_{0k} is the random effect capturing between schools variability, u_{0jk} is the random effect capturing variability between individuals and e_{0ijk} is a Level-1 random effect that represents the prediction error for unit of time i of subject j in school k. Random effects are assumed to follow a normal distribution with a mean of 0 and a respective variance of δ^2_{v0} , δ^2_{u0} , and δ^2_{e0} .

The fixed part of this model includes the variable Wave_{ijk} (β_1) that signals the measurement occasion (1, 2 or 3). The fixed part also includes five groups of predictors/measures.

The first group of measures addresses macro level contextual characteristics (parameters β_2 to β_5) namely “contextual concentrated disadvantage” measured at the census tract level, (CT Disadvantage_{ijk}), “contextual concentration of juveniles with arrest records”

also measured at the census tract level (CT Contextual Delinq_{ijk}), and school level value-added education (School Ad.Value_{ijk}).

The second group of measures (β_6 to β_{10}) addresses individual level control variables. They include baseline age, baseline antisocial behaviour (in order to control for varying levels of initial GABI scores), gender (Male) and two dummies measuring family level SES [SES (low) and SES (mid) high level SES was the excluded term].

The third group of measures (β_{11} to β_{13}) addresses indicators of strain, namely high educational aspirations (High Ed. Aspir_{ijk}), low educational expectations (Low Ed. Expec._{ijk}) and strain (Strain_{ijk}).

The fourth group of variables include indicators of informal social control. It includes a set of dummy variables measuring family structure (β_{14} to β_{18}) (Mother&other_{ijk}, Father&other_{ijk}, Mother.Only_{ijk}, Father.only_{ijk} and Neither.parents_{ijk}). It also includes variables measuring parental attachment (Parental Attachment_{ijk}), parental monitoring (Monitoring_{ijk}), and school level attachment (School Attach_{ijk}).

The final group of measures captures indicators of contagion effects (β_{22} to β_{24}). It includes best friend's delinquency (BFr.Delinq._{ijk}), proportion of deviant schoolmates in school (Prop.Dev.Schoolmates.School._{ijk}), and proportion of deviant schoolmates in the census tract (Prop.Dev.Schoolmates in CT_{ijk}).

The equation for the fully specified base model is presented in equation 7.1. Mediation and interaction effects will be explored in depth in the next chapters.

Equation 7.1

$$\begin{aligned}
 &GABI_{ijk} \sim N(XB, \Omega) \\
 &GABI_{ijk} = \beta_{0ijk} \text{cons} + \beta_1 \text{Wave}_{ijk} + \beta_2 \text{CT Disadvantage}_{ijk} + \beta_3 \text{CT Contextual Delinq.}_{ijk} + \\
 &\beta_4 \text{CT Contextual Delinq}^2_{ijk} + \beta_5 \text{School Ad.Value}_{ijk} + \beta_6 \text{Baseline Age}_{ijk} + \beta_7 \text{Baseline} \\
 &\text{Delinquency}_{ijk} + \beta_8 \text{Male}_{ijk} + \beta_9 \text{SES (low)}_{ijk} + \beta_{10} \text{SES (mid)}_{ijk} + \beta_{11} \text{High Ed. Aspir}_{ijk} + \\
 &\beta_{12} \text{Low Ed. Expec.}_{ijk} + \beta_{13} \text{Strain.}_{ijk} + \beta_{14} \text{Mother\&other}_{ijk} + \beta_{15} \text{Father\&other}_{ijk} + \beta_{16} \text{Mother.Only}_{ijk} + \beta_{17} \text{Father.only}_{ijk} + \beta_{18} \text{Neither.parents}_{ijk} + \beta_{19} \text{Parental Attachment}_{ijk} \\
 &+ \beta_{20} \text{Monitoring}_{ijk} + \beta_{21} \text{School Attach}_{ijk} + \beta_{22} \text{BFr.Delinq.}_{ijk} + \\
 &\beta_{23} \text{Prop.Dev.Schoolmates.School.}_{ijk} + \beta_{24} \text{Prop.Dev.Schoolmates in CT}_{ijk} + e_{0ijk} \\
 \\
 &\beta_{0ijk} = \beta_0 + v_{0k} + u_{0jk} \\
 &v_{0k} \sim N(0, \delta^2_{v0}) \\
 &u_{0jk} \sim N(0, \delta^2_{u0}) \\
 &e_{0ijk} \sim N(0, \delta^2_{e0})
 \end{aligned}$$

b) The potential activity space model specification

The base activity space model is almost identical to the traditional model (equation 7.2) with the exception that the introduced contextual level variables were aggregated based on a potential activity space perspective instead of the traditional perspective. The activity space model differs from the traditional model in how individual level data is linked to contextual data. Instead of defining space as a categorical variable, where persons may be nested within neighbourhoods, potential activity spaces are defined as an actor-centred construct that is relative to actors' routine activities. Each actor has a potential activity space, thus each activity space has a single actor. The activity space for one actor is composed of multiple areas that may or may not overlap (home, school, and others). Also activity spaces across actors can also overlap, thus actors can share

parts of their activity spaces. As a result, the shared characteristics of an activity space may influence both actors.

The potential activity space model will be defined as follows:

Equation 7.2

$$\begin{aligned}
 &GABI_{ijk} \sim N(XB, \Omega) \\
 &GABI_{ijk} = \beta_{0ijk} \text{cons} + \beta_1 \text{Wave}_{ijk} + \beta_2 \text{AS Disadvantage}_{ijk} + \beta_3 \text{AS Contextual Delinq}_{ijk} + \\
 &\beta_4 \text{CT Contextual Delinq}^2_{ijk} + \beta_5 \text{School Ad.Value}_{ijk} + \beta_6 \text{Baseline Age}_{ijk} + \beta_7 \text{Baseline} \\
 &\text{Delinquency}_{ijk} + \beta_8 \text{Male}_{ijk} + \beta_9 \text{SES (low)}_{ijk} + \beta_{10} \text{SES (mid)}_{ijk} + \beta_{11} \text{High Ed. Aspir}_{ijk} + \\
 &\beta_{12} \text{Low Ed. Expec}_{ijk} + \beta_{13} \text{Strain}_{ijk} + \beta_{14} \text{Mother\&other}_{ijk} + \beta_{15} \text{Father\&other}_{ijk} + \beta_{16} \text{Mother.Only}_{ijk} + \beta_{17} \text{Father.only}_{ijk} + \beta_{18} \text{Neither.parents}_{ijk} + \beta_{19} \text{Parental Attachment}_{ijk} \\
 &+ \beta_{20} \text{Monitoring}_{ijk} + \beta_{21} \text{School Attach}_{ijk} + \beta_{22} \text{BFr.Delinq}_{ijk} + \beta_{23} \text{Prop.Dev.Schoolmates.School}_{ijk} + \beta_{24} \text{Prop.Dev.Schoolmates in AS}_{ijk} + e_{0ijk} \\
 \\
 &\beta_{0ijk} = \beta_0 + v_{0k} + u_{0jk} \\
 &v_{0k} \sim N(0, \delta^2_{v0}) \\
 &u_{0jk} \sim N(0, \delta^2_{u0}) \\
 &e_{0ijk} \sim N(0, \delta^2_{e0})
 \end{aligned}$$

One very important advantage that should be noted is that even though contextual variables have been measured as time constant, an individual can change their home or friends: thus the contextual variables may change. This transforms contextual variables from time constant into time varying. It was assumed, though, that these macro level contextual characteristics are relatively stable. This is because the gap between the times when the macro level variables were measured is small. Macro level variables were measured between two (macro level concentration of deviant peers) and six years (contextual centred disadvantage) before the first wave data collection (year 2008).

1.3. Modelling strategy

In a first stage, the empty model was estimated. Then a series of traditional main effects models for different blocks of independent variables were estimated. The aim of these analysis was to gain an understanding of how the coefficient of the contextual disadvantage changes in response to the introduction of each block of independent variables. Then, a fully specified model (as seen in equation 7.1) was estimated.

In the second stage, potential activity space models were estimated. First, a series of initial models that aimed to test the capacity of individual activity space characteristics (home, school, or best friend's activity space) to predict antisocial behaviour scores were estimated. Then, as was done with the traditional models, the effect of introducing each block of independent variables on the overall activity space based concentrated disadvantage indicator was assessed. The last analysis examined the fully specified potential activity space model (equation 7.2). Both fully specified models are then compared in order to asses if changing the spatial aggregation strategy may also have an impact on the conclusions drawn from each of the model types.

2. Descriptive statistics

Table 7.2 summarises the descriptive statistics on the antisocial behaviour measure: the GABI.

Table 7.2: Summary of Descriptive Statistics for the GABI

	GABI 2008	GABI 2009	GABI 2010
Mean	0.87	1.25	1.28
Median	0.00	1.00	1.00
SD	1.27	1.56	1.53
Min	0.00	0.00	0.00
Max	8.00	8.00	8.00
IQR	0.00	1.00	1.00

As expected, table 7.2 shows that the average general antisocial behaviour index (GABI) score increases over time. It should be noted, though, that the scale is designed to be sensitive to increases in the overall number of types of antisocial behaviours over time. Hence, this means that what increases is the average “diversity” of types of antisocial behaviours in which juveniles have engaged at least once during the follow-up period.

As can be seen in table 7.3, at baseline, the sample was on average 12.9 years old, and 52% male. As described before, low level SES is overrepresented, with 40% of the sample being classified as such.

Table 7.3: Summary of Individual Level Controls

Baseline Age (2008)	Mean= 12.9; SD= 0.71; Min=11; Max=17
Gender	Male= 52%; Female=48%
Baseline SES (2008)	Low= 40.8%; Mid= 30%; High= 29.2%

Figure 7.1 shows that there is a seemingly non-linear relationship between baseline age and the antisocial behaviour. Although this would normally suggest the need to introduce a quadratic term to represent this functional form in the model (Gujarati and Porter, 2011), only 27 cases of the analytical sample are between 16 and 17 years old at wave 1. Since this can be considered to be a very small number of cases in the context of the larger analytical sample size, it is considered unlikely that these cases will distort the analysis. Therefore, in order to keep the model as simple as possible, no quadratic term was introduced.

Regarding gender, males (compared to females) show a steeper increase in antisocial behaviour over time, and a higher antisocial behaviour starting score at wave 1. Also, high SES respondents experience a lower increase in antisocial behaviour scores, than do mid and low level SES respondents (see figure 7.2). All these variables behave as expected.

Figure 7.1: Average GABI by Baseline Age

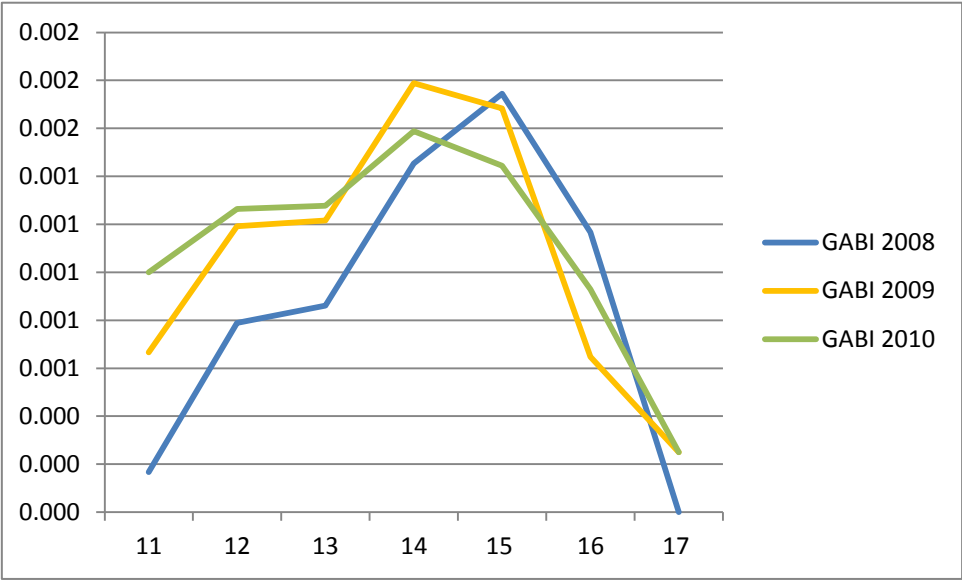
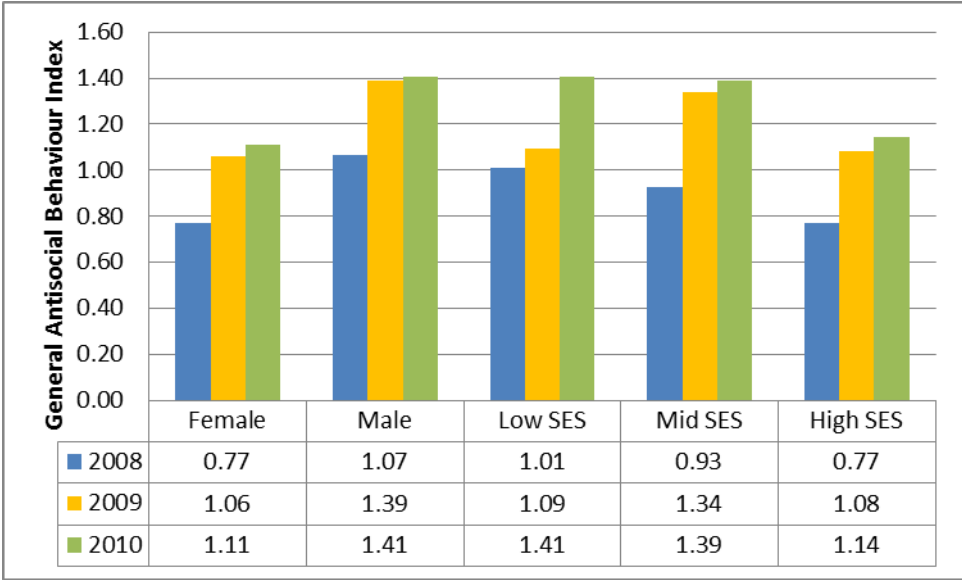


Figure 7.2: Average GABI by Gender and SES



Tables 7.3 to 7.6 display descriptive summaries of strain, social control, and social learning measures for each wave.

Table 7.3: Descriptive Statistics for Strain Indicators

Strain	Low	High
High Educational Aspirations 2008	0.05%	95.5%
High Educational Aspirations 2009	7.8%	92.2%
High Educational Aspirations 2010	6.3%	93.7%
Low Educational Expectations 2009	21.9%	78.1%
Low Educational Expectations 2009	24.8%	75.2%
Low Educational Expectations 2010	24.5%	75.5%
Strain 2008	80.9%	19.75%
Strain 2009	79.9%	20.1%
Strain 2010	79.0%	21.0%

Table 7.4: Descriptive Statistics on Social Control Indicators: Family Structure

Family structure	Wave 2008	Wave 2009	Wave 2010
Both Parents	66.5%	66.0%	65.8%
Mother- Stepfather	8.9%	8.5%	7.8%
Father- Stepmother	1.0%	1.1%	1.0%
Mother Only	19.7%	20.6%	21.5%
Father Only	1.8%	1.6%	1.9%
Neither Parents	2.1%	2.2%	2.0%

Table 7.5: Descriptive Statistics on Social Control Indicators: Parental Attachment, Parental Monitoring and School Attachment

	Mean	Median	SD	Min	Max	IQR
Parental Attachment 2008	4.44	4.50	0.66	1.00	5.00	1.00
Parental Attachment 2009	4.39	4.50	0.69	1.00	5.00	1.00
Parental Attachment 2010	4.38	4.50	0.67	1.00	5.00	1.00
Parental Monitoring 2008	3.27	3.33	0.57	1.00	4.00	0.67
Parental Monitoring 2009	3.20	3.33	0.59	1.00	4.00	0.83
Parental Monitoring 2010	3.19	3.33	0.58	1.00	4.00	0.83
School Attachment 2008	3.51	3.00	0.95	1.00	5.00	1.00
School Attachment 2009	3.53	4.00	0.92	1.00	5.00	1.00
School Attachment 2010	3.55	4.00	0.88	1.00	5.00	1.00

Table 7.6: Descriptive Statistics on Contagion Indicators

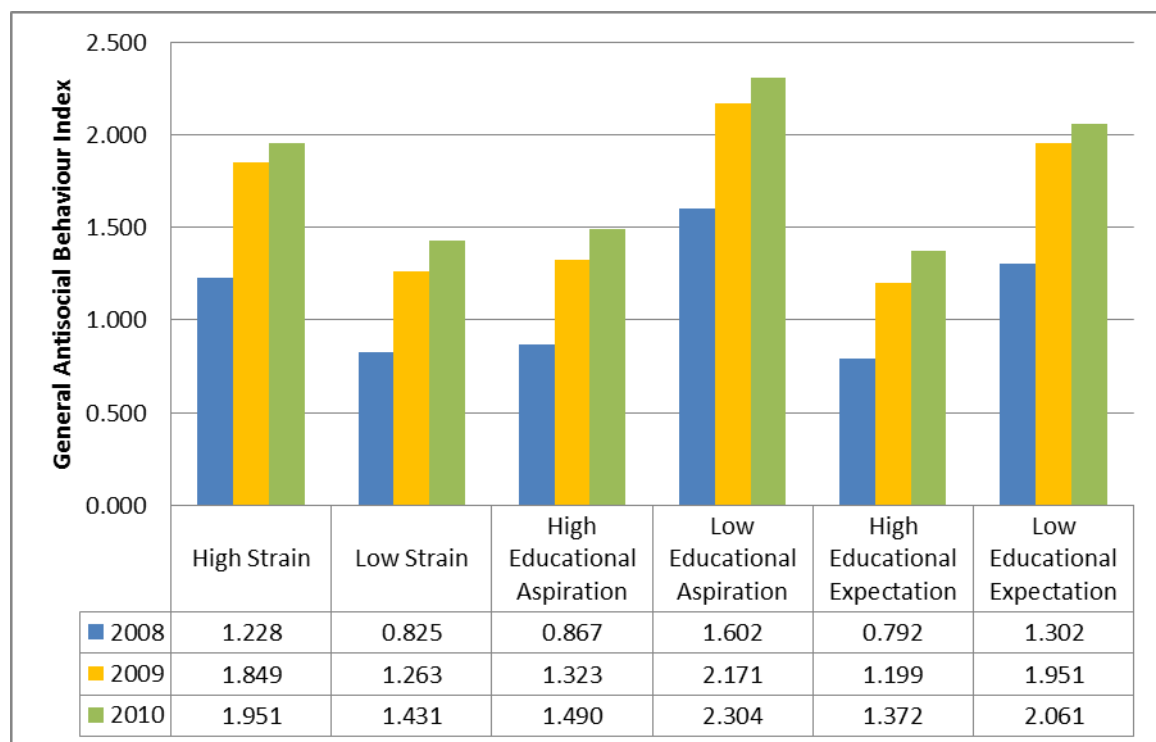
	Mean	Median	SD	Min	Max	IQR
Best Friend's Antisocial Behaviour (2008 GABI)	1.21	1.00	1.49	0.00	8.00	0.00
Best Friend's Antisocial Behaviour (2009 GABI)	1.87	1.00	1.78	0.00	8.00	0.00
Best Friend's Antisocial Behaviour (2010 GABI)	2.09	2.00	1.72	0.00	8.00	0.00
Proportion Deviant Schoolmates 2008	0.06	0.03	0.07	0.00	0.24	0.08
Proportion Deviant Schoolmates 2009	0.06	0.03	0.08	0.00	0.40	0.07
Proportion Deviant Schoolmates 2010	0.06	0.03	0.08	0.00	0.46	0.06
Proportion Deviant Schoolmates in School Activity Space 2008	0.05	0.04	0.05	0.00	0.24	0.06
Proportion Deviant Schoolmates in School Activity Space 2009	0.08	0.06	0.08	0.00	0.33	0.11
Proportion Deviant Schoolmates in School Activity Space 2010	0.09	0.06	0.08	0.00	0.33	0.10
Proportion Deviant Peers in Home Activity Space 2008	0.04	0.03	0.04	0.00	0.33	0.04
Proportion Deviant Peers in Home Activity Space 2009	0.09	0.06	0.08	0.00	0.43	0.12
Proportion Deviant Peers in Home Activity Space 2010	0.10	0.07	0.10	0.00	0.45	0.14
Proportion Deviant Peers in Best Friend's Home Activity Space 2008	0.04	0.03	0.04	0.00	0.33	0.04
Proportion Deviant Peers in Best Friend's Home Activity Space 2009	0.09	0.06	0.09	0.00	0.43	0.12
Proportion Deviant Peers in Best Friend's Home Activity Space 2010	0.10	0.07	0.09	0.00	0.45	0.14
Proportion of Deviant Peers in Census Tract 2008	0.12	0.12	0.11	0.00	1.00	0.15
Proportion of Deviant Peers in Census Tract 2009	0.17	0.14	0.16	0.00	1.00	0.27
Proportion of Deviant Peers in Census Tract 2010	0.19	0.15	0.18	0.00	1.00	0.28

Visual inspection of figure 7.3, suggests that all strain measures show a linear relationship with the antisocial behaviour score over time. Respondents with “high strain” (high educational aspirations and low educational expectations) also show a higher antisocial behaviour score than the rest at wave one. The same is the case with respondents having “low educational expectations” and “low educational aspirations”

who display higher average wave 1 antisocial behaviour scores than respondents showing high educational expectations and aspirations.

Descriptive statistics suggest that most of the included variables show important levels of skewness. Although there seems to be a debate regarding the potential problems that skewedness may pose for linear modelling, this is not considered to be problematic. It has been discussed that a non-normal distribution of the study variables may constitute a violation of the normality assumption. What is relevant is that the sampling distribution of the parameters is normally distributed. Non-normality of variables might be a problem in small samples where the sampling distribution may not take a normal distribution. For linear regression modelling, however, it is relevant that the error terms for each level are normally distributed with a mean of approximately 0 (Li, Wong, Lamoureux and Wong, 2012). This assumption will be checked later on.

Figure 7.3: GABI by Wave and Strain Measures



Regarding the indicators of social control, figure 7.4 displays how different types of family structures are related to varying antisocial behaviour scores by wave. GABI scores continue to grow over time for all family types, with the only exception being families composed of the biological father and a stepmother. This difference is, however, small. Visual analysis of figure 7.4 suggests that respondents living in alternative family arrangements display a steeper growth in antisocial behaviour scores than subjects living with both parents. This seems to be especially pronounced between waves 1 and 2.

Figure 7.4: GABI by Wave and Family Structure

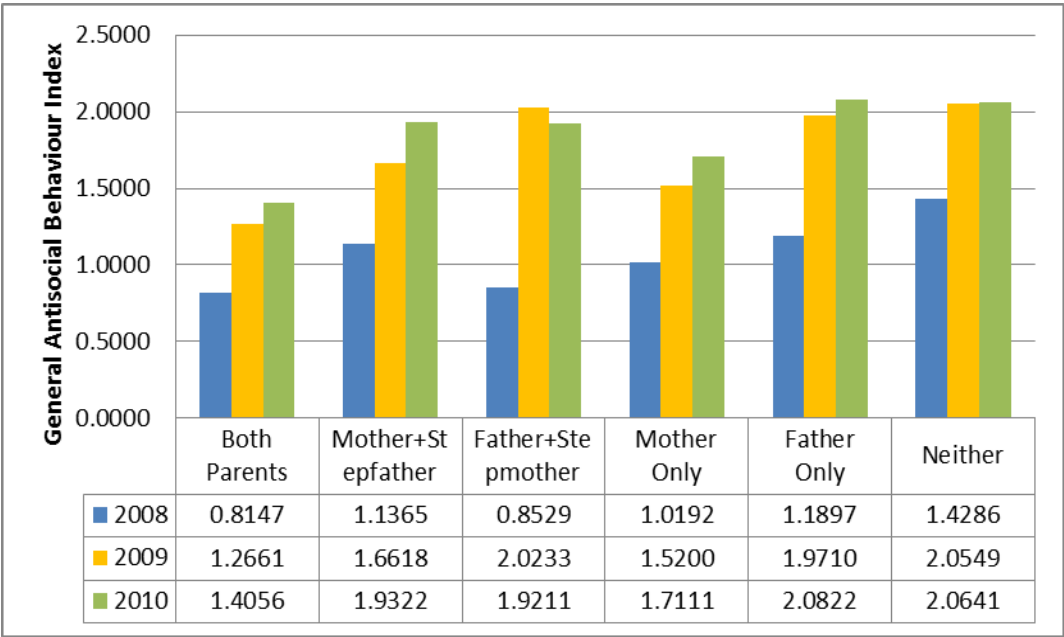


Figure 7.5 shows antisocial behaviour by levels (below and above grand mean) of parental attachment, parental monitoring and school attachment. As expected, lower levels of social control variables are systematically related to higher antisocial behaviour scores over time.

Figure 7.5: GABI by Wave and Level of Parental Attachment, Monitoring and School Attachment

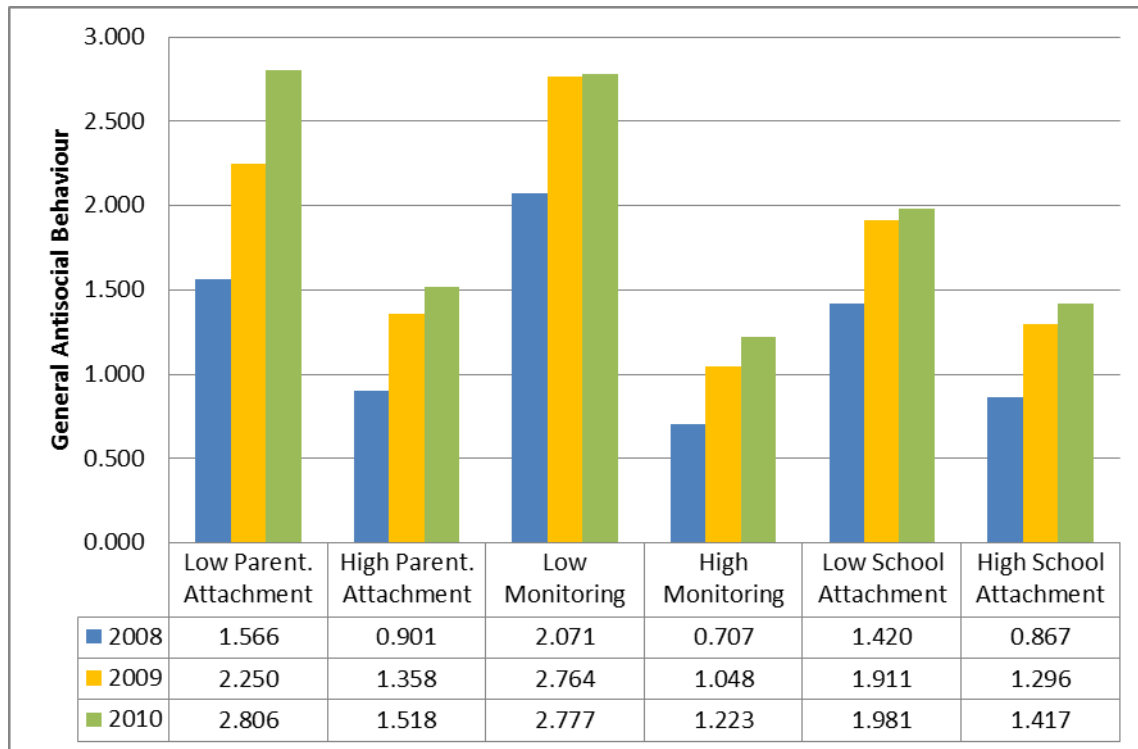


Figure 7.6 shows the relationship between the respondent's antisocial behaviour, and the respondent's best friend's antisocial behaviour. This figure displays an unexpected relationship between the average respondent's antisocial behaviour for friends that obtain the highest antisocial behaviour scores in 2008. However, only 14 cases obtain an 8 on the 2008 wave antisocial behaviour. Thus it is concluded that this unexpected relationship is unlikely to have a noticeable impact on the analysis.

Figure 7.6: Respondents' GABI by Wave and Best Friend's Self-Reported GABI

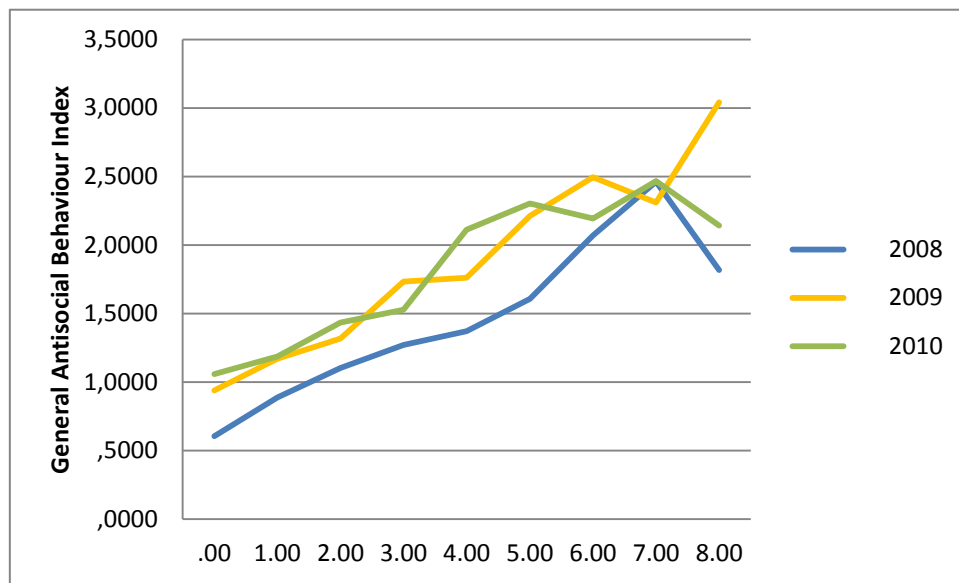


Table 7.7 displays a summary of descriptive statistics on spatial and contextual variables, while table 7.8 displays the correlation matrix among these variables and antisocial behaviour scores. Inspection of table 7.8 shows that all spatial and contextual variables are significantly correlated (with one exception). The first thing to be noted is that the correlations between concentrated disadvantage and concentration of peers with police records are fairly high. Thus we can anticipate that these variables may be subject to multicollinearity problems.

Concentrated disadvantage and contextual concentration of deviant peers tend to show a significant but low correlation with antisocial behaviour. Although contextual indicators based on activity space aggregation strategy show higher correlations with antisocial behaviour than census tract based indicators, this relationship is still weak. On the one hand, a high correlation can be observed between census tract based and activity space based disadvantage. Even though still high, census tract based concentration of deviant peers shows a lower correlation with antisocial behaviour scores than activity space based concentration of deviant peers. Also, overall activity space based disadvantage

and concentrated delinquent peers have slightly higher correlations with antisocial behaviour than census tract based variables. On the other hand, school value-added scores have a negative and significant relationship with all other contextual indicators, except with disadvantage at the school activity space. This was an expected result, due to the fact that the calculation of value-added scores has already taken student SES into account. Therefore its residual will have a low correlation with the SES of students living near the school, which are the students most likely to attend the school. It should also be noted that the correlation of school value-added scores is stronger with concentration of deviant peers (census or activity space based) than with concentrated disadvantage scores.

Three other types of contextual level variables were also calculated. These are the concentration of school level peers with high antisocial behaviour scores (above average) in school, the proportion of deviant schoolmates living in the same zone as the respondent, and the proportion of deviant schoolmates living within the same activity spaces. All correlations are significant and behave in the expected direction, with only one exception. The concentration of deviant school mates in school for wave 1 (2008) does not significantly correlate with antisocial behaviour scores or with concentration of school mates in the census tract for that year. This may suggest that this type of contextual factor tends to be more relevant at a later age.

After reviewing descriptive statistics for macro level contextual variables, and given the low observed frequencies regarding the proportion of deviant peers in census zone or activity spaces, it was decided to standardise these variables. This made it easier to interpret the obtained coefficients.

Table 7.7: Descriptive Statistics of Spatial and Contextual Variables

	Mean	Median	SD	Min	Max	IQR
Home Activity Space Disadvantage 2008	-0.03	-0.07	0.65	-10.22	30.80	0.90
Home Activity Space Disadvantage 2009	-0.02	-0.06	0.66	-10.22	30.80	0.92
Home Activity Space Disadvantage 2010	-0.04	-0.07	0.64	-10.22	30.87	0.89
Best Friend's Activity Space Disadvantage 2008	-0.04	-0.07	0.66	-10.22	30.80	0.89
Best Friend's Activity Space Disadvantage 2009	-0.02	-0.06	0.67	-10.22	30.61	0.94
Best Friend's Activity Space Disadvantage 2010	-0.07	-0.09	0.64	-10.16	30.87	0.84
School Activity Space Disadvantage 2008	-0.08	-0.19	0.66	-10.11	20.71	0.74
School Activity Space Disadvantage 2009	-0.08	-0.19	0.66	-10.11	20.71	0.74
School Activity Space Disadvantage 2010	-0.08	-0.19	0.66	-10.11	20.71	0.74
Home Activity Space Concentration of Peers with Arrest Records 2008	0.01	0.01	0.01	0.00	0.04	0.01
Home Activity Space Concentration of Peers with Arrest Records 2009	0.01	0.01	0.01	0.00	0.04	0.01
Home Activity Space Concentration of Peers with Arrest Records 2010	0.01	0.01	0.01	0.00	0.04	0.01
Best Friend's Activity Space Concentration of Peers with Arrest Records 2008	0.01	0.01	0.01	0.00	0.04	0.01
Best Friend's Activity Space Concentration of Peers with Arrest Records 2009	0.01	0.01	0.01	0.00	0.04	0.01
Best Friend's Activity Space Concentration of Peers with Arrest Records 2010	0.01	0.01	0.01	0.00	0.04	0.01
School's Activity Space Concentration of Peers with Arrest Records 2008	0.01	0.01	0.01	0.00	0.02	0.01
School's Activity Space Concentration of Peers with Arrest Records 2009	0.01	0.01	0.01	0.00	0.02	0.01
School's Activity Space Concentration of Peers with Arrest records 2010	0.01	0.01	0.01	0.00	0.02	0.01
Census Tract Level Concentrated Disadvantage 2008	-0.16	-0.29	0.65	-1.26	20.21	1.15
Census Tract Level Concentrated Disadvantage 2008	-0.16	-0.26	0.65	-1.26	20.21	1.14
Census Tract Level Concentrated Disadvantage 2008	-0.13	-0.04	0.60	-1.26	20.07	0.85
Census Tract Level Concentration of Peers with Arrest Records 2008 (Unstandardised)	0.01	0.01	0.01	0.00	0.04	0.01
Census Tract Level Concentration of Peers with Arrest Records 2009 (Unstandardised)	0.01	0.01	0.01	0.00	0.04	0.01
Census Tract Level Concentration of Peers with Arrest Records 2010 (Unstandardised)	0.01	0.01	0.00	0.00	0.04	0.01
School Value-Added Index	0.25	0.21	0.81	-1.81	1.93	1.27

Table 7.8: Correlation Matrix Between GABI by Contextual Variables

	GABI 2008	GABI 2009	GABI 2009	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1 Concentrated Disadvantage (CT) 2008	.079**	.096**	.096**	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2 Concentrated Disadvantage (CT) 2009	.083**	.099**	.096**	.972**	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
3 Concentrated Disadvantage (CT) 2010	.082**	.101**	.096**	.862**	.886**	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
4 Conc. of peers with police records (CT) 2008	.036*	.066**	.059**	.570**	.563**	.508**	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
5 Conc. of peers with police records (CT) 2009	.052**	.079**	.073**	.573**	.589**	.529**	.952**	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
6 Conc. of peers with police records (CT) 2010	.056**	.097**	.092**	.630**	.646**	.648**	.836**	.861**	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
7 Concentrated Disadvantage (Home AS) 2008	.099**	.119**	.116**	.762**	.748**	.670**	.458**	.462**	.513**	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
8 Concentrated Disadvantage (Home AS) 2009	.101**	.105**	.102**	.745**	.756**	.671**	.454**	.469**	.511**	.964**	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
9 Concentrated Disadvantage (Home AS) 2010	.086**	.099**	.099**	.731**	.735**	.744**	.450**	.453**	.507**	.946**	.964**	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
10 Conc. of peers with police records (Home AS) 2008	.088**	.116**	.105**	.642**	.635**	.570**	.582**	.581**	.656**	.574**	.568**	.551**	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
11 Conc. of peers with police records (Home AS) 2009	.101**	.124**	.115**	.713**	.725**	.661**	.619**	.645**	.737**	.623**	.636**	.615**	.870**	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
12 Conc. of peers with police records (Home AS) 2010	.081**	.110**	.103**	.715**	.724**	.731**	.616**	.630**	.745**	.620**	.625**	.631**	.852**	.975**	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
13 Concentrated Disadvantage (School AS)	.072**	.086**	.087**	.529**	.523**	.503**	.380**	.381**	.421**	.516**	.507**	.526**	.388**	.440**	.447**	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
14 Conc. of peers with police records (School AS)	.076**	.082**	.103**	.422**	.405**	.393**	.354**	.336**	.401**	.366**	.344**	.362**	.421**	.453**	.466**	.658**	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
15 Overall Concentrated Disadvantage (AS) 2008	.106**	.122**	.114**	.677**	.644**	.598**	.442**	.438**	.488**	.782**	.724**	.716**	.513**	.554**	.543**	.852**	.583**	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

*P>0.01; **P>0.01

Continues

Table 7.8: Correlation Matrix Between GABI by Contextual Variables (Continued)

	GABI 2008	GABI 2009	GABI 2009	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
16 Overall Concentrated Disadvantage (AS) 2009	.101**	.115**	.112**	.661**	.666**	.607**	.446**	.453**	.503**	.758**	.781**	.757**	.510**	.577**	.564**	.844**	.567**	.905**	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17 Overall Concentrated Disadvantage (AS) 2010	.084**	.091**	.103**	.635**	.627**	.611**	.428**	.424**	.504**	.716**	.721**	.793**	.478**	.538**	.574**	.870**	.587**	.880**	.903**	1	-	-	-	-	-	-	-	-	-	-	-	-	-
18 Overall Conc. of peers with police records (AS) 2008	.102**	.124**	.124**	.634**	.590**	.547**	.538**	.503**	.575**	.549**	.506**	.502**	.797**	.725**	.715**	.584**	.770**	.650**	.601**	.595**	1	-	-	-	-	-	-	-	-	-	-	-	-
19 Overall Conc. of peers with police records (AS) 2009	.094**	.115**	.117**	.641**	.651**	.603**	.541**	.558**	.636**	.550**	.556**	.547**	.705**	.820**	.797**	.627**	.790**	.656**	.685**	.649**	.857**	1	-	-	-	-	-	-	-	-	-	-	-
20 Overall Conc. of peers with police records (AS) 2010	.078**	.092**	.112**	.589**	.589**	.600**	.492**	.491**	.640**	.506**	.500**	.556**	.639**	.723**	.828**	.637**	.828**	.632**	.634**	.681**	.826**	.894**	1	-	-	-	-	-	-	-	-	-	-
21 School Value Added Index	-.060**	-.077**	-.104**	-.205**	-.206**	-.197**	-.206**	-.207**	-.210**	-.182**	-.177**	-.171**	-.259**	-.276**	-.263**	-.003	-.230**	-.129**	-.125**	-.093**	-.262**	-.254**	-.241**	1	-	-	-	-	-	-	-	-	-
22 Proportion Deviant Schoolmates 2008	.158**	.163**	.189**	.369**	.359**	.324**	.232**	.245**	.283**	.344**	.341**	.337**	.348**	.361**	.356**	.405**	.378**	.417**	.403**	.402**	.408**	.398**	.392**	-.161**	1	-	-	-	-	-	-	-	-
23 Proportion Deviant Schoolmates 2009	.164**	.235**	.236**	.354**	.350**	.339**	.273**	.273**	.286**	.287**	.280**	.277**	.311**	.323**	.330**	.383**	.304**	.378**	.367**	.368**	.355**	.360**	.350**	-.437**	.877**	1	-	-	-	-	-	-	-
24 Proportion Deviant Schoolmates 2010	.173**	.219**	.246**	.327**	.320**	.315**	.217**	.227**	.221**	.235**	.233**	.227**	.270**	.273**	.278**	.306**	.244**	.314**	.305**	.298**	.281**	.273**	.282**	-.445**	.860**	.894**	1	-	-	-	-	-	-
25 Proportion of deviant peers in Census Tract 2008	.220**	.207**	.213**	.264**	.253**	.214**	.195**	.210**	.245**	.194**	.189**	.171**	.293**	.292**	.268**	.181**	.232**	.239**	.227**	.209**	.318**	.290**	.265**	-.172**	.653**	.613**	.595**	1	-	-	-	-	-
26 Proportion of deviant peers in Census Tract 2009	.216**	.300**	.268**	.369**	.363**	.335**	.298**	.303**	.340**	.287**	.278**	.253**	.344**	.383**	.363**	.245**	.233**	.320**	.316**	.283**	.345**	.359**	.308**	-.345**	.697**	.753**	.669**	.846**	1	-	-	-	-
27 Proportion of deviant peers in Census Tract 2010	.215**	.269**	.308**	.331**	.323**	.320**	.276**	.279**	.310**	.243**	.233**	.233**	.330**	.359**	.340**	.211**	.276**	.273**	.269**	.264**	.339**	.344**	.338**	-.368**	.670**	.687**	.726**	.799**	.871**	1	-	-	-
28 Proportion deviant peers in Activity Spaces	.025	-.008	.0429	.293**	.294**	.279**	.095**	.087**	.190**	.230**	.226**	.236**	.237**	.275**	.292**	.283**	.343**	.257**	.253**	.269**	.343**	.354**	.363**	0.01	.363**	.304**	.253**	0.02	0.06	0.04	1	-	-
29 Proportion deviant peers in Activity Spaces	.064**	.095**	.112**	.407**	.412**	.369**	.177**	.183**	.242**	.398**	.386**	.392**	.338**	.382**	.375**	.419**	.406**	.416**	.418**	.419**	.389**	.430**	.426**	-.066**	.754**	.771**	.713**	.273**	.451**	.406**	.433**	1	-
30 Proportion deviant peers in Activity Spaces	.093**	.138**	.130**	.391**	.396**	.390**	.186**	.201**	.257**	.394**	.383**	.388**	.344**	.379**	.377**	.390**	.404**	.397**	.397**	.404**	.399**	.420**	.413**	-.124**	.746**	.732**	.765**	.301**	.498**	.496**	.397**	.939**	1

*P>0.01; **P>0.01

Figures 7.7 to 7.9 explore whether included predictors have a linear relationship. This is an important assumption that has to meet for linear modelling.

In general, even though the slopes are not very steep, the observed relationships are fairly linear. In spite of this fact, figure 7.7 suggests a slight deviation from the linear pattern. In order to assess if this might need to be modelled, a quadratic term was added for contextual disadvantage (Traditional and Activity Space Model) and concentration of peers with police records (Traditional and Activity Space Model). Sensitivity analyses were conducted in order to ascertain if the inclusion of the quadratic terms made any difference to the substantive interpretation of the models results. Neither the addition of quadratic term nor the addition of a cubic term made any substantive difference to the model interpretation (results not shown). In order to keep the model as parsimonious as possible, no quadratic or cubic terms were included.

Figure 7.10 allows to understand why the proportion of deviant peers in activity space fails to correlate with antisocial behaviour scores at wave 1 (2008). In comparison to the other two waves, the slope is rather flat. As previous literature has suggested, this variable may be more significant at a later age.

Figure 7.7: Contextual Variables by Respondents' GABI Scores

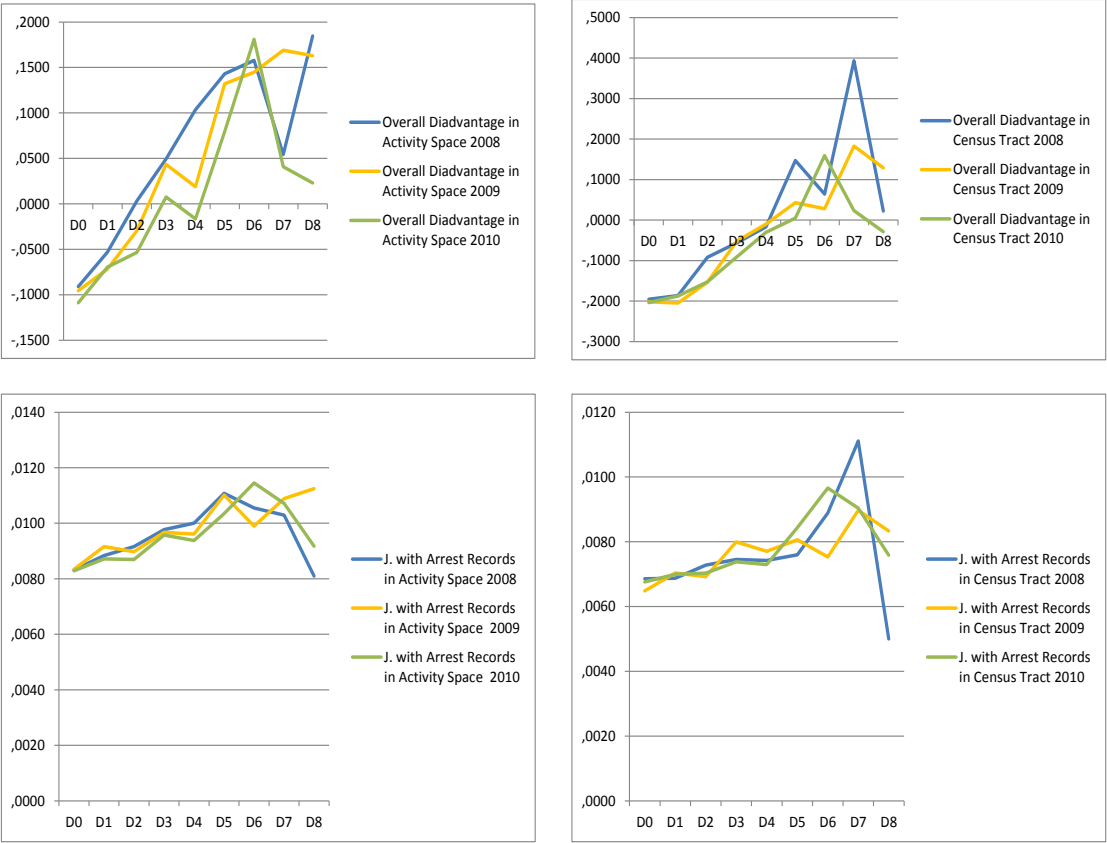


Figure 7.8: Proportion of Deviant Schoolmates by Respondents' GABI scores

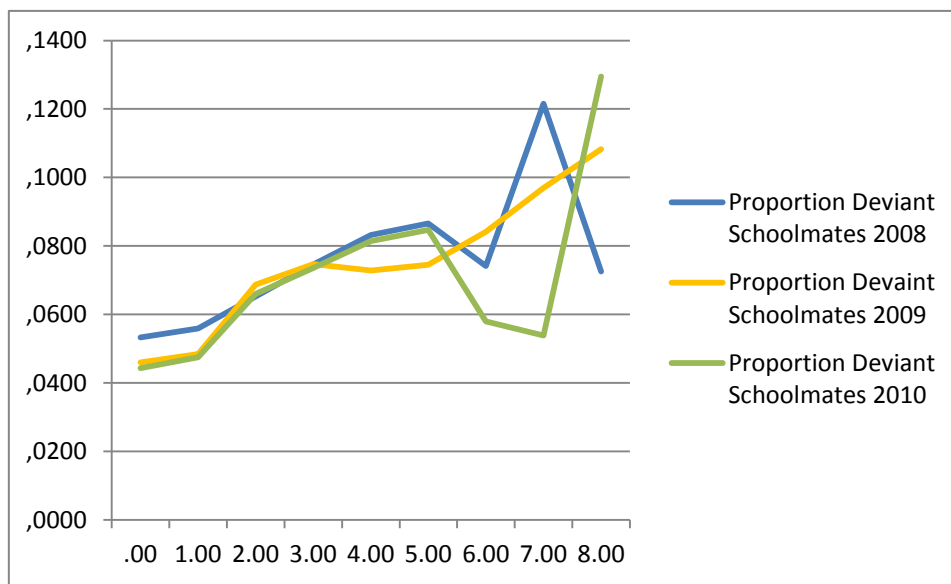


Figure 7.9: Proportion of Deviant Schoolmates Living in Same Census Tract by Respondents' GABI Scores

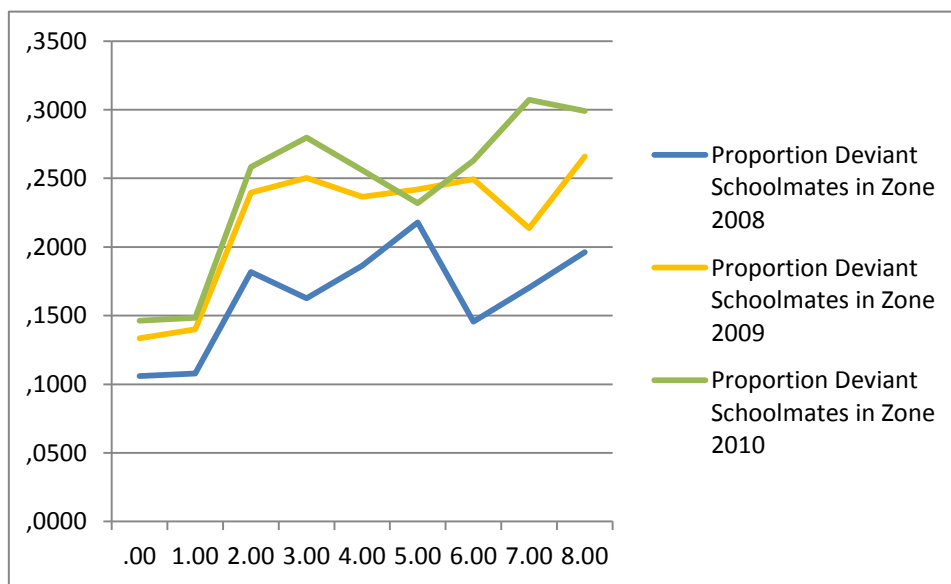
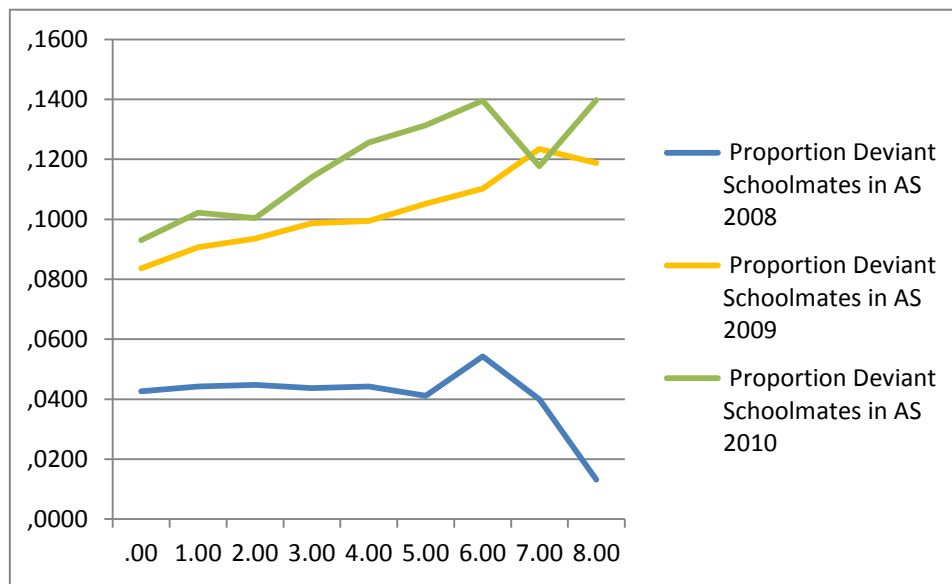


Figure 7.10: Proportion of Deviant Schoolmates in Same Activity Space by Respondents' GABI



In the next section, results of the model estimation will be presented.

3. Model estimation

In this section a series of longitudinal models based on equations 7.1 and 7.2 will be presented. The aim of these longitudinal models is to test if there is an effect of concentrated disadvantage and if it is possible to explain this away by theoretically selected covariates. Following the available literature, it was predicted that there would be a significant effect of contextual disadvantage on antisocial behaviour. However, it was also predicted that this effect could be explained away by known criminological processes (strain, social control, contagion effects). Later in this chapter, potential activity space based models will be presented. It will be explored if the traditional models and potential activity space will result in diverging conclusions.

3.1. Traditional (Census tract based) models

In this section a series of longitudinal linear models based on equation 7.1 were estimated. The analysis started by estimating three unconditional models. The estimation of an unconditional model aims to provide a baseline to which further estimated nested models can be compared. Following the estimation of an unconditional model, new predictors are added in a stepwise fashion. Successive models are assessed in two ways: the proportional reduction of unexplained variance at levels 1, 2 or 3 (δ^2_{v0} , δ^2_{u0} , and δ^2_{e0}), and the reduction of the deviance statistic ($-2 \times \log\text{likelihood}$) compared to the base model (Steele, 2008). Reductions in residual variance (or increases in variance explained) and intraclass correlation are usually interpreted as an improvement in the model because of the introduction of new predictors. The intra class correlation coefficient (ICC) provides another way to interpret the magnitude of the variance components. The ICC statistic ranges between 0 to 1, and measures the expected degree of similarity between respondents of a given cluster (Leckie and

French, 2013). When calculated for the empty model, the ICC represents the overall degree of similarity of individuals within a given cluster. On the other hand when the ICC is calculated for adjusted models (also known as residual ICC) it expresses the degree of similarity between individuals after covariates have been adjusted for.

It should be noted, though, that the introduction of new predictors may also increase variance (Snijders and Bosker, 1999). Therefore, the deviance statistic is usually interpreted. Regarding the deviance statistic, significant drops in the $-2 \times \log\text{likelihood}$ (assessed through a χ^2 test), suggesting that - compared to the previous model - the second model offers a better fit between the observed data and the data predicted by the model (Snijders and Bosker, 1999). The deviance statistic may also increase, in which case it is usually recommended to revert to the previous model (Leckie and French, 2013).

Table 7.9 displays the results of three unconditional models. The first model (left to right) is an unconditional model considering only a level 1 prediction error at the time (wave) level. The second model (left to right) includes an individual level random intercept (level 2). The third model also includes a school level random intercept (level 3). As can be seen in table 7.9, there is a statistically significant decrease of the $-2 \times \log\text{likelihood}$, especially when the intercept was allowed to vary across schools. For this model, the school level intraclass correlation was 0.04 while the individual level ICC was 0.74. This suggests that there is a high correlation between two waves within a given individual (which is to be expected). There is however a low correlation between waves within the same individual within a given school. Most of the correlation between waves is related to within individual clustering. Results suggest that a three level specification with a random intercept that is allowed to vary across levels 2 and 3

should be preferred. A cross classified model specification was ruled out, for reasons explained in Chapter 2. Models were estimated using the IGLS option in Mlwin. Results will be presented in the next section.

Table 7.9: Empty Models (N=3273)

	Empty model (L1 R. Effect) S.E.		Empty model (L2 R. Effect) S.E.		Empty model (L2, L3 R. Effect) S.E.	
Response	GABI		GABI		GABI	
Fixed Part						
cons	1.132*	0.01	1.149*	0.02	1.324*	0.04
Random Part						
Level: Wave	2.167*	0.02	0.774*	0.01	0.603*	0.01
Level: Individual			1.416*	0.03	1.599*	0.04
Level: School					0.08*	0.02
-2*loglikelihood:	59046		52821.2		39761.3	

*p<0.05; GABI: General Antisocial Behaviour Index; S.E. Standard Error

The next step was to estimate main effects and the full traditional model (census tract). Results are displayed in table 7.10.

The first model (Time) includes the first parameter that captures the effect of growth over time. As can be seen, the wave is positively and significantly related to the antisocial behaviour scores, suggesting that, as expected, average antisocial behaviour scores grow over time. This would suggest that, over time, sampled juveniles tend to diversify their engagement in different types of antisocial behaviours. This is an expected result, given the fact that the study was designed to follow juveniles during this developmental period.

Model 2 (“CT Disadvantage”) introduces census tract level “Contextual Concentrated Disadvantage”. The coefficient is positive and significant. This means that juveniles living in census tracts with higher levels of concentrated disadvantage will show a steeper increase in the diversity of antisocial behaviour types over time than juveniles who live in census tracts with lower levels of concentrated disadvantage. The model shows a significant improvement in model fit compared to model 1 ($\chi^2= 646$; $p<0.01$; $df=1$) and contributes to a 22% drop in level 3 residual variance $([1-(0.065/0.084)]*100)$. Accordingly the school level residual ICC decreases by approximately 25%.

Contrary to the traditional literature on the subject, it can be argued that this correlation (context-behaviour) alone suggests that there is a neighbourhood effect. This means that, in the case of Chile, as in other parts of the world, there is a significant difference in how people will behave depending on the type of context in which they live. This is consistent with previous literature on the subject (see, for example, Shaw and McKay, 1969; Wilson, 1987; Jargowsky and Steiner, 1997; Petronis and Anthony, 2003; Reboussin, Preisser, Song and Wolfson, 2010; Wells, Degenhardt, Bohnert, Anthony and Scott, 2009). This result was expected and is not necessarily new. It has to be stressed, though, that this result does not necessarily imply a context-behaviour causal relationship. In other words, whether this effect may be due to compositional or contextual effects is, up to this point of the analysis, not clear.

One typical strategy for dealing with this problem, and for strengthening causal inference, is to incorporate individual level covariates of confounders that may explain this effect away. It has been usually thought that if the effect of contextual disadvantage persists after controlling for relevant individual level variables, then a genuine

“neighbourhood effect” has been found. As has been argued before, this is a problematic reasoning. If the mechanisms explaining this relationship cannot be identified, then this reasoning just contributes to reifying the nature of contextual effects (Gans, 2002). In spite of these results, and based on the available literature, the effect of concentrated disadvantage is expected to be explained away by individual and other group level covariates. Regarding this issue, it is particularly relevant to examine which predictors will actually explain this effect away. These predictors may provide important clues to identify mechanisms that may be amenable to serve as potential targets for intervention.

In the next step, a set of additional explanatory variables measuring contextual characteristics, individual level controls and key criminogenic processes (strain, social control, and social learning) were introduced into the model.

Model 3 introduces Census Tract Contextual Concentration of Juveniles with Arrest Records. The aim of this model is to observe how the coefficient of Contextual Concentrated Disadvantage changes when Contextual Concentration of Juveniles with Arrest Records is added to the model. One plausible explanation for the observed link between contextual disadvantage and antisocial behaviour is related to the simultaneous concentration of peers that may also be willing to engage in antisocial behaviour. Even though the introduction of this variable results in a significant improvement of model fit compared model 2 ($\chi^2 = 224$; $p < 0.01$; $df = 1$), it does not significantly predict increases in diversity of antisocial behaviour types over time. It also has an unexpected negative sign. The introduction of this covariate seems to have negligible impact on the reduction of residual variance and results in a slight increase of the effect size of concentrated disadvantage on antisocial behaviour. To address the possibility that the result is related

to a multicollinearity problem, a separated model is estimated without including concentrated disadvantage. Even after dropping concentrated disadvantage, Contextual Concentration of Juveniles with Arrest Records does not gain significance. This test seems to rule out that this finding might be related to a multicollinearity problem.

The results so far suggest that the effect of contextual concentration on antisocial behaviour cannot be explained away by macro level census tract contextual level concentration of deviant peers. This result is rather surprising considering the fact that both variables show a moderate-high bivariate correlation. Even though unexpected in the context of the present thesis, findings are consistent with other studies examining the relationship between contextual level indicators of crime based on official records and individual level antisocial behaviour (Molnar et. al. 2005; Ludwig and Kling, 2007). Authors like Ludwig and Kling, (2007) have argued that failure to predict individual level antisocial behaviour based on contextual level measures of crime could be interpreted as evidence against the existence of a contextual level contagion effect. Certainly this finding is not consistent with the idea of contagion effects, but they cannot be ruled out before more a detailed analysis is conducted.

Model 4, tests for main effects of school level value-added education. As expected, this variable does obtain a significant and negative coefficient. This means that higher scores in the school value added scores are related to a stabilization effect. Compared to model 2, it also shows better fit ($\chi^2= 9.3$; $p<0.05$; $df=1$) and contributes to a proportional reduction of 18.4% in the observed level 3 residual variance ($[1-(0.053/0.065)]*100$). Value added scores represent a way to measure the contribution of the specific schools to learning (i.e. standardized scores), once socioeconomic characteristics of student intake have been taken into account. The initial finding suggests that students attending

schools providing value added education do not show the same increasing levels of diversity in antisocial behaviours as students attending schools with lower value added scores. Given the limitations of the scale it is not possible to know if there is an actual decrease of antisocial behaviour activity. This finding is consistent with previous literature on the subject (Avenyard, 2004; Tobler, Komro, Dabroski, Aveyard and Markham, 2011). However, the introduction of this covariate results only in a slight decrease in the effect size of contextual disadvantage on antisocial behaviour. So far, these results suggest that the effect of contextual disadvantage may not be explained away by school level characteristics. In spite of that, results also suggest that schools may prove to be an important ally when developing interventions targeting contextual level risk factors.

Model 5 tests the main effect of individual level control variables (gender, baseline age and family level SES) on the relationship between contextual disadvantage and antisocial behaviour. Results suggest that juveniles that are older at baseline, are males and occupying lower social positions show steeper increases in the lifetime diversity of antisocial behaviour types over time than younger (at baseline) females and higher SES juveniles. Mid-level SES (compared to high level SES) fails to significantly predict antisocial behaviour scores.

The inclusion of these variables is related to a slight proportional reduction (13%)⁵¹ of level 3 unexplained variance (compared to model 2). Model 5 also shows better fit ($\chi^2=181$; $p<0,05$; $df=4$) than model 2. It is interesting to note that individual level controls contribute to a slight reduction of the effect of contextual level disadvantage on antisocial behaviour but do not explain it away. This seems to suggest that the effect of

⁵¹ $[1-(0.056/0.065)]*100$

concentrated disadvantage may not be explained away by individual level variables like SES.

The next three variable blocks explore indicators of core criminogenic processes. Model 6 introduces strain indicators. Compared to model 2, the introduction of the block of strain indicators contributes to a significant improvement of model fit ($\chi^2=632$; $p<0,05$; $df=3$), but no change in level 2 residual variance. Only a slight change is observed regarding the relationship between contextual disadvantage and antisocial behaviour scores. However, the effect of concentrated disadvantage remains statistically significant in model 6.

As expected “High educational aspirations” obtains a negative sign. This means that, over time, juveniles with lower educational aspirations and low educational expectations will show increasing diversity in antisocial behaviour types. In particular low educational expectations is thought to express perception of blocked opportunities, an important aspect of strain perspective. However the key indicator that is expected to express subjective tension, is the “strain” variable. The strain variable takes the value of 1 if the respondent shows high aspirations, but low expectations. In other words juveniles that perceive they have the ability and motivation to pursue post-secondary studies, but believe they cannot pursue them (for whatever reason it may be), may be subject to subjective strain. It is hypothesized that this tension may motivate deviancy. Surprisingly, “Strain” obtains a significant coefficient that is, however, in the opposite direction than expected. Instead of showing increased antisocial behaviour diversity over time, strained juveniles seem to show a stable trajectory. Results of previous descriptive analysis revealed that strained students displayed antisocial behaviour scores that were above average for all measured waves (1.6 in 2008, 1,7 in 2009 and 1.8 in

2010). In addition, average differences between waves are small. One possible explanation of this pattern is that strain is related to an effect on the shape of the age crime-curve (Fabio, Loeber and Cohen, 2011). Strained individuals may show earlier initiation of antisocial behaviours, thus, the apparent stabilization effect may be reflecting that this group has reached their peak of the age crime curve. Unfortunately no previous waves are available (before seventh grade), therefore this hypothesis cannot be tested. Furthermore, it cannot be ruled out that these juveniles may be displaying repeated antisocial behaviours of the same type, without diversifying. Consequently, results on strain should be interpreted with care.

Model 7 introduces social control measures. Compared to model 2, model 7 shows a significant improvement in model fit ($\chi^2=1737$; $p<0.05$; $df=8$). In addition a reduction of 13% ($[1-(1.659/1.442)]*100$) of between individual residual variance (level 2) and a 24% between school (level 3) residual variance ($[1-(0.049/0.065)]*100$) was found. This variable block also results in a slight reduction of the concentrated disadvantage coefficient, which remains significant. Regarding family structure, all alternative family arrangements (with the exception of living without any biological parent) significantly predict increased levels in the diversity of antisocial behaviours over time. This is consistent with the social control framework. Within this framework it is thought that family structure may facilitate social control. Compared to families with both parents, single parent families or reconstituted families⁵² are thought to have more difficulties in maintaining adequate social control. For example single parent families may have more difficulties in allocating time to supervision and monitoring. Reconstituted (i.e. blended) families may have more problems in setting norms and being consistent about their reinforcement.

⁵² When two adults who have children from previous relationships, join via marriage, cohabitation or civil partnership.

Regarding to why “living without any biological parent” does not predict antisocial behaviour, an explanation may be ventured. It is likely that most of these juveniles are living with other relatives, most likely grandparents. In Chile, extended family (grandparents, uncles, among others) plays an important role in raising children when biological parents are not able to. This not uncommon, especially in the case of disadvantaged families. Extended families may be able to compensate missing parents fostering attachment and monitoring.

Regarding low Parental Attachment, low Parental Monitoring and low School Attachment their coefficients behave as expected, significantly predicting increased levels of antisocial behaviour diversity over time. Indirect social control such as attachment to conventional institutions (family and school) is believed to foster conformity. Direct forms of social control (parental monitoring) are thought to reduce antisocial behaviours because parents may react and help prevent antisocial behaviour engagement.

Results suggest that informal social control variables do significantly contribute to predict antisocial behaviour scores and also contribute to improve the model fit. They seem, however, to be able to only partially explain away the effect of concentrated disadvantage on antisocial behaviour scores.

The next block of variables introduced (Model 8) is related to indicators of peer contagion effects. Compared to model 2, the introduction of this variable block is related to a significant improvement in model fit ($\chi^2=15386$; $p<0.05$; $df=3$). In addition, residual variance decreases by 12.2% (level 1), 21.5% (level 2) and 72% for level 3 (between schools). This also reflects on the residual school level ICC (0.01), which also shows an important reduction. Nevertheless, the individual level ICC does not show a

relevant reduction. The most interesting finding, however, is that the coefficient of contextual concentrated disadvantage also shows an important reduction losing its statistical significance.

Regarding individual predictors, Best friend's delinquency, and concentration of schoolmates in census tract results in significant coefficients, but not concentration of deviant schoolmates within school. This means that juveniles whose best friend reports increasing antisocial behaviour scores over time, and who live in census tracts with a higher concentration of antisocial school peers (above average GABI scores) also show increasing levels diversity in antisocial behaviour engagement.

These results may potentially suffer from multicollinearity problems. If the variable concentration of schoolmates in census tract is dropped, concentration of deviant schoolmates within census tract gains significance. Because both are measuring a similar construct, it is plausible to think that both variables may significantly predict increased levels of antisocial behaviours over time.

This finding is interesting. Critical appraisal of included studies in the systematic review (Chapter 3) suggested that peer characteristics (antisocial behaviour) may be a relevant confounder variable that seems to be frequently missing in empirical analysis on the effects of neighbourhood concentrated disadvantage. In addition, if studies do include it, it has often been poorly measured (for an exception see Haynie, Silver and Teasdale, 2006). Peer effects are thought to play a key role in explaining antisocial behaviour, increasing in importance as juveniles grow older. Results support Oberwittlers' (2007) idea that the effect of contextual poverty may depend on peer networks living within the same neighbourhood.

The fact that in this study peer effects have been measured independently (avoiding same source bias) and they have also been successfully located in space, suggests that this may be a meaningful finding that sheds light on the problem of how the effect of concentrated disadvantage on antisocial behaviour may be transmitted. It also suggests that peer contagion effects may play a more important part than previously thought (Ludwig and Kling, 2007). It is also interesting to note that network-based variables predict antisocial behaviour whereas overall concentration of delinquent peers (with arrest records) living in the census tract do not.

Regarding this finding, there is still one issue that needs to be considered. Observed peer effects might still be expressing compositional rather than contextual effects. This is because policy and work related constraints may constrain groups of at risk families (and thus perhaps at risk children) to live in certain areas and to attend certain schools. Thus the relationship between census tract level concentration of antisocial peers and a steeper growth in individual level antisocial behaviour diversity may still be an expression of concurrent group characteristics rather than an influence effect. This discussion will be picked up again in chapter 9.

One way to strengthen the causal inference of a contextual effect on antisocial behaviour is to control for baseline antisocial behaviours (2008). Steeper growth may be due to high initial risk levels, rather than to the expression of a contextual effect. Thus, in model 9 the main effect of baseline antisocial behaviour on the growth observed over time in antisocial behaviour scores (diversity) was assessed. Compared to model 2, model 9 provides a significantly better fit ($\chi^2=8142$; $p<0.05$; $df=1$). The addition of baseline antisocial behaviour also resulted in a reduction of 90.7% in level 3 residual variance ($[1-(0.006/0.065)]*100$), and a 90.9% reduction in level 2 residual variance

$([1-(0.15/1.659)]*100)$. It is also interesting to notice that the Individual level ICC (0.246) shows a substantial reduction in comparison to model 2 individual level ICC (0.782). This means that an important part of the correlation between two random waves within one individual in the same school is explained by the initial diversity of antisocial behaviours. It seems that an important part of individual level change in antisocial behaviour over time is explained by initial levels of antisocial behaviour.

Another interesting issue is that the effect of concentrated disadvantage on antisocial behaviour scores shows a substantial reduction, losing its significance. It is interesting to note that baseline antisocial behaviour contributes to reducing both between schools and between persons residual variability, while contagion variables mainly contribute to reducing between school variability. In other words, baseline antisocial behaviour contributes to explaining differences between persons and schools, while contagion effects mainly contributes to explaining differences between schools.

This is an important issue. Systematic review results suggested that this was one of the most commonly omitted confounders. Selection effects are one possible explanation as to why disadvantaged neighbourhoods may concentrate higher proportions of juveniles engaging in antisocial behaviours. Longitudinal studies may help to address this issue by allowing us to observe change (growth) in antisocial behaviour engagement, once initial levels of antisocial behaviours have been accounted for. If contextual level variables still predict increased levels of growth in antisocial behaviours after controlling for initial levels of antisocial behaviour, it could be regarded as evidence in favour of contextual effects.

Analysis of main effects suggests that there are two types of variables that explain away the effect of contextual concentrated disadvantage. Both types of variables point to

diverging interpretations of the model results. On one hand, contagion effects suggest that there may be a contextual effect related to the concentration of deviant peers. In order to ascertain if this is the case, contagion factors should remain significant in the fully specified model, especially after controlling for baseline antisocial behaviour. On the other hand, the impact of baseline antisocial behaviour on the model suggests that there may also be a strong compositional effect, where the juveniles living in deprived contexts also show higher initial levels of antisocial behaviour. Thus, particular attention will be paid to how both types of variables behave in the fully specified model (model 10).

Model 10, introduces all predictors at once. As expected the deviance statistic suggests that there is evidence to prefer this model over model 2 ($\chi^2=23692$; $p<0.05$; $df=21$). Compared to model 2, Model 10 level 2 and level 3 residual variables decrease by a 95% and 98%, losing their significance. Included variables seem to be able to explain most of observed differences between schools and between individuals.

Regarding the fixed part of the model, most of the included variables obtain coefficients that are significant and in the expected directions. Concentrated contextual disadvantage remains a significant predictor of antisocial behaviour diversity over time. Nevertheless, this time it shows a small but negative coefficient. This would suggest that once all other variables have been controlled for, living in a neighbourhood with high concentration of disadvantage would contribute to a stabilization of antisocial behaviour scores. One potential interpretation of this result may be similar to the case of the strain variable. Given the fact that the bivariate relationships suggest a positive correlation between disadvantage and diversity of antisocial behaviours, it may be related to a shift in the, of the age, crime curve. Juveniles living in census tracts with high concentration

of disadvantage may show an earlier initiation of antisocial behaviour, thus the observed stabilization might be related to juveniles reaching a peak of diversity of antisocial behaviour engagement. As in the case of anomia, given the limitations of the antisocial behaviour measure it is not possible to test this.

Regarding other contextual factors, contextual concentration of juveniles with arrest records never gains significance, while school value added education loses its significance in model 10. Some complementary analyses (not shown) suggest that peer effects may have a role in explaining away the effect of concentrated disadvantage. This issue will be explored in chapter 10. It is interesting to note that individual level SES also loses its significance in model 10. This may be related to the inclusion of family level social control measures, a key variable that is hypothesized to mediate the effect of family level SES on antisocial behaviour (Larzelere and Patterson, 1990). Also some family living arrangements like living with father and other loses its significance while living with neither parent never gains significance.

Even though there are some intriguing results so far (negative concentrated disadvantage coefficient) up to this point the results seem to support the preliminary conclusion that at least a major part of the effect of contextual disadvantage may be mediated primarily by peer contagion variables (potentially representing a contextual effect) and baseline antisocial behaviour (potentially representing compositional effects). Social control and strain variables may also partially be mediating this effect. These issues will be addressed again after reviewing the potential activity space models.

In order to assess model assumptions, the distribution of residuals for each level of the fully specified model was inspected. Residuals for all levels showed a normal distribution (results not shown).

In the next section, the presented results will be compared to the activity space based model.

Table 7.10: Traditional Longitudinal Main Effect Model (N=3272)

Traditional model	1	2		3		4		5		6		7		8		9		10		
	Main effects Time	S.E.	Main effects CT	S.E.	Main effects Cont. Conc. Juv. w/arrest records	S.E.	Main effects School Added Value	S.E.	Main effects Indiv. level controls	S.E.	Main effects Strain	S.E.	Main effects Social Control	S.E.	Main effects Contagion	S.E.	Main effects Baseline Ant. Behaviour	S.E.	Fully Specified Traditional Model	S.E.
Response	GABI		GABI		GABI		GABI		GABI		GABI		GABI		GABI		GABI			
Fixed Part																				
cons	0.629*	0.045	0.651*	0.042	0.647*	0.043	0.672*	0.041	-2.369*	0.358	0.837*	0.061	2.287*	0.088	0.39*	0.036	-0.273*	0.022	0.81*	0.18
Wave	0.348*	0.008	0.347*	0.008	0.347*	0.008	0.347*	0.008	0.348*	0.008	0.341*	0.008	0.322*	0.008	0.187*	0.013	0.333*	0.008	0.263*	0.01
CT Context. Conc. Disadv.			0.129*	0.034	0.132*	0.037	0.125*	0.034	0.118*	0.034	0.119*	0.034	0.123*	0.033	0.014	0.034	0.025	0.016	-0.039*	0.017
CT Cont. Conc. Juv. w/arrest records	-	-	-	-	-0.015	0.017	-	-	-	-	-	-	-	-	-	-	-	-	0.003	0.01
School Added Value	-	-	-	-	-	-	-0.144*	0.046	-	-	-	-	-	-	-	-	-	-	0.006	0.013
Baseline age	-	-	-	-	-	-	-	-	0.216*	0.028	-	-	-	-	-	-	-	-	-0.031*	0.012
Male	-	-	-	-	-	-	-	-	0.336*	0.04	-	-	-	-	-	-	-	-	0.066*	0.018
SES (Low)	-	-	-	-	-	-	-	-	0.105*	0.034	-	-	-	-	-	-	-	-	0.019	0.025
SES (Mid)	-	-	-	-	-	-	-	-	0.047	0.03	-	-	-	-	-	-	-	-	-0.004	0.022
Baseline Antisocial Behaviour	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.982*	0.007	0.933*	0.007
High Educ. Aspirations	-	-	-	-	-	-	-	-	-	-	-0.245*	0.047	-	-	-	-	-	-	-0.11*	0.044
Low Educ. Expectations	-	-	-	-	-	-	-	-	-	-	0.327*	0.065	-	-	-	-	-	-	0.151*	0.065
Strain	-	-	-	-	-	-	-	-	-	-	-0.16*	0.066	-	-	-	-	-	-	-0.178*	0.067
Lives with mother & other	-	-	-	-	-	-	-	-	-	-	-	-	0.182*	0.044	-	-	-	-	0.088*	0.03
Lives with father & other	-	-	-	-	-	-	-	-	-	-	-	-	0.231*	0.109	-	-	-	-	0.103	0.093
Lives with mother only	-	-	-	-	-	-	-	-	-	-	-	-	0.178*	0.032	-	-	-	-	0.064*	0.021
Lives with father only	-	-	-	-	-	-	-	-	-	-	-	-	0.223*	0.087	-	-	-	-	0.184*	0.069
Lives with neither parents	-	-	-	-	-	-	-	-	-	-	-	-	0.099	0.076	-	-	-	-	-0.025	0.061
Parental attachment	-	-	-	-	-	-	-	-	-	-	-	-	-0.058*	0.016	-	-	-	-	-0.014	0.014
Paretal monitoring	-	-	-	-	-	-	-	-	-	-	-	-	-0.389*	0.019	-	-	-	-	-0.165*	0.017
School attachment	-	-	-	-	-	-	-	-	-	-	-	-	-0.041*	0.01	-	-	-	-	-0.027*	0.009
Best Friends Antisocial Behaviour	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.085	0.007	-	-	0.039*	0.005
Prop. Deviant Schoolmates	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.533	0.29	-	-	0.267	0.145
Prop. Deviant Schoolmates in CT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.907*	0.127	-	-	0.667*	0.067

*p<0.05; GABI: General Antisocial Behaviour Index; CT: Census Tract; S.E. Standard Error

Table 7.10: Traditional Longitudinal Main Effect Model⁵³ (Continued)

Traditional model	1		2		3		4		5		6		7		8		9		10	
	Main effects Time	S.E.	Main effects CT	S.E.	Main effects Cont. Conc. Juv. w/arrest records	S.E.	Main effects School Added Value	S.E.	Main effects Indiv. level controls	S.E.	Main effects Strain	S.E.	Main effects Social Control	S.E.	Main effects Contagion	S.E.	Main effects Baseline Ant. Behaviour	S.E.	Fully Specified Traditional Model	S.E.
Random Part																				
Level: Wave	0.486*	0.008	0.482*	0.008	0.483*	0.008	0.482*	0.008	0.483*	0.008	0.479*	0.008	0.476*	0.008	0.423*	0.01	0.478*	0.008	0.342*	0.008
Level: Individual	1.651*	0.038	1.659*	0.038	1.653*	0.038	1.659*	0.038	1.602*	0.037	1.614*	0.038	1.442*	0.034	1.302*	0.036	0.15*	0.007	0.07*	0.007
Level: School	0.084*	0.02	0.065*	0.017	0.068*	0.017	0.053*	0.015	0.056*	0.015	0.056*	0.015	0.049*	0.013	0.018	0.008	0.006	0.002	0.001	0.001
School Level ICC	0.038		0.029		0.031		0.024		0.026		0.026		0.025		0.010		0.009		0.002	
Individual Level ICC	0.781		0.782		0.781		0.780		0.774		0.777		0.758		0.757		0.246		0.172	
-2*loglikelihood:	38047.3		37401.2		37176.9		37391.9		37219.6		36765		35663.4		22015.2		29259		13708.3	

*p<0.05; CT: Census Tract; ICC: Intra Class Correlation; S.E. Standard Error

⁵³ N=3272

3.2. Potential activity space based models

This section will focus on exploring similarities and differences between the traditional model and the activity space based model. The specification of potential activity space models is identical to traditional models, except for the fact that contextual variables have been aggregated based on the shape of potential activity spaces. As it was argued before, aggregating contextual characteristics based on activity spaces seems to have a better evidence base, also providing some advantages for longitudinal modelling. Another key advantage is that it allows the testing of ideas regarding how diverse activity spaces may have differential effects on behavioural outcomes.

Before estimating main effects, a set of preliminary activity space models were estimated in order to test if the three selected potential activity spaces were in fact good predictors of antisocial behaviour (table 7.11). Models 1, 2 and 3 display the main effects of concentrated disadvantage on antisocial behaviour scores for home, school and best friend's activity space. Models 4, 5 and 6 do the same for contextual concentration of peers with arrest records. Results suggested that only home based and school based activity spaces significantly predict antisocial behaviour scores while characteristics based on best friend's activity spaces failed to do so. It is interesting to note that school level ICC's of the traditional model and activity space models 1 to 3 are quite similar. This suggests that they may, at least, have a similar capability to explain between school variability.

Hypothesis 01 stated that it was expected that effects of different activity spaces on antisocial behaviour may vary depending on the type of activity space. Results suggest that even though the effect sizes for school activity space characteristics (disadvantage, concentration of deviant peers) are about 30% to 50% stronger than the effect of home

based activity space, this difference does not reach statistical significance. Hence no support for hypothesis 01 was found. This result may be related to the fact that both tested contextual variables (disadvantage, concentration of deviant peers) seem to show a relevant level of spatial autocorrelation. Since juveniles usually live close to schools, characteristics of those areas may have a tendency to be similar. This characteristic may make it difficult to tease differential effects apart. In spite of this, differentiating between types of activity spaces may still have implications for the study of other characteristics such as for example collective efficacy or cultural characteristics. In any case differential effects will be explored in more detail in chapters 8, 9 and 10.

In light of the present results, it was decided to calculate overall activity space effects using only information from home and school potential activity spaces⁵⁴.

Models 7 and 8, present the effect sizes of overall activity space based measures, considering only home and school potential activity spaces. Unlike the case of the traditional model, now the effect of contextual concentration of juveniles with arrest records on antisocial behaviour scores is positive and statistically significant, as it was initially expected. This may suggest that potential activity space aggregation strategy might provide a more adequate alternative to capturing exposure to contextual characteristics.

Table 7.12 shows the results of a series of longitudinal main effects and fully specified models predicting antisocial behaviour scores over time. This time, contextual variables have been aggregated based on the potential activity space approach (equation 7.2). It should be noted that the results of the potential activity space model are remarkably similar to the traditional model.

⁵⁴ Based on a simple average of both activity space measures.

Model 1 only introduces time as the first covariate. As in the case of the traditional model, time is significantly related to an increased diversity in antisocial behaviours. Model 2 (“Disadvantage in AS”) introduces census tract level Contextual Concentrated Disadvantage, this time aggregated based on activity spaces. The coefficient is positive and significant, suggesting that, higher concentration of disadvantage in activity spaces is also related to steeper increases in diversity of antisocial behaviour types over time. The model shows a significant improvement in model fit compared to model 1 ($\chi^2= 523$; $p<0.01$; $df=1$) and contributes to a 20% drop in level 3 residual variance ($[1-(0,067/0,08)]*100$). Accordingly the school level residual ICC decreases by approximately 21%.

Model 3 introduces Contextual Concentration of Juveniles with Arrest Records in AS. Although this time the coefficient turns out to be positive it still fails to reach significance. Compared to model 2, model 3 still shows a better fit ($\chi^2= 417$; $p<0.05$; $df=1$). As in the case of the traditional model these results cannot be explained away by dropping concentrated disadvantage from the model. Even after dropping concentrated disadvantage, Contextual Concentration of Juveniles with Arrest Records (AS) still does not gain significance.

Model 4, tests for main effects of school level value-added education, which obtains a negative coefficient. As in the traditional model, higher scores in the value added index are related to a stabilization effect. This means that students attending schools with lower value added scores show a steeper growth in antisocial behaviour diversity than students attending schools providing value added education. Compared to model 2, model 4 also shows better fit ($\chi^2= 10.7$; $p<0.05$; $df=1$) and contributes to a proportional reduction of 22.4% in the observed level 3 residual variance ($[1-(0.052/0.067)]*100$).

Model 5 tests the main effect of individual level control variables (gender, baseline age and family level SES) on the relationship between contextual disadvantage and antisocial behaviour. As in the case of the traditional model, results suggest that a higher baseline age, being male and pertaining to lower social positions also show steeper increases in the lifetime diversity of antisocial behaviour types over time. Also mid-level SES (compared to high level SES) fails to significantly predict antisocial behaviour scores. Model 5 shows better fit ($\chi^2=173.8$; $p<0.05$; $df=4$) than model 2 and a 17.9%⁵⁵ proportional reduction in level 3 unexplained variance.

Now, model 6 introduces strain indicators. Compared to model 2, the introduction of the block of strain indicators contributes to an improvement of model fit ($\chi^2=661$; $p<0.05$; $df=3$). In addition Level 3 (between school) unexplained variance shows a 14.9% reduction. Regarding the introduced strain variables, the results are similar to the traditional model. All three variables (“High educational aspirations”; “Low educational expectations” and “Strain”) show significant coefficients. They also show the same signs, included an unexpected negative sign for strain. So far this suggests that both the traditional model and the potential activity space model lead us to reach similar conclusions.

Model 7 introduces social control measures. Compared to model 2, model 7 shows a significant improvement in model fit ($\chi^2=1767$; $p<0.05$; $df=8$) and a 28% reduction in between school residual variance ($[1-(0.048/0.067)]*100$). With the exception of “living without any biological parent” all introduced variables obtain significant coefficients that behave in the expected direction. So far the substantive interpretation of activity space model results are the same as in the case of traditional approach.

⁵⁵ $[1-(0.057/0.067)]*100$

In the next model (model 8) indicators of contagion effects are introduced. Compared to model 2, model 8 presents a significantly better model fit ($\chi^2=26247$; $p<0.05$; $df=3$). In addition, level 3 (between schools) residual variance decreases by 83,5%. The introduction of contagion effects seems to explain an important part of observed differences between schools. As in the traditional model, residual school level ICC shows an important reduction (0,006). Exactly as the case of the traditional model, the coefficient of concentrated contextual disadvantage in activity space loses its significance. Here a difference with the traditional model could be found. This time all contagion predictors show significant coefficients that behave in the expected direction (best friend's delinquency, concentration of school mates in activity space and concentration of deviant schoolmates within school). All show positive signs suggesting an association with increased levels of diversity of antisocial behaviours over time. It is interesting to note that the introduction of peer effects also contributes to the school value-added indicator losing its significance. This suggest that a high contextual level concentration of deviant peers (school or out of school context) may override the school's organisational capacity to respond and to have a preventive effect.

In model 9, the main effect of baseline antisocial behaviour on the growth observed over time in antisocial behaviour scores (diversity) was assessed. Compared to model 2, model 9 provides a significantly better fit ($\chi^2=8196$; $p<0.05$; $df=1$). The addition of baseline antisocial behaviour also resulted in a reduction of 90% in level 3 residual variance ($[1-(0.006/0.067)]*100$). It is also interesting to observe that, as in the case of the traditional model, individual level ICC (0,242) shows a substantial reduction in comparison to model 2 individual level ICC (0,781). Also the effect of concentrated disadvantage on antisocial behaviour scores shows a substantial reduction, losing its significance.

So far results suggest that conclusions drawn based on the activity space based model are almost identical to the conclusions drawn from the traditional model.

Model 10, introduces all predictors at once. As expected the deviance statistic suggests that there is evidence to prefer this model over model 2 ($\chi^2=30428$; $p<0,05$; $df=21$). Compared to model 2, Model 10 level 2 and level 3 residual variables decrease by a 93,7% and 95,5%. As in the case of the traditional model, the full activity space model seems to be able to explain an important part of observed differences between individuals and between schools.

When compared to the traditional model, most of the included variables obtain similar coefficients, signs, and significance statistics. However, this time concentrated contextual disadvantage loses its significance. So does contextual concentration of peers with arrest records, and school level added value scores.

This would suggest that the effect of macro level contextual factors seems to be fully mediated by other variables introduced in the equation, most notably baseline antisocial behaviour and contagion effects. In the case of strain variables, “high educational aspiration” loses its significance in the activity space model, which it did not in the traditional model. Regarding social control variables “living only with the father” loses its significance when compared with the traditional model. These issues will be addressed later in chapters 8 and 9.

Regarding the contagion effects, this time only best friend’s antisocial behaviour and school level concentration of antisocial peers remain significant predictors of the growth of antisocial behaviour over time. As in the case of the traditional model, these results are subject to multicollinearity problems. When concentration of deviant schoolmates in school is dropped from the model, concentration of schoolmates in activity space gains

significance. The effect of this this issue on substantive results will be addressed in chapter 10.

The last issue relates to model fit. Compared to the empty model, the fully specified potential activity space model shows a better model fit than the traditional model suggesting that potential activity space models may provide a better fit with the data. In spite of this, the similarities in conclusions drawn from each type of specification are strikingly similar.

Regarding model assumptions, residuals for all levels showed a normal distribution (results not shown).

**7.11: Activity Space Based Longitudinal Model: Main Effects by Type of Activity Space (Home, School, Best Friend's Home)
(N=3273)**

	1		2		3		4		5		6		7		8	
	Disadv. Home AS	S.E.	Disadv. School AS	S.E.	Disadv. Friends Home AS	S.E.	Contextual Dev. Peers Home AS	S.E.	Contextual Dev. Peers School AS	S.E.	Contextual Dev. Peers Friends Home AS	S.E.	Overall Contextual Disadv. AS	S.E.	Overall Contextual Dev. Peers AS	S.E.
Response	GABI		GABI		GABI		GABI		GABI		GABI		GABI		GABI	
Fixed Part																
cons	0.632*	0.04	0.637*	0.04	0.624*	0.05	0.625*	0.04	0.624*	0.04	0.619*	0.05	0.636*	0.04	0.622*	0.043
Wave	0.347*	0.01	0.348*	0.01	0.343*	0.01	0.35*	0.01	0.348*	0.01	0.348*	0.01	0.347*	0.01	0.35*	0.008
Context. Conc. Disadv. Home AS	0.084*	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Context. Conc. Disadv. School AS	-	-	0.141*	0.06	-	-	-	-	-	-	-	-	-	-	-	-
Context. Conc. Disadv. Best Friends Home AS	-	-	-	-	0.037	0.02	-	-	-	-	-	-	-	-	-	-
Cont. Conc. Juv. w/arrest records Home AS	-	-	-	-	-	-	0.046*	0.02	-	-	-	-	-	-	-	-
Cont. Conc. Juv. w/arrest records School AS	-	-	-	-	-	-	-	-	0.087*	0.04	-	-	-	-	-	-
Cont. Conc. Juv. w/arrest records Best Friends Home AS	-	-	-	-	-	-	-	-	-	-	0.01	0.01	-	-	-	-
Overall Context. Conc. Disadv. AS	-	-	-	-	-	-	-	-	-	-	-	-	0.172*	0.05	-	-
Overall Cont. Conc. Juv. w/arrest records AS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.093*	0.031

*p<0.05; GABI: General Antisocial Behaviour Index; AS: Activity Space; S.E. Standard Error

**7.11: Activity Space Based Longitudinal Model: Main Effects by Type of Activity Space (Home, School, Best Friend's Home)
(Continued)**

	1		2		3		4		5		6		7		8	
	Disadv. Home AS	S.E.	Disadv. School AS	S.E.	Disadv. Friends Home AS	S.E.	Contextual Dev. Peers Home AS	S.E.	Contextual Dev. Peers School AS	S.E.	Contextual Dev. Peers Friends Home AS	S.E.	Overall Contextual Disadv. AS	S.E.	Overall Contextual Dev. Peers AS	S.E.
Random Part																
Level: Wave	0.483*	0.01	0.486*	0.01	0.458*	0.01	0.486*	0.01	0.486*	0.01	0.461*	0.01	0.483*	0.01	0.486*	0.008
Level: Individual	1.654*	0.04	1.651*	0.04	1.613*	0.04	1.648*	0.04	1.651*	0.04	1.611*	0.04	1.654*	0.04	1.647*	0.038
Level: School	0.072*	0.02	0.075*	0.02	0.083*	0.02	0.074*	0.02	0.074*	0.02	0.086*	0.02	0.067*	0.02	0.069*	0.018
School Level ICC	0.033		0.034		0.039		0.034		0.033		0.040		0.030		0.031	
Individual Level ICC	0.781		0.780		0.787		0.780		0.780		0.786		0.781		0.779	
-2*loglikelihood:	37518.5		38042.5		31491.7		37151.8		37989.8		31205.3		37515.3		37103.2	

*p<0.05; AS: Activity Space; ICC: Intra Class Correlation; S.E. Standard Error

Table 7.12: Activity Space Based Longitudinal Model (N=3272)

Potential Activity Space Model	1		2		3		4		5		6		7		8		9		10	
	Main effects Time	S.E.	Main effects Disadv. AS	S.E.	Main effects Cont. Conc. Juv. w/arrest records AS	S.E.	Main effects School Added Value	S.E.	Main effects Indiv. level controls	S.E.	Main effects Strain	S.E.	Main effects Social Control	S.E.	Main effects Contagion	S.E.	Main effects Baseline Ant. Behaviour	S.E.	Fully Specified Activity Space	S.E.
Response	GABI		GABI		GABI		GABI		GABI		GABI		GABI		GABI		GABI		GABI	
Fixed Part																				
cons	0.629*	0.045	0.636*	0.042	0.627*	0.04	0.659*	0.04	-2.339*	0.36	0.833*	0.06	2.283*	0.09	0.444*	0.05	-0.278*	0.021	1.319*	0.269
Wave	0.348*	0.008	0.347*	0.008	0.35*	0.01	0.347*	0.01	0.348*	0.01	0.341*	0.01	0.322*	0.01	0.259*	0.02	0.333*	0.008	0.314*	0.017
AS Context. Conc. Disadv.	-	-	0.172*	0.051	0.131*	0.06	0.176*	0.05	0.165*	0.05	0.167*	0.05	0.181*	0.05	0.1162	0.06	0.04	0.021	0.047	0.037
AS Cont. Conc. Juv. w/arrest records	-	-	-	-	0.063	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-0.049	0.026
School Added Value	-	-	-	-	-	-	-0.154*	0.05	-	-	-	-	-	-	-	-	-	-	-0.041	0.025
Baseline age	-	-	-	-	-	-	-	-	0.212*	0.03	-	-	-	-	-	-	-	-	-0.067*	0.018
Male	-	-	-	-	-	-	-	-	0.335*	0.04	-	-	-	-	-	-	-	-	0.08*	0.027
SES (Low)	-	-	-	-	-	-	-	-	0.111*	0.03	-	-	-	-	-	-	-	-	-0.018	0.041
SES (Mid)	-	-	-	-	-	-	-	-	0.05	0.03	-	-	-	-	-	-	-	-	-0.061	0.039
Baseline Antisocial Behaviour	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.983*	0.007	0.926*	0.011
High Educ. Aspirations	-	-	-	-	-	-	-	-	-	-	-0.254*	0.05	-	-	-	-	-	-	-0.073	0.078
Low Educ. Expectations	-	-	-	-	-	-	-	-	-	-	0.327*	0.07	-	-	-	-	-	-	0.312*	0.103
Strain	-	-	-	-	-	-	-	-	-	-	-0.163*	0.07	-	-	-	-	-	-	-0.34*	0.106
Lives with mother & other	-	-	-	-	-	-	-	-	-	-	-	-	0.187*	0.04	-	-	-	-	0.147*	0.046
Lives with father & other	-	-	-	-	-	-	-	-	-	-	-	-	0.236*	0.11	-	-	-	-	0.117	0.155
Lives with mother only	-	-	-	-	-	-	-	-	-	-	-	-	0.182*	0.03	-	-	-	-	0.065*	0.032
Lives with father only	-	-	-	-	-	-	-	-	-	-	-	-	0.201*	0.09	-	-	-	-	0.001	0.101
Lives with neither parents	-	-	-	-	-	-	-	-	-	-	-	-	0.097	0.08	-	-	-	-	0.046	0.084
Parental attachment	-	-	-	-	-	-	-	-	-	-	-	-	-0.059*	0.02	-	-	-	-	-0.015	0.022
Paretal monitoring	-	-	-	-	-	-	-	-	-	-	-	-	-0.391*	0.02	-	-	-	-	-0.201*	0.026
Schoo attachment	-	-	-	-	-	-	-	-	-	-	-	-	-0.041*	0.01	-	-	-	-	-0.012	0.014
Best Friends Antisocial Behaviour	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.102*	0.01	-	-	0.04*	0.008
Prop. Deviant Schoolmates	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.805*	0.44	-	-	0.986*	0.241
Prop. Deviant Schoolmates in AS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.333*	0.61	-	-	-0.22	0.361

*p<0.05; GABI: General Antisocial Behaviour Index; AS: Activity Space; S.E. Standard Error

Table 7.12: Activity Space Based Longitudinal Model⁵⁶ (Continued)

Potential Activity Space Model	1		2		3		4		5		6		7		8		9		10	
	Main effects Time	S.E.	Main effects Disadv. AS	S.E.	Main effects Cont. Conc. Juv. w/arrest records AS	S.E.	Main effects School Added Value	S.E.	Main effects Indiv. level controls	S.E.	Main effects Strain	S.E.	Main effects Social Control	S.E.	Main effects Contagion	S.E.	Main effects Baseline Ant. Behaviour	S.E.	Fully Specified Activity Space	S.E.
Random Part																				
Level: Wave	0.486*	0.008	0.483*	0.008	0.486*	0.01	0.483*	0.01	0.484*	0.01	0.479*	0.01	0.475*	0.01	0.488*	0.02	0.477*	0.008	0.385*	0.015
Level: Individual	1.651*	0.038	1.654*	0.038	1.648*	0.04	1.654*	0.04	1.599*	0.04	1.608*	0.04	1.438*	0.03	1.418*	0.06	0.146*	0.007	0.104*	0.014
Level: School	0.084*	0.02	0.067*	0.017	0.061*	0.02	0.052*	0.01	0.055*	0.02	0.057*	0.02	0.048*	0.01	0.011	0.01	0.006*	0.002	0.003	0.002
School Level ICC	0.038		0.030		0.028		0.024		0.026		0.027		0.024		0.006		0.010		0.006	
Individual Level ICC	0.781		0.781		0.779		0.779		0.774		0.777		0.758		0.745		0.242		0.217	
-2*loglikelihood:	38047.3		37515.3		37097.9		37504.6		37341.5		36853.5		35747.8		11267.8		29319.1		7086.9	

*p<0.05; AS: Activity Space; ICC: Intra Class Correlation; S.E. Standard Error

⁵⁶ N=3272

4. Chapter conclusions

One understandable concern involved in testing new spatial aggregation strategies (traditional vs potential activity space) to study contextual effects is related to the fact that results may change only because of the change in spatial aggregation units, and not because they actually reflect a better way to measure exposure. Therefore, results need to be carefully examined.

It is therefore interesting to note that conclusions drawn based on both aggregation strategies (traditional and potential activity spaces) are surprisingly similar. Most of the tested variables obtain similar coefficients in terms of direction (sign) and significance. In addition, when comparing traditional and potential activity space approach, most of the introduced variable blocks showed a similar effect on the relationship between contextual disadvantage and antisocial behaviour scores.

Results from both types of models (traditional and potential activity space), support the idea that there seems to be an unconditional effect of contextual disadvantage on the growth of antisocial behaviour diversity over time. Juveniles exposed to deprived areas not only report higher diversity of antisocial behaviours than juveniles exposed to less deprived areas but also show a steeper growth of antisocial behaviour (GABI) scores over time. This is an expected result which is consistent with the previous literature.

Results also suggest that most (according to the traditional approach) if not all (according to the potential activity space) of this initial effect is mediated by demographic and criminogenic factors. These results provide evidence to support hypothesis 00. The effect of contextual concentrated disadvantage on growth of antisocial behaviour diversity over time seems to be mostly indirect. It also seems to be

largely mediated by baseline antisocial behaviour and peer contagion effects (differential association).

There are however some differences between both models that may require some attention. The first one refers to the effect of contextual concentrated disadvantage which differs between the (fully specified) traditional and potential activity space models. Although the effect is small, results from the traditional model suggest that once other covariates have been controlled for, contextual concentrated disadvantage is related to a stabilization effect over time. Contrary to this, in the activity space model the effect of concentrated disadvantage is fully explained away by introduced covariates. This difference is related to how contextual effects have been aggregated. One possible explanation is the traditional approach may be slightly more able to capture overall self-selection effects than to capture clear contextual effects. This because lower SES students tend to live closer to their schools (2 km in average), whereas high SES students tend to live farther away (4 km in average). Thus lower SES students will be more likely to live within the same census tract than other students of the same school. This would not emerge in the activity space approach because it may help to disrupt this correlation by introducing an actor based and distance based contextual aggregation strategy, thus introducing more variability to this measure. It might be that the remaining significant coefficient is expressing an effect that is specifically related to living in deprived areas that, as discussed earlier, may be related to an effect on the shape of the age-crime curve.

The second relevant difference between the traditional and activity space models regards contagion effects. Both variables namely “concentration of deviant schoolmates within school” and “concentration of deviant schoolmates outside of school” (census

tract or activity spaces) predict growth in antisocial behaviour scores once the other one has been dropped from the model. Observed differences can be however attributed to multicollinearity issues. Since both variables refer to contextual facilitation of differential association it is not possible to determine if one might be redundant. It is however thought that both factors may play a part in explaining growth in antisocial behaviour diversity. This finding is interesting since macro level “contextual concentration of deviant peers with arrest records” did not result in a significant coefficient either for the traditional or the activity space model. It could be argued that, on a smaller scale, concentration of antisocial peers may not only be considered as a mediator, but also as a contextual characteristic in its own right. This discussion will be picked up again in chapter 10.

Finally, the data were also explored with regarding to hypothesis 01, namely that contextual effects of different activity space characteristics (disadvantage or concentration of peers with arrest records) on antisocial behaviour may vary depending on the type of activity space. Results did not support the idea that different types of activity spaces may have differential effects on antisocial behaviours scores. This finding may be partly attributed to the fact that some activity spaces may overlap, leading to some degree of similarity across them.

Beyond the above mentioned similarities and differences, the potential activity space model presents some key advantages related to its evidence base, its sensitivity to capture time varying variables and the possibility it affords to help tease apart differential effects of the characteristics of diverse potential activity spaces on behavioural outcomes. Thus specific hypotheses on criminogenic variables and their

mediation and interaction effects will be tested using an activity space approach (see chapters 8, 9 and 10).

**Chapter 8: Examination of indirect contextual influences on antisocial behaviour:
the relationship between strain and contextual variables**

The present chapter aims to address specific mediation and interaction effects regarding the theoretical approach of strain. As was explained in Chapter 4, strain refers to negative affective states: usually anger and related emotions. These negative emotional states result from frustration induced by negative relationships (Agnew 1992) or perceived contradictions in the social structure (Merton, 1957) that prevent the achievement of positively valued goals. These negative emotional states are thought to lead to pressure for a corrective action. Under certain circumstances, this corrective action is thought to lead to delinquent acts (Agnew, 1992).

The fundamental ideas of strain (anomia) theory can be traced back to Emile Durkheim and Robert Merton. These ideas were further developed by other authors like Richard Cloward, Lloyd Ohlin (1960), Messner and Rosenfeld, (1997) and Robert Agnew (see, for example, Agnew, Cullen, Burton, Evans and Dunaway, 1996; or Agnew and Thaxton, 2004).

1. Revisiting hypotheses regarding the relationship between contextual disadvantage and strain

Agnew (1999) suggested that disadvantaged communities were not only more likely to retain strained individuals, but would also act as amplifier of strain (Agnew, 1999). Other theoretical developments by Wilson (1987) and Anderson (1990) also imply that a neighbourhood's concentrated disadvantage may have a primary role as a source and an amplifier of strain related processes. In this regard, a wide range of studies have given support to the idea of a positive correlation between economic deprivation and antisocial behaviour (Braithwaite, 1981; Sampson, 1986; Thornberry and Farnworth, 1982; Hirschi, 2004; Farnworth, Thornberry, Krohn and Lizotte, 1994; Weatherburn

and Lind, 1997). In addition, strain is believed to be one key mediating variable. In spite of this fact, most of these studies do not address contextual level measures but rather only use individual level measures.

Studies addressing this dimension have also been supportive of the contextual disadvantage – antisocial behaviour relationship (see, for example, Weatherburn and Lind, 1997; Araya and Sierra, 2002; Thornberry and Farnworth, 1982; Crutchfield and Pitchford, 1997; Allan and Steffenmeister, 1989; Pratt and Godsey, 2003; Collier-Goubil, 2010).

The main problem is that the abovementioned studies only rely on external measures, which are presumed to be stressful for the subjects. None of those studies actually verifies if external measures are actually correlated with subjective measures of strain. In another words studies usually do not verify if the impact of certain external conditions are mediated subjective strain. Another series of studies has been supportive of a positive relationship between subjective strain and antisocial behaviour (Menard, 1995; Agnew et al., 1996; Spohn, 2004; Bao, Haas and Pi, 2007).

Evidence also suggests that subjective strain may mediate the contextual disadvantage – antisocial behaviour relationship (Warner and Fowler, 2003; Boardman, Finch, Ellison, Williams and Jackson, 2001; Curry and Latkin, 2003; Warner and Fowler, 2003; Spohn, 2004).

Even though evidence is generally supportive, previously cited research has been subject to the same methodological problems that have been discussed in the systematic review in the first section (e.g. same source bias and cross sectional design, among,

others)⁵⁷. Also, while most neighbourhood effects studies have concentrated on the study of social control and contagion processes, fewer studies have been focused on strain related processes. Very limited research has been done in longitudinal studies on strain as a potential mediator between neighbourhood disadvantage and behaviour (for example Drukker et al., 2010, focused only on parental stress). A final caveat relates to how strain has been measured. Strain has been mostly measured in terms of exposure to noxious stimuli (exposure to violence and economic strain) and negative emotional states (psychological distress). Perceived goal blockage, which is a core feature of strain, has seldom been measured. Also the strain hypothesis has remained relatively un-researched within the neighbourhood effects literature. It could be argued that this is an important gap in the literature. Conceptually speaking strain cannot be considered as synonymous to stress. A key difference between strain and stress, is that the source of the former is related to a social state that is may be perceived as being unfair (Bjarnason, 2009) whereas sources of stress may refer to any type of circumstance that is perceived as overwhelming. Based on the literature review presented in chapter 3, the following hypotheses were proposed:

Hypothesis 1: Subjective strain variables are expected to predict increased diversity of levels of antisocial behaviours.

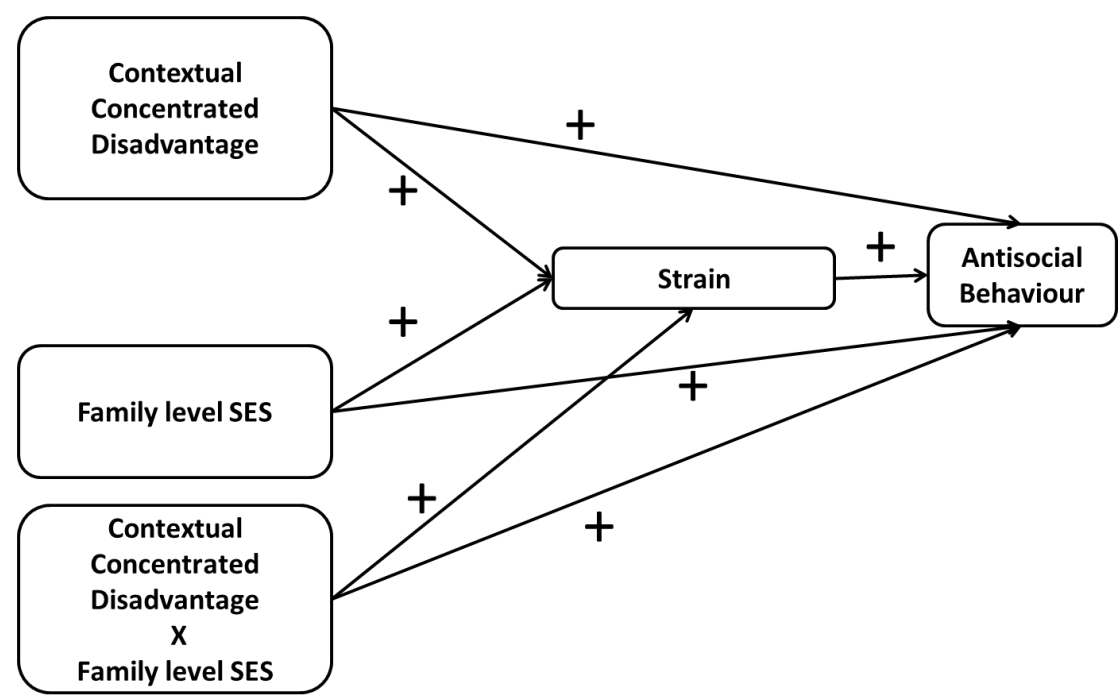
Hypothesis 2: It is expected to find a significant interaction effect between contextual level concentrated disadvantage and individual level SES, predicting increased antisocial behaviour.

Hypothesis 3: Finally, it is expected that the effect of “contextual disadvantage”, and “individual level SES” (and their interaction effect) on antisocial behaviour would be, at

⁵⁷ For a detailed discussion, please refer to the complementary appendix.

least partially, mediated by subjective strain (Hypothesis3). See summary of hypotheses in figure 8.1.

Figure 8.1: Hypotheses Regarding the Relationship Between Disadvantage, Strain and Antisocial Behaviour *



**Model will be adjusted by social control variables, contagion variables, and controls*

2. Brief methods overview

As was described in Chapter 4, after main effect models were estimated, tests for interaction and mediation effects were conducted. In order to conduct these tests a three-step process was used. Each mediational path was tested independently (Roth and MacKinnon, 2012; Baron and Kenny, 1986).

Firstly, the total effect “*c*” of the independent variable *X* on *Y* (outcome) was estimated. This effect excludes the mediator variable *M*, but is adjusted by all other covariates of the fully specified model and an error term *e* (see equation 8.1 and figure 8.2).

$$Y = i + cX + (\text{covariates}) + e \quad [\text{Equation 8.1}]$$

In a second step, the effect of *X* on the mediator *M* is established (equation 8.2).

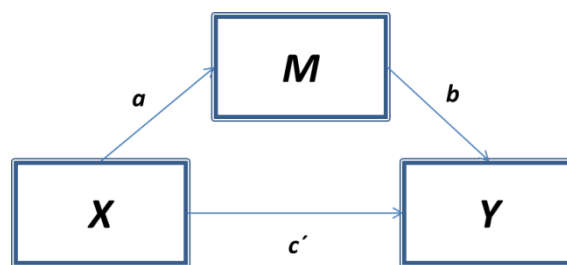
$$M = i + aX + (\text{covariates}) + e \quad [\text{Equation 8.2}]$$

In the final step, the full model including *X* and *M* is estimated. This is the same as the fully specified main effects model (see equation 8.3).

$$Y = i + bM + c'X + (\text{covariates}) + e \quad [\text{Equation 8.3}]$$

Figure 8.2 provides a conceptual overview of this process.

Figure 8.2: Single Mediation Model



Usually the mediating effect is calculated by multiplying $a*b$ or subtracting $c-c'$. In the present thesis the “ $a*b$ ” method was used. Chapter 4 provides a more detailed description of this method.

3. Results

Table 8.1 displays results of the regression models that will be used to assess mediation effects. The first model (1) corresponds to the fully specified potential activity space model estimated in Chapter 7. It should be remembered that in this model neither contextual disadvantage nor family level SES predicts antisocial behaviour once other covariates have been controlled for. It will now be explored if this can be attributed, at least partially, to a mediation effect of strain indicators.

Before addressing mediation issues, first the interaction effect between contextual concentrated disadvantage and family level SES was included. As can be seen in table 8.1 (model 2), none of the included interaction terms were significant, nor did they contribute to an improved model fit ($\chi^2 = 1.38$; $p > 0.05$; $df = 1$) compared to model 1.

In the next model (3) the initial steps exploring whether strain indicators may potentially mediate the effect of disadvantage (contextual and family level SES) on antisocial behaviour were taken. Model 3 is equal to model 2, with the exception that all strain indicators were dropped [equation 8.1] in order to ascertain the main marginal effect of disadvantage on antisocial behaviour. As can be seen, none of the disadvantage indicators significantly predicts antisocial behaviour once other covariates have been controlled for. Even though these results would suggest the need to stop the mediation model, MacKinnon (2008) suggests that there may be non-significant effects of disadvantage on antisocial behaviour and still be a significant mediation effect. This would happen in inconsistent mediation models where the main effect and the mediated effect may have opposite signs. In these models, the relationship between disadvantage and antisocial behaviour increases in magnitude when it is adjusted for the mediator.

Therefore in a second step (models 4, 5 and 6), it was assessed whether disadvantage indicators may significantly predict each of the three strain indicators (“High Educational Aspirations”, “Low Educational Expectations” and “Strain”) [equation 8.2]. Results suggest that neither contextual level disadvantage or the proposed interaction effects significantly predict any of the proposed mediators. Despite these findings, family level SES (low and mid) does significantly predict increased levels of low educational expectations and increased strain. Also, interestingly, contextual concentration of deviant peers does seem to be related to increased levels of strain.

In a third step it was verified whether the mediators (M) did affect antisocial behaviour (Y) when disadvantage indicators (X) have been controlled for. As can be seen in model 1, the variable “high educational expectation” fails to significantly predict antisocial behaviour once other covariates have been controlled for.

The analysis so far suggests that the effect of contextual disadvantage on antisocial behaviour does not seem to be transmitted through strain indicators. However, since family level SES may transmit its effects through two of the three selected strain indicators, mediation effects were tested. In addition, a supplementary analysis was conducted to address if strain would significantly mediate the effect of contextual concentration of peers with arrest records on antisocial behaviour. Table 8.2 presents the results of mediation effects for SES. Since confidence intervals for mediation effects of strain and low educational expectations do not include zero within their boundaries, this suggests that both variables significantly mediate the effect of SES on antisocial behaviour once other covariates have been controlled for. On the other hand, strain does not significantly mediate the effect of concentration of peers with arrest records on

antisocial behaviour. The final model is presented in figure 8.3. Discontinuous lines identify studied variables that do not show either direct or indirect effects.

Table 8.1: Interaction Effects and Initial Mediation Analysis: Strain (N=3272)

	1		2		3		4		5		6	
			Interaction									
			Cont.		X->Y							
			Conc. Dis		(Med							
	Full Model	S.E.	* F. SES	S.E.	excl.)	S.E.	X->M1	S.E.	X->M2	S.E.	X->M3	S.E.
Response	GABI		GABI		GABI		H.Ed.Asp		L.Ed.Expect		Strain	
Fixed Part												
cons	1.319*	0.269	1.311*	0.269	1.282*	0.259	0.67*	0.082	0.125	0.156	-0.05	0.152
Wave	0.314*	0.017	0.313*	0.017	0.313	0.017	-0.004	0.005	0.012	0.01	0.009	0.01
AS Context. Conc. Disadv.	0.047	0.037	-0.01	0.062	-0.012	0.063	-0.016	0.019	0.032	0.041	0.022	0.04
AS Cont. Conc. Juv. w/arrest												
records	-0.049	0.026	-0.048	0.026	-0.045	0.026	-0.004	0.008	0.035	0.018	0.037*	0.017
School Added Value	-0.041	0.025	-0.045	0.026	-0.043	0.026	-0.014	0.008	-0.004	0.022	-0.005	0.021
Baseline age	-0.067*	0.018	-0.067*	0.018	-0.063*	0.018	-0.011	0.006	0.045*	0.011	0.038*	0.011
Male	0.08*	0.027	0.081*	0.027	0.076*	0.027	0.018*	0.008	0.042*	0.016	0.054*	0.016
SES (Low)	-0.018	0.041	0.001	0.044	-0.003	0.044	0.025	0.014	0.116*	0.026	0.112*	0.025
SES (Mid)	-0.061	0.039	-0.039	0.043	-0.04	0.043	0.017	0.014	0.091*	0.025	0.089*	0.025
Baseline Antisocial Behaviour	0.926*	0.011	0.926*	0.011	0.928*	0.011	-0.01*	0.003	0.016*	0.007	0.009	0.006
High Educ. Aspirations	-0.073	0.078	-0.075	0.078	-	-	-	-	-	-	-	-
Low Educ. Expectations	0.312*	0.103	0.309*	0.103	-	-	-	-	-	-	-	-
Strain	-0.34*	0.106	-0.337*	0.106	-	-	-	-	-	-	-	-
Lives with mother & other	0.147*	0.046	0.145*	0.046	0.146*	0.046	-0.01	0.014	-0.032	0.027	-0.039	0.026
Lives with father & other	0.117	0.155	0.117	0.155	0.141	0.151	-0.041	0.048	-0.025	0.089	-0.101	0.088
Lives with mother only	0.065*	0.032	0.064*	0.032	0.068*	0.032	0.006	0.01	0.036	0.019	0.039*	0.018
Lives with father only	0.001	0.101	-0.001	0.101	-0.001	0.101	0.001	0.032	0.076	0.058	0.079	0.057
Lives with neither parents	0.046	0.084	0.049	0.084	0.041	0.084	0.065*	0.026	0.071	0.048	0.091	0.047
Parental attachment	-0.015	0.022	-0.015	0.022	-0.018	0.021	0.032*	0.007	-0.034*	0.012	-0.018	0.012
Paretal monitoring	-0.201*	0.026	-0.201*	0.026	-0.213*	0.025	0.05*	0.008	-0.089*	0.015	-0.059*	0.014
Schoo attachment	-0.012	0.014	-0.013	0.014	-0.021	0.014	0.026*	0.004	-0.052*	0.008	-0.031*	0.008
Best Friends Antisocial Behaviour	0.04*	0.008	0.04*	0.008	0.04*	0.008	0.002	0.002	0.009*	0.004	0.01*	0.004
Proportion Deviant Schoolmates	0.986*	0.241	0.985*	0.241	0.978*	0.241	0.094	0.075	-0.368*	0.153	-0.303*	0.15
Proportion Deviant Schoolmates in AS	-0.22	0.361	-0.222	0.364	-0.243	0.366	-0.051	0.111	0.709*	0.246	0.632*	0.241
AS Context. Conc. Disadv. *low SES	-	-	0.066	0.075	0.071	0.075	0.017	0.023	0.017	0.046	0.018	0.045
AS Context. Conc. Disadv. *Mid SES	-	-	0.085	0.072	0.095	0.072	-0.002	0.022	0.04	0.043	0.02	0.042

*p<0.05; GABI: General Antisocial Behaviour Index; SES: Socioeconomic Status; AS: Activity Space; S.E. Standard Error

Table 8.1: Interaction Effects and Initial Mediation Analysis⁵⁸ (Continued)

	1		2		3		4		5		6	
			Interaction		X->Y							
			Cont.		(Med							
			Conc. Dis		excl.)							
	Full Model	S.E.	* F. SES	S.E.	S.E.	S.E.	X->M1	S.E.	X->M2	S.E.	X->M3	S.E.
Response	GABI		GABI		GABI		H.Ed.Asp		L.Ed.Expect		Anomia	
Random Part												
Level: Wave	0.385*	0.015	0.385*	0.015	0.387*	0.015	0.039*	0.002	0.107*	0.004	0.108*	0.004
Level: Individual	0.104*	0.014	0.103*	0.014	0.103*	0.014	0.01*	0.001	0.056*	0.005	0.048*	0.005
Level: School	0.003	0.002	0.003	0.002	0.003	0.002	0	0	0.006*	0.002	0.006*	0.002
School Level ICC	0.006		0.006		0.006		0.000		0.036		0.037	
Individual Level ICC	0.217		0.216		0.215		0.204		0.367		0.333	
-2*loglikelihood:	7086.994		7085.564		7179.11		-649.36		3317.882		3224	

*p<0.05; GABI: General Antisocial Behaviour Index; AS: Activity Space; ICC: Intra Class Correlation; S.E. Standard Error

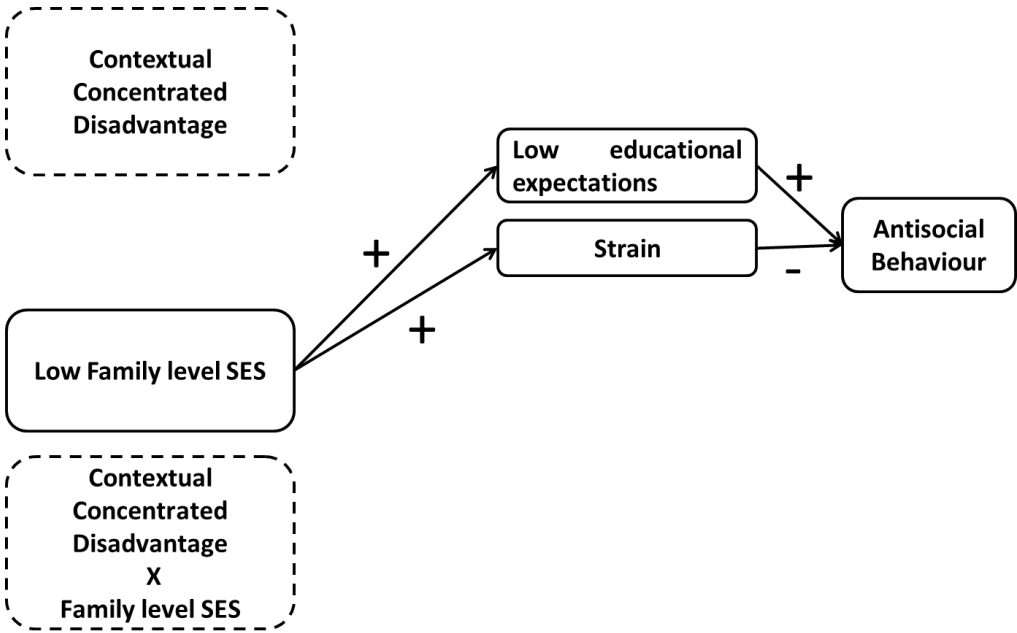
Table 8.2: Strain Mediation Effects

	a		b		Mediated	Lower Conf.		Upper Conf.
		S.E.		S.E.	Effect	S.E.	Interval	Interval
SES (Low) ->Low Ed. Ex.-> GABI	0.116	0.026	0.312	0.103	0.036	0.014	0.008	0.064
SES (Low) ->Strain-> GABI	0.112	0.025	-0.34	0.106	-0.038	0.015	-0.067	-0.009
AS Cont. Conc. Juv. w/arrest records ->Strain-> GABI	0.037	0.017	-0.34	0.106	-0.013	0.007	-0.026	0.001

*p<0.05; GABI: General Antisocial Behaviour Index; S.E. Standard Error

⁵⁸ N=3272

Figure 8.3: Disadvantage, Strain and Antisocial Behaviour: Final Model *



**Model adjusted by strain variables, other social control variables, contagion variables, and controls*

4. Chapter conclusions

The present chapter aimed to test hypotheses about whether contextual concentrated disadvantage interacts with individual level concentrated disadvantage, to predict increased levels of antisocial behaviour diversity over time. In addition, it was tested whether at least part of the effect of contextual disadvantage, and its interaction effects, is mediated by indicators of strain.

Regarding hypotheses 1 (*“Subjective strain variables are expected to predict increased levels of antisocial behaviours”*), the findings of the main effects activity space models (Model 1, also examined in Chapter 7) suggest that only two out of three strain indicators predict a growth in antisocial behaviour diversity (“low educational expectations” and “strain”). Contrary to expectation, strain showed a stabilization effect on antisocial behaviour diversity, even though simple correlations suggested it had a positive cross sectional relationship with antisocial behaviour scores.

These results suggest that once other covariates have been controlled for, higher strain is related to stable (not increasing) average antisocial behaviour diversity over time. One possible explanation is that strain has an effect on the shape of the age crime-curve (Fabio, Loeber and Cohen, 2011), favouring an earlier initiation in antisocial behaviours (before 7th grade). Thus, it may be that for this group the present model is capturing the peak of the age crime curve (thus seemingly stable) rather than the initiation phase of the curve, which is what the study intended. Another explanation may be related to specialisation. Strained individuals may engage frequently in only one type of antisocial behaviours, thus this type of scale would not be able to capture this effect. The only way to address these issues would be to include longer observation periods and to improve on the measures of the dependent variable. Hence, only partial support

for hypothesis 1 was found.

In addition, and since interaction effects did not reach significance, no support was found for hypothesis 2 (*“It is expected that a significant interaction effect between contextual level concentrated disadvantage and individual level SES will be found, predicting increased antisocial behaviour.”*). As in the case of contextual disadvantage, the effect of individual level SES seems to have been explained away by other variables in the model.

Finally only partial support was provided for Hypothesis 3 (*“the relationship between “contextual disadvantage”, “individual level SES” (and their interaction effect) and antisocial behaviour would be, at least partially, mediated by subjective strain”*). None of the tested strain indicators significantly mediated the effect of contextual concentrated disadvantage on antisocial behaviour. Neither did strain indicators significantly mediate the effect of contextual concentration of deviant peers on antisocial behaviour.

In spite of that, low educational expectations and strain did significantly mediate the relationship between family SES and antisocial behaviour. As predicted, lower family level SES is related to decreasing levels of educational expectations and increasing levels of strain. However in turn, low educational expectations seem to be related to a steeper growth of antisocial behaviour diversity while the presence of strain is related to stable (not increasing) scores over time.

The stabilization effect (negative coefficient) of strain is somewhat difficult to interpret. This is partially related to the limitations in how the dependent variable was constructed (see chapter 6). As discussed before, although this finding may be related to its impact on the shape of the age crime curve, this hypothesis cannot be confirmed with the

present data. Accordingly, only partial support could be found for hypothesis 3.

There is very little research on the relationship between strain and contextual factors. Thus, some recommendations for future research might be ventured. Future studies addressing strain as a potential mediator of contextual effects might want to consider introducing earlier waves of measures (before 7th grade) and longer follow up periods to address if strain may be a predictor of earlier initiation of antisocial behaviours. Another recommendation for future research is related to the need to use more adequate measures of strain. Future studies should consider using strain measures that tap more directly into its key components (e.g. perception of blocked opportunities). It seems important to consider that strain is conceptually different from stress. Regarding this issue, it would be interesting to test measures that could address stressors that are actually perceived as unfair, which a key conceptual difference between stress and strain. In addition, measures of concentrated disadvantage and family level SES could also be improved on. Neither of those variables includes direct measures of income. Although these measures are correlated with income (see chapters 5 and 6), future studies might also consider testing propositions of strain theory for contextual effects by also incorporating income measures. As a final recommendation, future studies might also consider studying different types of antisocial behaviours (property crime, violent crime, etc.). This in order to assess if strain may have greater relevance for explaining the effects of contextual disadvantage on some types of antisocial behaviours, compared to others.

In the next chapter indirect effects of social control measures will be examined.

**Chapter 9: Examination of indirect contextual influences on antisocial behaviour:
the relationship between social control and contextual variables**

The present chapter aims to specifically test hypotheses regarding mediation and interaction effects related to informal social control and its relationship with contextual concentrated disadvantage.

Informal social control is one of the most researched theoretical approaches to the study of juvenile antisocial behaviour. As was described in Chapter 4, the origins of the social control perspective can be traced back to Travis Hirschi, who developed the "Social Bonding Theory" in 1969 (Hirschi, 2004). This theory focuses on understanding why, even though deviant means usually provide the most expeditious way to satisfy personal desires, people abstain from engaging in deviant behaviour. According to this theory, people do not want to disappoint significant others. Thus, people conform when they build strong attachment, commitment, and involvement, to prosocial institutions and organisations like family, school, and work, among others. If those bonds break, people are believed to be free to misbehave. Individuals who do not have such ties are believed to have greater freedom to engage in deviant behaviour because they have less to lose (Brezina, 1998).

There has been frequent recourse to social control theory as an explanatory framework for studying relevance of the family as a factor that may influence deviant behaviour. Within this framework, parenting variables are thought to foster attachment to conventional social norms. In addition, Sampson and Laub (1993) argued that criminal involvement is also inhibited by the exercise of direct controls such as monitoring and parental disciplinary style. Indirect controls (attachment) is thought to be fostered by "responsiveness". Parents, who are open, warm and responsive to their children's needs are thought to nurture attachment and thus promote indirect social

control. On the other hand, direct control primarily depends on supervision.

Since informal social control studies the attachment to prosocial institutions, the role of schools as a potential sources of informal social emerges as a relevant context to be studied. It is thought that because schools are institutions that socialise conventional norms and values, attachment to school may also help to foster conventional behaviour. If attending school becomes an unpleasant experience (degrading, demoralising), the attachment to this institution (thus its influence on behaviour) is believed to deteriorate. Students with low school attachment will also be "free" to engage in unconventional behaviour. It is also believed that children that develop a low attachment to school or parents will be more prone to affiliate with other deviant peers and be influenced by them (Hirshi, 2004).

1. Revisiting hypotheses regarding the relationship between contextual disadvantage and informal social control

Two groups of hypotheses were tested: one related to family level informal social control, and the second related to school level social control. The key issue here was to assess if informal social control variables may mediate the effect of contextual characteristics on antisocial behaviour.

In the case of family level social control, concentrated disadvantage is believed to provide a context of stressful experiences that may deteriorate parenting, specifically monitoring and attachment (see, for example, Plunkett, 1999; McLeod and Shanahan, 1993; Takeuchi, Williams and Adair, 1991; Ross, 2000; Baumer, 1999; Beyers, 2003; Beshears, 2005; Coster et al., 2006). In turn, reduced family level social control is thought to leave children exposed to other potentially unconventional influences, like peers (see, for example, Baumer, 1999; Lloyd and Anthony, 2003; Simons, Simons, Burt, Brody and Curtona, 2005; Eamon, 2002).

Findings of previous studies suggest that parental management (an expression of family level social control) mediate the effect of family level SES on antisocial behaviour (Loeber and Dishion, 1983; Larzelere and Patterson, 1990). Available evidence also suggests that the effect of contextual concentration of disadvantage on antisocial behaviour may also be mediated by family level social control (Beshears, 2005).

Therefore, the following hypotheses were proposed (please refer to Chapter 4 for a detailed discussion in this regard):

Hypothesis 4: Parenting variables (i.e. monitoring and attachment) will mediate the effect of both contextual concentrated disadvantage and family level SES on antisocial

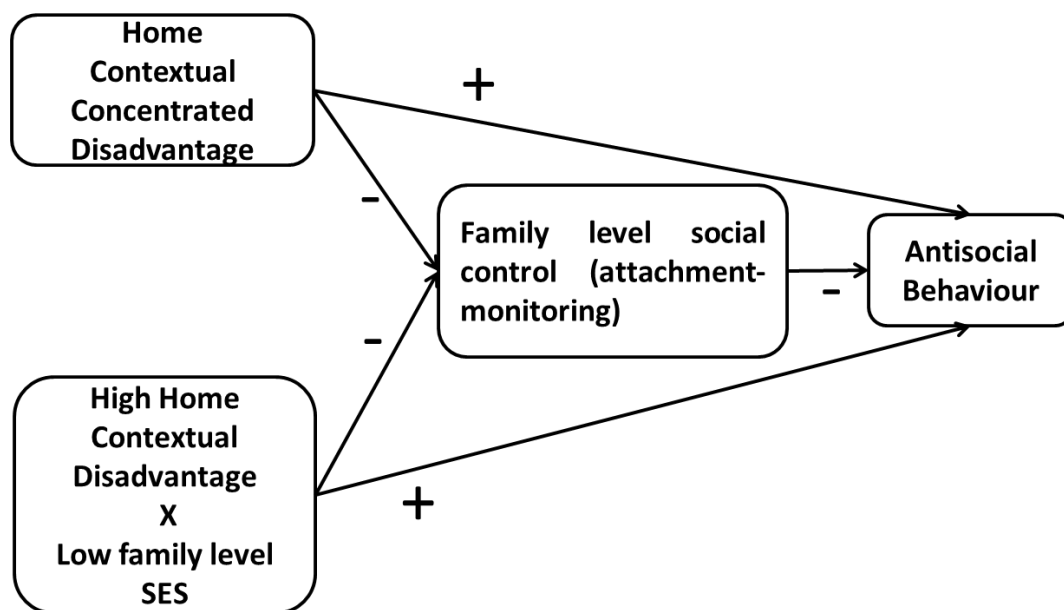
behaviour.

Hypothesis 5: Individual level SES and contextual concentrated disadvantage may interact, amplifying their effect on family level social control and antisocial behaviour.

Hypothesis 6: The effect of concentrated disadvantage surrounding respondents' home (i.e. home activity space) on family level social control should be stronger than the effect of contextual concentrated disadvantage surrounding other activity spaces.

Hypotheses 4, 5 and 6 are graphically displayed in figure 9.1.

Figure 9.1: Hypotheses Regarding the Relationship Between Family Social Control, Contextual Concentrated Disadvantage, and Antisocial Behaviour*



**Model will be adjusted by strain variables, other social control variables, contagion variables, and controls*

Regarding school level informal social control, the literature suggests that school attachment - an expression of informal social control - may also mediate the relationship between contextual disadvantage and antisocial behaviour (Baumer, 1998).

Formally it would be expected that:

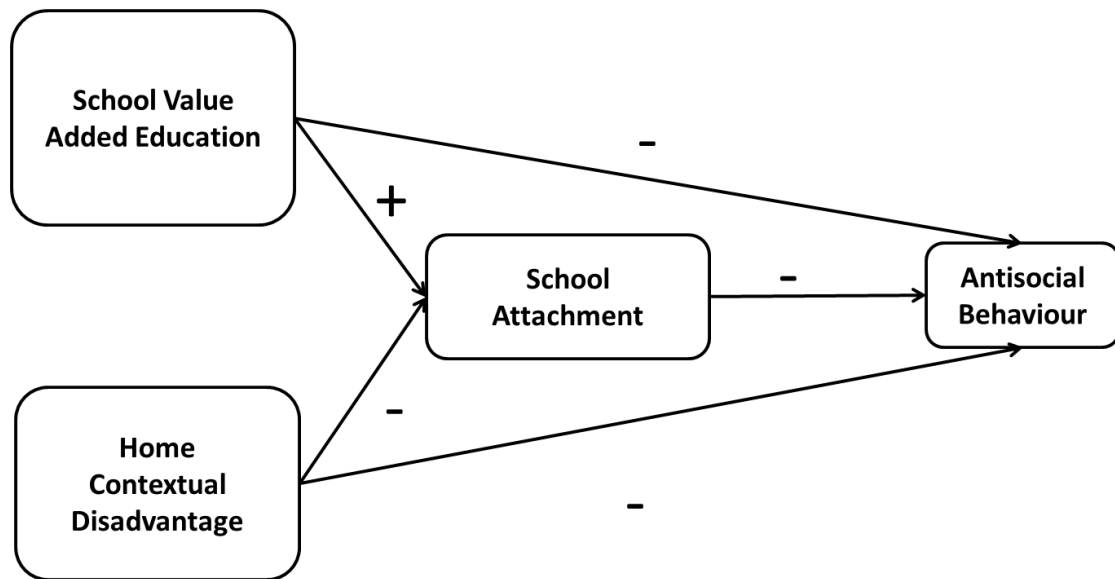
Hypothesis 7: Students attending schools providing value-added education would show lower levels of antisocial behaviours.

Hypothesis 8: The effect of school value-added education on antisocial behaviour will be at least partially mediated by school attachment.

Hypothesis 9: The effect of contextual concentrated disadvantage surrounding the student's home on antisocial behaviour will be at least partially mediated by school attachment.

A summary of hypotheses 7, 8 and 9 are depicted in figure 9.2.

Figure 9.2: Hypotheses Regarding the Relationship Between School Effectiveness, Concentrated Disadvantage, School Attachment and Antisocial Behaviour



**Model will be adjusted by strain variables, other social control variables, contagion variables, and controls*

2. Brief methods overview

The same approach used in Chapter 8 was followed. First, interaction effects were estimated. Interaction effects were produced by a multiplication of the relevant variables to be tested. The product of the two variables was added to the equation, which introduced an additional non-linear effect. Then, mediation effects were assessed using the conventional three step procedure described in Chapter 2 and revisited in Chapter 8 (Roth and MacKinnon, 2012; Baron and Kenny, 1986).

3. Results

Table 9.1 displays the results of the regression models that were estimated to assess family level social control mediation and interaction effects (hypotheses 4, 5 and 6 depicted in Figure 9.1). It should be remembered that the first model (1) corresponds to the fully specified activity space model estimated in Chapter 7. As it can be seen, in the final model, parental attachment did not significantly predict growth of antisocial behaviour diversity over time. Despite this, and as expected, parental monitoring is related to a significant stabilization effect. Regarding school level variables, even though value added education and school attachment do show main (unconditional) effects on antisocial behaviour, in the final model none of them shows significant coefficients. It has also to be reminded that in the final model (1), neither contextual disadvantage nor family level SES did significantly predict antisocial behaviour, once other variables have been controlled for.

In model 2, the interaction effect between contextual concentrated disadvantage and family level SES was included. Also, the overall contextual disadvantage indicator was replaced by the disadvantage indicators calculated for the home and school potential activity spaces. As can be seen in table 9.1, none of the included interaction terms were significant, nor did they contribute to an improved model fit. Therefore, no evidence was found to support hypothesis 5.

In the next model (3), the tested mediators (attachment and monitoring) were dropped. This was done in order to assess the direct marginal effect of contextual concentrated disadvantage in different activity spaces on antisocial behaviour. None of the macro-level contextual variables or the interaction effect with family level SES did significantly predict antisocial behaviour. For the present model specification, none of

the disadvantage indicators reaches a significant level, initially suggesting that there is no support for hypotheses 6. It is interesting to add, however, that if activity space concentrated disadvantage indicators are tested without controlling for other covariates, school activity space disadvantage significantly predicts antisocial behaviour, while home activity space concentrated disadvantage does not. As has been stated, this is interesting given the fact that most, if not all, neighbourhood effects studies only measure contextual characteristics of home based contexts (census tract) which may be misleading. Different types of activity spaces might have differential effects on measured outcomes. This should still be explored further in future studies. It could be proposed that the main reason for these variables failing to predict antisocial behaviour is related to the model specification. This effect has been explained away by other covariates. Even though some authors could argue that this may be reflecting “over control”, it should be noted that one of the aims of this thesis is to address potential mechanisms the effect of macro level contextual factors and antisocial behaviour.

Before completely ruling out that a mediation effect exists (inconsistent mediation may be at work), models 4 and 5 were estimated. Models 4 and 5 assessed if disadvantage indicators may significantly predict each of the two family level social control indicators (“parental attachment”, “parental monitoring”) [equation 9.2]. Results suggest that none of the contextual level disadvantage indicators, or their interaction effects, significantly predict any of the proposed mediators, after other covariates have been controlled for. Hence, no evidence was found that would support hypothesis 4 regarding the mediating effect of parental monitoring variables.

Even though there is a tendency for families with poorer monitoring and attachment indicators to live in contexts with higher levels of contextual disadvantage (please refer to descriptive results at the beginning of chapter 7), the presented findings suggest that the observed effects of contextual concentrated disadvantage are unlikely to be transmitted through deterioration of parenting. These results are not consistent with previous literature. It should be stressed that these results do not imply that family level social control variables are not relevant predictors of antisocial behaviour. In fact parenting (i.e. monitoring) still predicts antisocial behaviour. However, parenting does not seem to be mediating the effect of concentrated disadvantage on the growth of antisocial behaviour scores, once other factors have been controlled for. Thus, no mediation effects were found.

There is, however, an interesting, and unexpected, contextual effect that must be discussed. Although this was not part of the planned analysis, it should be noted that a higher activity space level concentration of juveniles with arrest records (home and school) significantly predicts lower parental monitoring levels. Consistent with previous findings, best friend's antisocial behaviour also shows a significant and negative relationship with parental monitoring which would have been expected. This result does, however, confirm that there seems to be a significant relationship between poor monitoring and exposure to contagion effects (peer differential association) over time, which is consistent with previous literature (see, for example, Baumer, 1999; Lloyd and Anthony, 2003; Simons, Simons, Burt, Brody and Curtona, 2005; Eamon, 2002).

There are two possible explanations for this association. On the one hand, it has been suggested that neighbourhoods with high crime levels may provide a stressful environment that could contribute to the deterioration of parental monitoring

(contextual effect) (see, for example, Plunkett, 1999; McLeod and Shanahan, 1993; Takeuchi, Williams and Adair, 1991; Ross, 2000; Baumer, 1999; Beyers, 2003; Beshears, 2005; Coster et al., 2006). Given that in the present study activity spaces are not restricted to the home activity space, this interpretation does not seem completely plausible. It may be more plausible to suggest that disadvantaged families that are more likely to end up living in certain neighbourhoods, may also have the tendency to display inadequate monitoring strategies. Both may be regarded as compositional effects. Clustering of families displaying poor social control (monitoring skills) in certain neighbourhoods might be one factor that explains why some these neighbourhoods also show a higher concentration of juveniles engaged in antisocial behaviours. Since these juveniles live in similar areas and attend the same schools, they will share similar activity spaces. This seems to be a key issue in explaining contextual effects on antisocial behaviour. This will be discussed in the next chapter when examining contagion effects. The possibility of calculating a mediation effect for this path was considered (contextual concentration of peers with arrest records => Low monitoring => Increased growth in antisocial behaviour scores). It may however not make sense to do so because; theoretically speaking, reverse causality may be at work. Therefore, it was decided not to do so.

The final model is presented in figure 9.3. Discontinuous lines identify studied variables that did not show either direct or indirect effects.

In the next part of the present chapter, a series of models to test school level mediation effects will be tested (See table 9.2).

Table 9.1: Interaction Effects and Initial Mediation Analysis: Family Level Social Control (n=3272)

	1	2		3	4		5			
			Interaction		X->Y		X->M1		X->M2	
	Full Model	S.E.	Cont. Conc.	S.E.	(Med excl.)	S.E.	(Attachment)	S.E.	(Monitoring)	S.E.
Response	GABI		GABI		GABI		P. Attachment		Monitoring	
Fixed Part										
cons	1.319*	0.269	1.283*	0.259	0.571*	0.255	4.036*	0.227	3.418*	0.194
Wave	0.314*	0.017	0.313*	0.017	0.32*	0.017	-0.04*	0.013	-0.047*	0.012
AS Context. Conc. Disadv.	0.047	0.037								
Context. Conc. Disadv. Home Activity Space	-	-	-0.004	0.051	0.004	0.053	-0.058	0.044	0.005	0.039
Context. Conc. Disadv. School Activity Space	-	-	0.023	0.033	0.013	0.036	-0.015	0.026	0.018	0.027
Context. Conc. Disadv. Home Activity Space * Low SES	-	-	0.021	0.061	0.016	0.062	0.1	0.052	-0.025	0.045
Context. Conc. Disadv. Home Activity Space* Mid SES	-	-	0.058	0.059	0.043	0.06	0.074	0.05	0.028	0.044
AS Cont. Conc. Juv. w/arrest records	-0.049	0.026	-0.046	0.026	-0.043	0.028	-0.011	0.021	-0.034	0.021
School Added Value	-0.041	0.025	-0.04	0.026	-0.029	0.029	0.021	0.019	-0.025	0.022
Baseline age	-0.067*	0.018	-0.063*	0.018	-0.058*	0.018	-0.018	0.017	-0.042*	0.014
Male	0.08*	0.027	0.075*	0.027	0.082*	0.027	0.24*	0.024	-0.025	0.021
SES (Low)	-0.018	0.041	-0.011	0.043	-0.004	0.044	0.024	0.037	0.005	0.032
SES (Mid)	-0.061	0.039	-0.054	0.041	-0.059	0.042	0.062	0.036	0.052	0.03
Baseline Antisocial Behaviour	0.926*	0.011	0.928*	0.011	0.949*	0.011	-0.076*	0.01	-0.103*	0.008
High Educ. Aspirations	-0.073	0.078	-0.073	0.078	-0.147	0.078	0.324*	0.064	0.322*	0.055
Low Educ. Expectations	0.312*	0.103	0.309*	0.103	0.324*	0.103	-0.051	0.085	-0.077	0.072
Anomia	-0.34*	0.106	-0.34*	0.106	-0.32*	0.107	-0.068	0.087	-0.076	0.074
Lives with mother & other	0.147*	0.046	0.147*	0.046	0.157*	0.046	-0.067	0.04	-0.058	0.034
Lives with father & other	0.117	0.155	0.138	0.151	0.236	0.147	-0.199	0.134	-0.089	0.107
Lives with mother only	0.065*	0.032	0.067*	0.032	0.078*	0.032	0.073*	0.029	-0.077*	0.024
Lives with father only	0.001	0.101	0.1	0.101	0.056	0.1	-0.193	0.088	-0.266*	0.073
Lives with neither parents	0.046	0.084	0.04	0.084	0.155	0.083	-0.622*	0.071	-0.442*	0.06
Parental attachment	-0.015	0.022	-0.018	0.021						
Paretal monitoring	-0.201*	0.026	-0.213*	0.025						
Schoo attachment	-0.012	0.014	-0.021	0.014	-0.035*	0.014	0.097*	0.012	0.093*	0.01
Best Friends Antisocial Behaviour	0.04*	0.008	0.04*	0.008	0.044	0.008	-0.009	0.006	-0.02	0.006
Proportion Deviant Schoolmates	0.986*	0.241	0.978*	0.241	0.972	0.25	-0.121	0.206	0.081	0.186
Proportion Deviant Schoolmates in AS	-0.22	0.361	-0.235	0.365	-0.056	0.383	0.08	0.297	-0.013	0.28

*p<0.05; GABI: General Antisocial Behaviour Index AS: Activity Space; S.E. Standard Error

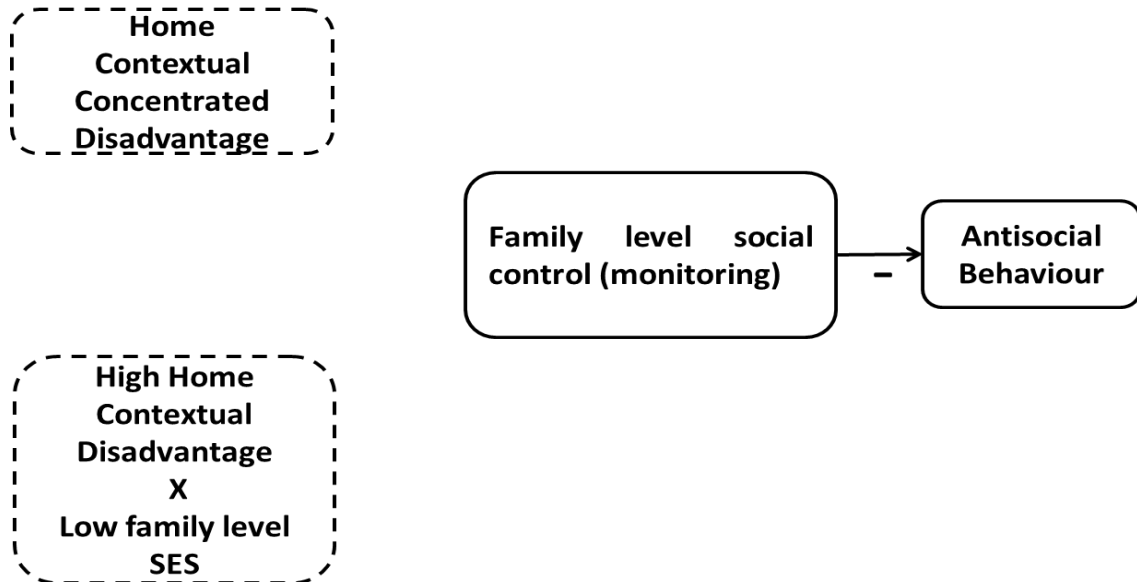
Continues

Table 9.1: Interaction Effects and Initial Mediation Analysis: Family Level Social Control⁵⁹ (Continued)

	1	2		3	4		5			
			Interaction							
	Full Model	S.E.	Cont. Conc.	S.E.	X->Y (Med excl.)	S.E.	X->M1 (Attachment)	S.E.	X->M2 (Monitoring)	S.E.
Response	GABI		GABI		GABI		P. Attachment		Monitoring	
Random Part										
Level: Wave	0.385*	0.015	0.386*	0.015	0.392*	0.015	0.199*	0.008	0.15*	0.006
Level: Individual	0.104*	0.014	0.103*	0.014	0.107*	0.014	0.176*	0.011	0.119*	0.008
Level: School	0.003	0.002	0.00	0.002	0.005*	0.003	0.000	0.000	0.003	0.000
School Level ICC	0.01		0.01		0.01		0.00		0.01	
Individual Level ICC	0.22		0.22		0.22		0.47		0.45	
-2*loglikelihood:	7087.0		7179.7		7185.3		5928.2		4882.8	

*p<0.05; S.E. Standard Error

Figure 9.3: Family Social Control, Contextual Concentrated Disadvantage, and Antisocial Behaviour: Final Model*



**Model adjusted by strain variables, other social control variables, contagion variables, and controls*

⁵⁹ N=3272

Now hypotheses 7, 8 and 9 will be tested (see figure 9.2). To test the proposed mediation effects, a series of regression models were estimated (table 9.2). Again, model 1 displays the results of the fully specified activity space model that was estimated in Chapter 7. Even though school level value added education did show a significant main effect (unconditional) on the reduction of antisocial behaviour, it loses its significance in the fully specified model. This could be regarded as partial evidence in favour of hypotheses 7. The initially observed main effect is consistent with previous literature. Additional analysis suggest that the effect school level value added educations losses its significance when contagion effects are added to the model. It may seem that the protective effect of value added education may be overridden by the school level concentration of deviant peers (and or in the activity spaces). One possible explanation for this finding is that schools (as an organisation) may have a harder time in organizing their activities when they concentrate high levels of students displaying antisocial behaviours.

Regarding school attachment, this variable also fails to predict antisocial behaviour in the fully specified model. This effect may have been explained away by family factors. Model 4 suggest that higher level parental monitoring and attachment is related to higher levels of school attachment. It could be thought that families displaying higher attachment and monitoring will also choosing better schools that may facilitate school attachment.

Model 2 displays the fully specified model, this time estimating the effect of contextual concentrated disadvantage and concentration of peers with arrest records by type of potential activity space (home-school). None of the contextual disadvantage indicators

significantly predicted antisocial behaviour. To assess if observed results may have been result of multicollinearity problems, models 2 and 3 were estimated including, one by one, indicators that were suspected to be subject to multicollinearity problems. In spite of this, results did not change. Consequently, the “no-significance” of these contextual factors does not seem to be related to multicollinearity problems.

Model 3 displays the effects of contextual variables on antisocial behaviour, this time dropping “school attachment” in order to assess direct effects. Again only “school activity space concentration of juveniles with arrest records” is negatively related with antisocial behaviour confirming it’s stabilizing effect.

The results of models 1 to 3 suggest that no mediation effect analysis should be attempted for this set of variables. School attachment (the key mediator) does not significantly predict antisocial behaviour after other covariates have been controlled for. In addition, the hypothesised relationship between contextual concentrated disadvantage and antisocial behaviours does not hold in any of the estimated models. As a result, no support for hypotheses 8 and 9 was found.

Despite these results, model 3 shows that concentration of peers with arrest records in the school activity space seems to have a significant but negative (unexpected) relationship with antisocial behaviour. This negative coefficient may be interpreted in the same way as the negative coefficient of strain, where the presence of high levels of juveniles with arrest records may be signalling a stabilization effect. Descriptive analysis suggests that a high concentration of peers with arrest records in the activity spaces is in fact related to an antisocial behaviour trajectory that starts above sample average (GABI

of 1.3 in 2008) and remains relatively stable during the next two waves (average GABI of 1.63 in 2009 and 1.68 in 2010).

As in the case of the strain coefficient (chapter 8) this may be related to a shift in the shape of the age crime curve. Attending to schools surrounded by high proportion of juveniles with arrest records may be related to an earlier initiation of antisocial behaviours thus reflecting a stable trend. This trend might be related to the peak of the age crime curve in this group whereas the rest of the sample is showing increased trends in antisocial behaviour scores. This finding was further explored in the next models (4 and 5).

Models 4 and 5 explore if contextual level variables may significantly predict reduced school attachment. Since contextual concentration of peers with arrest records loses its significance in model 3, it was explored whether this may be due to multicollinearity problems. In fact, after excluding activity space concentration of deviant schoolmates, contextual concentration of juveniles with arrest records gains significance. This time it predicts lower levels of school attachment. Dropping activity space concentration of deviant schoolmates is also related to a stabilization effect on antisocial behaviour in the fully specified model.

This suggests that contextual concentration of deviant peers may have a relevant influence on reduced levels of school attachment, potentially impacting earlier initiation of antisocial behaviours. Unfortunately, the present study has no earlier waves thus this derived hypothesis cannot currently be tested. Future studies may need to address this issue further.

Table 9.2: Interaction Effects and Initial Mediation Analysis: School Level Social Control (N=3272)

	1		2		3		4		5	
			Full Model		X->Y		X->M		X->M	
			Separated		(Med		(School		(School	
			Activity		excl.)		attachment)		attachment)	
	Full Model	S.E.	Spaces	S.E.	S.E.	S.E.	S.E.	S.E.	S.E.	S.E.
Response	GABI		GABI		GABI		SCHAT		SCHAT	
Fixed Part										
cons	1.319*	0.27	1.34*	0.27	1.319*	0.268	1.893*	0.33	1.897*	0.25
Wave	0.314*	0.02	0.309*	0.02	0.309*	0.017	0.028	0.02	0.043*	0.01
AS Context. Conc. Disadv.	0.047	0.04	-	-	-	-	-	-	-	-
AS Cont. Conc. Juv. w/arrest records	-0.049	0.03	-	-	-	-	-	-	-	-
Context. Conc. Disadv. Home Activity Space	-	-	0.011	0.03	0.011	0.027	0.008	0.03	-	-
Context. Conc. Disadv. School Activity Space	-	-	0.052	0.04	0.052	0.036	0.003	0.06	-	-
Cont. Conc. Juv. w/arrest records: Home Activity Space	-	-	0.002	0.02	0.002	0.019	-0.017	0.02	-	-
Cont. Conc. Juv. w/arrest records: School Activity Space	-	-	-0.068*	0.03	-0.067*	0.026	-0.036	0.04	-0.051*	0.02
School Added Value	-0.041	0.03	-0.047	0.03	-0.048	0.025	0.05	0.04	-0.004	0.03
Baseline age	-0.067*	0.02	-0.067*	0.02	-0.068*	0.018	0.015	0.02	0.014	0.02
Male	0.08*	0.03	0.081*	0.03	0.082*	0.027	-0.11*	0.03	-0.137*	0.03
SES (Low)	-0.018	0.04	-0.024	0.04	-0.023	0.041	-0.101*	0.05	-0.042	0.03
SES (Mid)	-0.061	0.04	-0.064	0.04	-0.064	0.038	-0.043	0.05	-0.035	0.03
Baseline Antisocial Behaviour	0.926*	0.01	0.926*	0.01	0.926*	0.011	-0.022	0.01	-0.026*	0.01
High Educ. Aspirations	-0.073	0.08	-0.073	0.08	-0.077	0.078	0.266*	0.09	0.229*	0.06
Low Educ. Expectations	0.312*	0.1	0.313*	0.1	0.317*	0.103	-0.341*	0.12	-0.315*	0.08
Anomia	-0.34*	0.11	-0.342*	0.11	-0.343*	0.106	0.146	0.13	0.092	0.09
Lives with mother & other	0.147*	0.05	0.149*	0.05	0.148*	0.046	0.076	0.06	0.019	0.04
Lives with father & other	0.117	0.16	0.111	0.16	0.106	0.155	0.366	0.19	0.129	0.12
Lives with mother only	0.065*	0.03	0.064*	0.03	0.065*	0.032	-0.031	0.04	-0.045	0.03
Lives with father only	0.001	0.1	0.004	0.1	0.002	0.1	0.182	0.12	0.035	0.09
Lives with neither parents	0.046	0.08	0.048	0.08	0.046	0.084	0.137	0.1	0.095	0.08
Parental attachment	-0.015	0.02	-0.014	0.02	-0.016	0.022	0.135*	0.03	0.145*	0.02
Parental monitoring	-0.201*	0.03	-0.201*	0.03	-0.204*	0.025	0.218*	0.03	0.234*	0.02
School attachment	-0.012	0.01	-0.013	0.01	-	-	-	-	-	-
Best Friends Antisocial Behaviour	0.04*	0.01	0.04*	0.01	0.041*	0.008	-0.019*	0.01	-0.024*	0.01
Proportion Deviant Schoolmates	0.986*	0.24	0.953*	0.24	0.955*	0.241	0.056	0.31	0.193	0.2
Proportion Deviant Schoolmates in AS	-0.22	0.36	-0.103	0.37	-0.116	0.364	0.848	0.5	-	-

*p<0.05; GABI: Antisocial Behaviour Index; SCHAT: School Attachment; AS: Activity Space; S.E. Standard Error
Continues

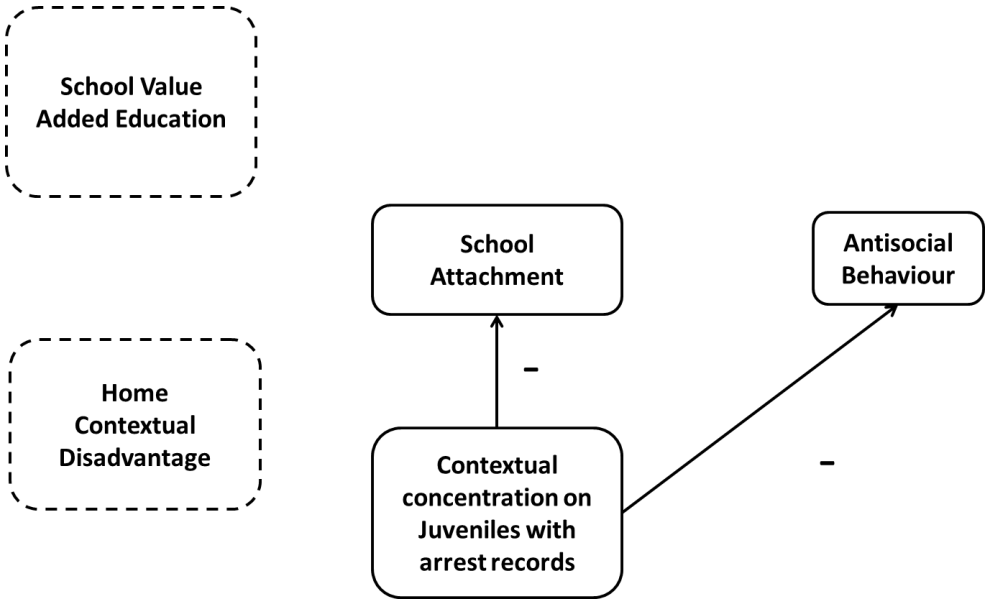
Table 9.2: Interaction Effects and Initial Mediation Analysis: School Level Social Control⁶⁰ (Continued)

	1		2		3		4		5	
			Full Model Separated Activity Spaces		X->Y (Med excl.)		X->M (School attachment)		X->M (School attachment)	
	Full Model	S.E.	S.E.	S.E.	S.E.	S.E.	S.E.	S.E.	S.E.	S.E.
Response	GABI		GABI		GABI		SCHAT		SCHAT	
Random Part										
Level: Wave	0.385*	0.02	0.385*	0.02	0.385*	0.015	0.495*	0.02	0.492*	0.01
Level: Individual	0.104*	0.01	0.103*	0.01	0.103*	0.014	0.221*	0.02	0.22*	0.01
Level: School	0.003	0.00	0.002	0.00	0.002	0.002	0.016*	0.01	0.017*	0.01
School Level ICC	0.006		0.004		0.004		0.022		0.024	
Individual Level ICC	0.217		0.214		0.214		0.324		0.325	
-2*loglikelihood:	7087.0		7083.1		7088.7		8323.0		7525.0	

*p<0.05; General Antisocial Behaviour Index; SCHAT; School Attachment; ICC: Intra class correlation;
S.E. Standard Error

⁶⁰ N=3272

Figure 9.4: School Level Social Control, Contextual Concentrated Disadvantage, and Antisocial Behaviour: Final Model*⁺



**Model adjusted by strain variables, other social control variables, contagion variables, and controls.*

+Estimated effects after dropping “contextual concentration of deviant schoolmates in activity space”

4. Chapter conclusions

The present chapter aimed to test if family level social control (parental attachment and monitoring) and school level social control (school attachment) may mediate the effect of contextual characteristics on antisocial behaviour. Mediation effects could not be estimated because hypothesised mediation paths did not hold after controlling for other covariates.

Regarding hypothesis 4 (*“Parenting variables (i.e. monitoring and attachment) will mediate the effect of both contextual concentrated disadvantage and family level SES on antisocial behaviour”*), the evidence did not support the expected mediating effect of parenting variables (i.e. monitoring and attachment) between contextual concentrated disadvantage, SES and antisocial behaviour. In addition, parental attachment did not reach significance in the fully estimated potential activity space model (model 1). Furthermore, neither SES nor contextual disadvantage variables significantly predicted parental attachment or monitoring. These results were rather unexpected. Even though family level SES has usually been found to have the weakest effect on antisocial behaviour (Loeber and Dishion, 1983), evidence suggested that family level social control variables (parental management) should have mediated the effect of family level SES (Larzelere and Patterson, 1990) and contextual concentration of disadvantage (Beshears, 2005) on antisocial behaviour. This result may be related to SES lacking an income component. However, SES does have a main (unconditional) effect on reduced monitoring and attachment. In particular the effect of SES on monitoring is explained away when contagion effects are introduced in the model. This may suggest that an alternative path through which SES may be operating is to facilitate exposure of juveniles to school-neighbourhood contexts where a higher concentration of deviant

peers may be present. This may be the same reason why no support was found for hypothesis 5 (*“Individual level SES and contextual concentrated disadvantage may interact, amplifying their effect on family level social control and antisocial behaviour”*).

Regarding Hypothesis 6 (*“The effect of concentrated disadvantage surrounding respondents’ home (i.e. home activity space) on family level social control should be stronger than the effect of contextual concentrated disadvantage surrounding other activity spaces”*) suggested that the effect on parenting of concentrated disadvantage in the home activity space should be stronger than the effect of contextual concentrated disadvantage surrounding other activity spaces. Since no contextual effect was significant, no evidence to support this hypothesis was found. However, when the effect of both activity spaces has been compared (without introducing other covariates), the characteristics of the school potential activity space appeared to be stronger than characteristics of the home activity space. This finding may be explored in more detail in future studies. It also seems that some of these effects have been captured by other covariates, in particular contagion effects. Low SES may be a factor leading to families to live in riskier neighbourhoods, increasing the risk of exposure to school-neighbourhood contexts with higher concentrations of juveniles engaging in a wider variety of antisocial behaviours.

Regarding school level social control three hypotheses were tested.

In relation to hypothesis 7 (*“Students attending schools providing value-added education would show lower levels of antisocial behaviours”*), even though there is a main effect of value-added education on reduced levels of antisocial behaviour (Chapter 7), this variable does not maintain a significant level in the fully specified potential

activity space model. Results suggest that its effect is also explained away by baseline antisocial behaviour and contagion effects. It might be possible that higher concentrations in schools of juveniles engaged in a variety of antisocial behaviours may be more challenging to address by the school organization. Staffing and resources may not be sufficient to address specific needs of this type of population, thus limiting the chances to provide value added education and impacting reduced levels of antisocial behaviour engagement. This subject is relatively new and warrants more research that could help enhance the potential of school to act as preventive agents. This may be the same reason why no evidence for hypothesis 8 was found (*“The effect of school value-added education on antisocial behaviour will be at least partially mediated by school attachment”*).

Finally, regarding hypothesis 9 (*“the effect of contextual concentrated disadvantage surrounding the student’s home on antisocial behaviour will be at least partially mediated by school attachment”*) since concentrated disadvantage surrounding the student’s home did not significantly predict antisocial behaviour, nor did school attachment, thus no support for hypothesis 9 was found. Results so far suggest that by itself, concentrated disadvantage does not seem to be a relevant factor predicting antisocial behaviour scores. It’s effect is fully mediated by other factors.

Results presented in chapters 7, 8 and 9 suggest that contagion effects (peer differential association) may be a relevant factor affecting the relationship between antisocial behaviour and other predictors. It also seems to be a relevant factor for explaining the effect of concentrated disadvantage on the growth of antisocial behaviour diversity. Little is known about how peer contagion effects may relate to contextual concentrated disadvantage and antisocial behaviour. In the next chapter, contagion effects will be

examined in detail.

Chapter 10: Examination of indirect effects: the relationship between contagion effects and contextual variables

Results presented in the last two chapters seem to suggest that some of the observed results might be somehow related to contagion effects, specifically peer differential association. This is interesting, given the fact that, as was argued in chapter 3 (systematic review), peer effects have been usually ignored and poorly measured in the context of neighbourhood effects research. Since included contagion effects have shown to be important predictors of antisocial behaviour, the present study paid special attention to incorporating adequate measures of peer differential association.

As it has already been discussed in chapter 7 and 9, the inclusion of peer contagion effects seems to contribute to a significant reduction of the coefficients of contextual concentrated disadvantage and school level value-added education as predictors of antisocial behaviour scores over time. Contagion effects also seem to explain away the effect of family level SES on monitoring.

As strain perspectives focus on the role of structural contradictions and emergent subjective tensions, and social control perspectives study the breakdown of attachment and informal social control, the contagion effects perspective focuses on how problematic and deviant behaviours are learned and reinforced.

As it was mentioned before the first criminologist to theorise about contagion effects was Edwin Sutherland, in 1947 (Sutherland, Cressey and Luckenbill, 1992), who argued that deviant behaviour could be learned in interactions with others. A key aspect of social learning of deviant behaviour is related to the principle of differential association. This principle states that deviant behaviour may be learned because of an excess of “definitions” (i.e. motivations, attitudes and rationalisations) favourable to law violation over definitions not favourable to law violations. This may happen when individuals

come into contact with deviant definitions and are isolated from other non-criminal affiliations. From this perspective, those social relationships that start early, are more durable, occur more frequently, and occupy a greater degree of personal time, may have a greater effect on behaviour.

Differential association with deviant peers is usually thought to play a key role in explaining antisocial behaviour. It is thought that, as juveniles grow older, the importance of peer differential association in explaining antisocial behaviour increases. Some previous studies suggest that the effect of contextual poverty may depend on peer networks living within the same neighbourhood (Oberwittler, 2007). As Oberwittler suggests, and given the fact that juveniles with arrest records tend to concentrate within areas with high concentrated poverty (Shaw and McKay, 1969), it seems plausible to think that peer differential association might (at least partially) explain the effect of concentrated disadvantage on antisocial behaviour.

The present chapter aims to explore the role that contagion effects, and specifically peer differential association, may have in explaining the link between contextual disadvantage and antisocial behaviour.

1. Revisiting hypotheses regarding the relationship between contextual disadvantage and contagion effects

The previously cited literature suggests that peer differential association (i.e. contagion effects) on antisocial behaviour may be structured through three spatial processes. The first process relates to what has been called “the geographic propinquity effect”. Geographic propinquity refers to how families, organisations (e.g. schools) and social positions may create contexts where homophilous relationships develop (McPherson, Smith-Lovin and Cook, 2001). As described earlier, “homophily” refers to the tendency to form relationships with people that are similar (e.g. in terms sex, age, race, education, and other factors). Homophily is also a key determinant of friendship formation, and by extension, a relevant process to address the problem of differential association. Attending to the same school or living nearby may increase the probability of a tie formation (friendship or acquaintance). Consequently, it could be thought that overlapping activity spaces may increase the chances of tie formation. It seems reasonable to propose that higher concentrations of same-aged deviant peers (either self-reported or with arrest records) in key activity spaces may increase the likelihood of differential affiliation among them. In this context, family level SES, as an indicator of social position may also be considered as a relevant factor fostering geographic propinquity.

The second relevant spatial process that has been addressed relates to “co-offending literature”. This refers to the fact that delinquent acts tend to be committed in groups, and co-offenders are likely to live close to each other (Reiss and Farrington, 1991). It follows that once a tie is established offending may be facilitated by the presence of other juveniles living nearby and willing to co- offend. It follows that ties facilitating

offending may not need to be stable (as in a friendship) but can also be short lived and driven by particular situations.

The third spatial process is related to concentrated disadvantage as an indicator of contextual level social control. Since routine activities are usually structured around key activity nodes, it seems reasonable to investigate if the characteristics of those contexts might facilitate or inhibit antisocial behaviours. It has been usually thought that contexts with low levels of supervision and social control may provide opportunities for unstructured socialising activities (Maimon et. al, 2010), thus facilitating occurrence and differential affiliation and co-offending. Previous literature also suggests that concentrated disadvantage may play an important role in reducing the capacity of residents of an area to exert informal social control (Sampson, Raudenbush and Earls, 1997; Sampson, 1999; Wikstrom, Oberwittler, Treiber and Hardie, 2012). Therefore, concentrated disadvantage has usually been considered as a proxy for low levels of informal social control. In the case of peer differential affiliation, (as noted before) evidence suggests that concentrated disadvantage may intensify the relationship between peer effects and antisocial behaviour (Bellair and McNulty, 2009). This is because co-offending may be facilitated in a context with low levels of social control.

Following the previous discussion summary, the following hypotheses could be proposed:

Hypothesis 10: Concentration of delinquent juveniles (i.e. with arrest records) living within activity spaces will have a direct effect on increased levels of antisocial behaviour (Hypothesis10).

Hypothesis 11: Since additional school related propinquity effects should also be accounted for, it would also be expected that a concentration of deviant schoolmates within school would also have a direct effect on increased levels of antisocial behaviour.

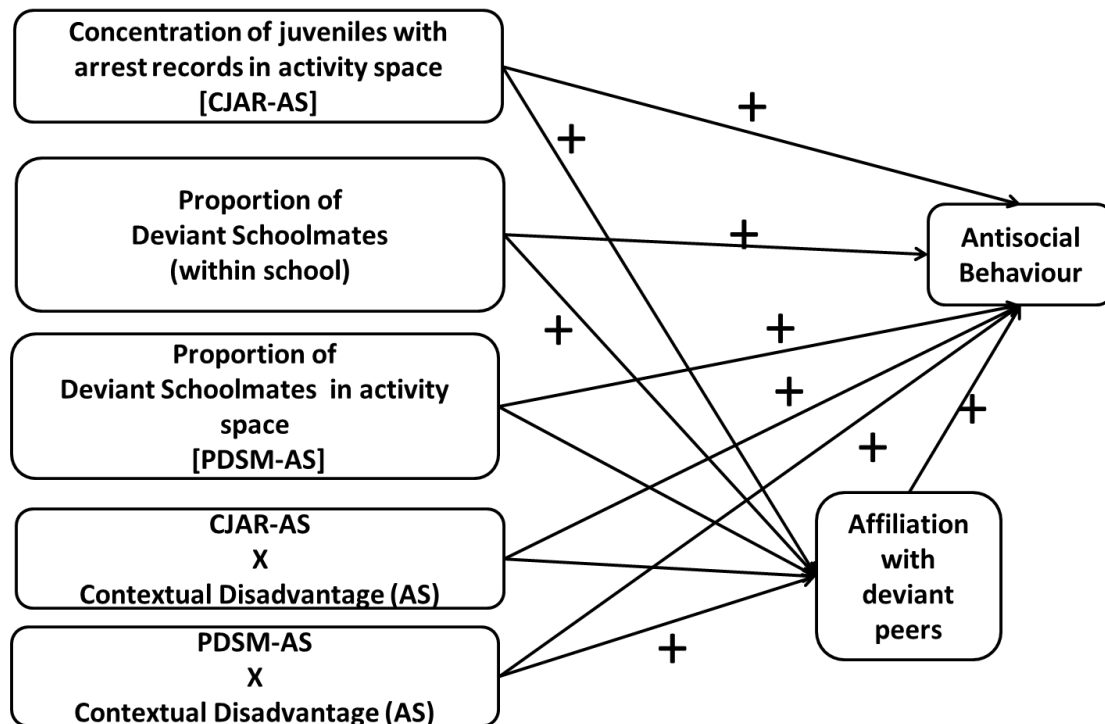
Hypothesis 12: The concentration of deviant schoolmates living across juvenile activity spaces will also have a direct effect on increased levels of antisocial behaviour.

Hypothesis 13: The effect of activity space concentration of juveniles with arrest records, proportion of deviant schoolmates and proportion of deviant schoolmates in activity space on antisocial behaviour will at least be partially mediated by antisocial peer affiliation.

Hypothesis 14: The last prediction states that contextual concentrated disadvantage will interact with contextual concentration of deviant peers, intensifying the effect on antisocial behaviour. The effects of these interactions are also expected to be at least partially mediated by antisocial peer affiliation.

Hypotheses 10 to 12 explore contextual effects that might facilitate co-offending and differential affiliation. Hypothesis 13 explores whether these variables may influence friendship formation with deviant peers.

Figure 10.1: Hypotheses Regarding the Relationship Between Concentrated Deviant Peers, Concentrated Deviant Schoolmates and Antisocial Behaviour.



**Model will be adjusted by strain variables, social control variables and controls (see Chapter 4)*

2. Brief methods overview

The same approach as described in chapters 8 and 9 was followed. As in the last two chapters, firstly interaction effects are estimated, followed by the mediation analysis. Mediation effects were assessed using the conventional three step procedure described in Chapter 2 and revisited in Chapter 8 (Roth and MacKinnon, 2012; Baron and Kenny, 1986).

3. Results

As in the last two chapters, the results of each analysis stage are presented in table 10.1 (Models 1 to 4). However since both measures of contextual concentration of deviant schoolmates (in school and in activity space) were subject to multicollinearity problems, an additional analysis was performed to explore the results of the mediation when the variable “proportion of deviant schoolmates in school” was dropped from the model. These results are presented in table 10.2. Table 10.3 presents mediation effects and confidence intervals for relevant mediation paths. Figure 10.2 presents the final model.

Model 1 presents the results of the fully specified model. In this model, best friend’s antisocial behaviour and proportion of deviant schoolmates in school significantly predicted growth of antisocial diversity over time, thus providing support for hypothesis 11. Initially concentration of deviant schoolmates in activity space fails to predict growth in antisocial behaviour scores. As it was discussed in chapter 7, this result was related to multicollinearity. When concentration of deviant schoolmates within schools is dropped, concentration of deviant schoolmates in activity spaces gains significance. Since both processes refer to the same problem which is concentration of peers within meaningful activity nodes, this may also be regarded as evidence to support hypothesis 12. Regarding macro level concentrated disadvantage and concentration of juveniles with arrest records, neither variable significantly predicts antisocial behaviour scores in model 1.

Results from chapters 8 and 9 suggest that contagion effects do seem to affect the relationship of other predictors with antisocial behaviour. Peer contagion effects contribute to explaining away the effect of contextual concentrated disadvantage and

school added-value on antisocial behaviour scores. Contagion effects also seem to explain away the effect of SES on parental monitoring suggesting that the relationship between SES, Monitoring and Antisocial Behaviour may be more complex than anticipated. These findings would suggest that contagion effects (peer differential association) variables might be more important in explaining the effect of contextual concentrated disadvantage, than has been credited to them before.

The next step was to test hypotheses 13 and 14. To do so, in model 2 the hypothesised interaction effects are added. As in the case of the previous models, none of the proposed interaction effects significantly predicts antisocial behaviours. In spite of this fact, “best friend's antisocial behaviour” and “proportion of deviant schoolmates” remain significant predictors. In the next model, the effect of the predictors on antisocial behaviour is estimated when the mediator variable (best friends antisocial behaviour) has been dropped. The proportion of deviant schoolmates still remains a significant predictor of antisocial behaviour scores over time. This is not necessarily problematic, since it may be related to an inconsistent mediation effect.

Thus, model 4 investigates if hypothesised variables may predict best friend's antisocial behaviour. Neither macro level contextual concentration of deviant peers nor concentration of deviant schoolmates in activity space showed a significant direct or mediated effect on antisocial behaviour. Surprisingly, this time the proposed interaction effects do significantly predict best friend's antisocial behaviour, though they are not always in the expected direction. The interaction term between contextual disadvantage and concentration of juveniles with arrest records obtains a negative sign, thus it seems to be related to stable antisocial behaviour scores (scores not increasing over time). Once other variables have been controlled for, juveniles living in areas with high levels

of concentrated disadvantage and concentration of juveniles with arrest records seem to show stable antisocial behaviour scores over time. This finding is unexpected and again may be related to a shift in the shape of the age crime curve as in the case of strain and the effect of school activity space concentration of juveniles with arrest records. In addition, concentration of schoolmates in activity space significantly interacts with contextual concentration disadvantage in order to predict affiliation with defiant peers.

Based on these results, there were grounds to assess if best friend's antisocial behaviour would significantly mediate the effect of proportion of deviant schoolmates and both interaction effects on antisocial behaviour. The results are presented in table 10.2. Since none of the confidence intervals contains 0, all the three studied mediation effects are considered significant. The effect of "proportion of deviant schoolmates", on antisocial behaviour scores is partially mediated by best friends antisocial behaviour. Also the effect of both interaction terms ("concentrated disadvantage" X "proportion of deviant schoolmates in activity space" and "concentrated disadvantage" X "activity space concentration of juveniles with arrest records") was fully mediated by best friends antisocial behaviour.

Table 10.1: Interaction Effects and Initial Mediation Analysis: Contagion Effects (N=3272)

	1		2		3		4	
					X->Y (Best Frd. GABI excluded)		X->M (Best Frd. Antisocial Behaviour)	
	Full Model	S.E.	Interaction terms	S.E.		S.E.		S.E.
Response	GABI		GABI		GABI		BF GABI	
Fixed Part								
cons	1.319*	0.269	1.338*	0.27	1.125*	0.26	0.263	0.612
Wave	0.314*	0.017	0.315*	0.02	0.324*	0.02	0.416*	0.037
AS Context. Conc. Disadv.	0.047	0.037	0.018	0.05	-0.002	0.05	-0.061	0.116
AS Cont. Conc. Juv. w/arrest records	-0.049	0.026	-0.049	0.03	-0.037	0.03	-0.025	0.061
Context. Conc. Disadv. * AS Cont. Conc. Juv. w/arrest records	-	-	-0.005	0.04	-0.019	0.04	-0.254*	0.095
Context. Conc. Disadv. *Proportion Deviant Schoolmates in AS	-	-	0.617	0.66	0.478	0.64	4.547*	1.549
School Added Value	-0.041	0.025	-0.044	0.03	-0.034	0.03	-0.029	0.065
Baseline age	-0.067*	0.018	-0.068*	0.02	-0.05*	0.02	0.07	0.041
Male	0.08*	0.027	0.08*	0.03	0.077*	0.03	0.129*	0.062
SES (Low)	-0.018	0.041	-0.016	0.04	0.036	0.04	0.134	0.094
SES (Mid)	-0.061	0.039	-0.058	0.04	-0.032	0.04	0.115	0.089
Baseline Antisocial Behaviour	0.926*	0.011	0.926*	0.01	0.926*	0.01	0.191*	0.025
High Educ. Aspirations	-0.073	0.078	-0.073	0.08	-0.073	0.07	0.135	0.173
Low Educ. Expectations	0.312*	0.103	0.311*	0.1	0.402*	0.1	0.156	0.227
Anomia	-0.34*	0.106	-0.339*	0.11	-0.411*	0.1	-0.007	0.234
Lives with mother & other	0.147*	0.046	0.147*	0.05	0.142*	0.05	0.184	0.103
Lives with father & other	0.117	0.155	0.114	0.16	0.153	0.14	0.065	0.347
Lives with mother only	0.065	0.032	0.065	0.03	0.071	0.03	0.107	0.072
Lives with father only	0.001	0.101	-0.004	0.1	0.013	0.1	0.367	0.226
Lives with neither parents	0.046	0.084	0.048	0.08	0.004	0.08	-0.069	0.187
Parental attachment	-0.015	0.022	-0.015	0.02	-0.026	0.02	-0.008	0.049
Paretal monitoring	-0.201*	0.026	-0.201*	0.03	-0.199*	0.02	-0.195*	0.057
School attachment	-0.012	0.014	-0.012	0.01	-0.005	0.01	-0.066*	0.032
Best Friends Antisocial Behaviour	0.04*	0.008	0.04*	0.01	-	-	-	-
Proportion Deviant Schoolmates	0.986*	0.241	1.00*	0.24	1.074*	0.23	2.106*	0.555
Proportion Deviant Schoolmates in AS	-0.22	0.361	-0.349	0.37	-0.35	0.36	-1.039	0.882

*p<0.05; GABI: Antisocial Behaviour Index; BF GABI Best Friend's Antisocial Behaviour Index; AS: Activity Space; S.E.: Standard Error

Continues

Table 10.1: Interaction Effects and Initial Mediation Analysis: Contagion Effects (Continued)

	1		2		3		4	
			Interaction		X->Y (Best Frd. GABI excluded)		X->M (Best Frd. Antisocial Behaviour)	
	Full Model	S.E.	terms	S.E.	S.E.	S.E.	S.E.	S.E.
Response	GABI		GABI		GABI		BF GABI	
Random Part								
Level: Wave	0.385*	0.015	0.386*	0.015	0.398*	0.014	1.762*	0.069
Level: Individual	0.104*	0.014	0.104*	0.014	0.132*	0.014	0.677*	0.072
Level: School	0.003	0.002	0.002	0.002	0.003	0.002	0.026	0.015
School Level ICC	0.006		0.004		0.006		0.011	
Individual Level ICC	0.22		0.22		0.25		0.29	
-2*loglikelihood:	7087		7086		8592		12451	

*p<0.05; GABI: Antisocial Behaviour Index; BF GABI Best Friend's Antisocial Behaviour Index; AS: Activity Space; S.E.: Standard Error

In sum, neither macro level contextual concentration of deviant peers nor macro level concentration of deviant schoolmates in activity space shows a significant direct or mediated effect on antisocial behaviour. In spite of that, the effect of the proportion of deviant schoolmates on antisocial behaviour is partially mediated by deviant peer affiliation. Thus, only partial support for both hypotheses 13 and 14 was found. The final model is presented in figure 10.2.

Table 10.2: Contagion Mediation Effects

	a	S.E.	b	S.E.	Mediated Effect	S.E.	Lower Conf. Interval	Upper Conf. Interval
Proportion of deviant schoolmates -> Affiliation with deviant peers ->GABI +	2.106	0.555	0.040	0.008	0.084	0.028	0.030	0.139
Proportion of deviant schoolmates in AS -> Affiliation with deviant peers ->GABI	1.245	0.567	0.053	0.007	0.066	0.031	0.127	0.004
Context. Conc. Disadv. * AS Cont. Conc. Juv. w/arrest rec. -> Affiliation with deviant peers -> GABI	-0.254	0.095	0.040	0.008	-0.010	0.004	-0.019	-0.002
Context. Conc. Disadv. *Proportion Dev. Schoolm. in AS -> Affiliation with deviant peers ->GABI ++	4.547	1.549	0.040	0.008	0.182	0.072	0.041	0.323

+ Significant only if proportion of deviant schoolmates is excluded from analysis

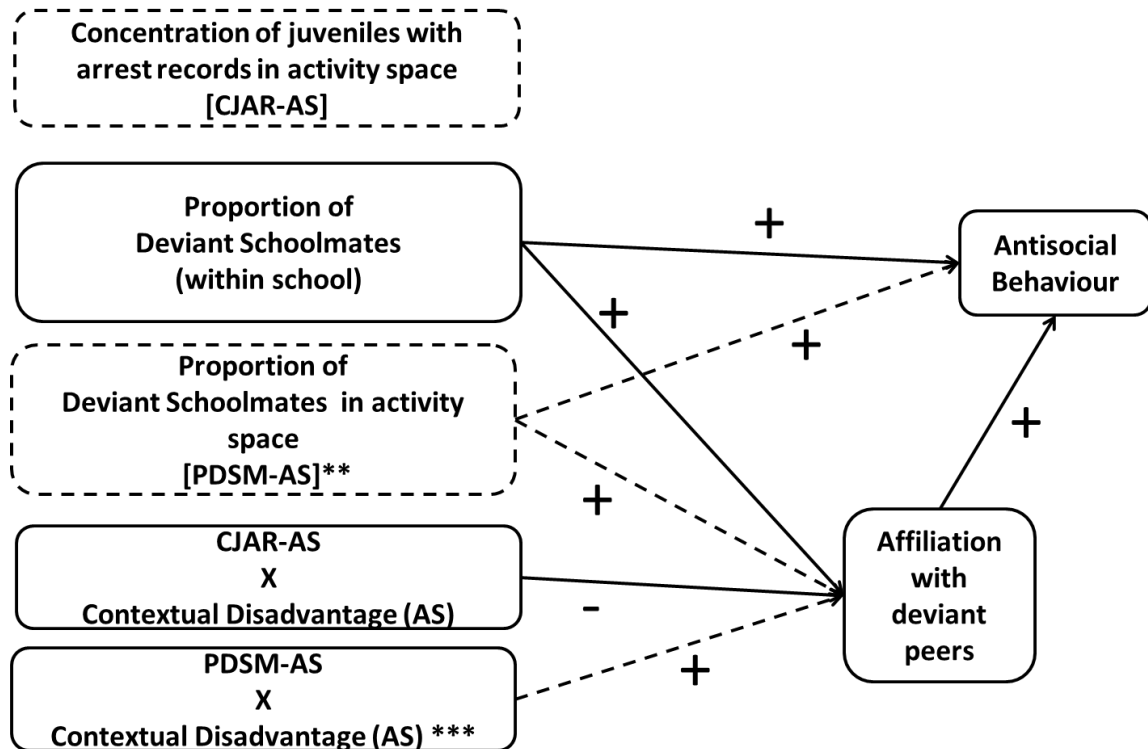
++ Looses significance if proportion of deviant schoolmates is excluded from analysis

*p<0.05; GABI: Antisocial Behaviour Index; BF GABI Best Friend's Antisocial Behaviour Index; AS: Activity Space; S.E.: Standard Error

Unlike other models, the effect from the variables “proportion of deviant schoolmates” (direct and indirect) and “proportion of deviant schoolmates in activity space (not significant)” seemed to have been affected by multicollinearity. Therefore, a supplementary mediation analysis was conducted. Results of this analysis suggests that when proportion of deviant schoolmates is dropped from the model, its direct and indirect effects are then captured by the variable “proportion of deviant schoolmates in activity space”. In addition, the interaction effect between contextual disadvantage and proportion of deviant schoolmates in activity spaces loses its significance. These results suggest that both variables may very well be able to explain growth in antisocial behaviour diversity, either directly or mediated through best friends antisocial behaviours. Both of them refer to the role that a higher contextual concentration of deviant peers may have on the growth of antisocial behaviour over time.

It is important to note that higher concentrations of deviant schoolmates (in school or in activity spaces) may, at least partially, reflect a compositional effect. High contextual concentration of antisocial juveniles may be related to family self-selection effects. Even though juveniles may not have a say about where they live, disadvantaged families (who may also tend to have poorer parenting abilities) may be more prone to end up living in certain neighbourhoods. Children and juveniles that are raised within these contexts may end up living near each other and attending the same schools. However, after controlling for baseline antisocial behaviour, effects of contextual concentration of deviant peers (in school or activity space) still predicts a steeper growth in antisocial behaviour diversity over time. Including initial levels of antisocial behaviours in the equation should be capturing compositional effects related to higher risk juveniles concentrating in school or activity spaces. Therefore, since the effect of concentration variables does not disappear, this may suggest that contextual effects may be at work. The way in which peer effects have been measured allows us to conceptualize them as a variable measuring a potential contextual effect. Peer effects can be expressing a somewhat mixed effect: both compositional and contextual.

Figure 10.2: Relationship Between Concentrated Deviant Peers, Concentrated Deviant Schoolmates and Antisocial Behaviour: Final Model*



**Model adjusted by strain variables, other social control variables, contagion variables, and controls.*

***Direct and indirect effects (- - -) gain significance if concentration of antisocial schoolmates (within school) is dropped from the model*

**** Indirect effect (- - -) loses significance if concentration of antisocial schoolmates (within school) is dropped from the model.*

4. Chapter conclusions

The present chapter aimed to test several contextual interaction and mediation effects related to variables measuring peer differential affiliation. Peer differential affiliation is thought to be a key variable explaining neighbourhood contagion effects.

Hypotheses 10 to 13 explore predictions based on “geographic propinquity” literature (McPherson, Smith-Lovin and Cook, 2001). Geographic propinquity refers to the fact that people whose activity spaces converge (i.e. overlap) will have higher chances of developing a tie, thus be more likely to influence each other. A higher contextual concentration of antisocial peers either in school or in potential activity spaces was thought to increase the chances of befriending antisocial peers, and thus be influenced by them. If this is the case, geographic propinquity may contribute to facilitating differential peer affiliation.

Hypothesis 10 stated that concentration of juveniles with arrest records living within activity spaces would have a direct effect on increased levels of antisocial behaviour. No evidence to support this hypothesis was found. Even though this variable did show an initial unconditional effect on the growth of antisocial behaviour diversity (not shown), this effect was explained away by contextual disadvantage and other individual level controls. This “no effect” has been consistent across different models and aggregation strategies (traditional vs. activity space based). Further analysis suggests that this may not be necessarily regarded as evidence against the existence of contagion effects as a relevant contextual variable. As it was discussed before, other studies directly measuring crime and or delinquency by using official records also fail to find significant results. This might be related to the fact that official police records reflect

not only delinquency, but also how the police operate. Therefore, the interpretation of these types of measures requires some caution.

Consistent with hypothesis 11, a significant direct effect of contextual concentration of deviant peers on the growth of antisocial behaviour diversity was also found. In spite of this, contextual concentration of deviant schoolmates in activity space (hypothesis 11) failed to predict increased levels of antisocial behaviour diversity over time. This “no effect” seemed however to be largely related to a multicollinearity problem. When concentration of antisocial schoolmates is dropped from the model, activity space concentration shows a significant direct effect on the growth of antisocial behaviour diversity over time. This could be regarded as partial evidence in favour of hypothesis 12. Since this variable also showed low econometric reliability indicators, this result needs to be interpreted with caution. Taken together, these results suggest that concentration of antisocial peers in meaningful developmental contexts like school or perhaps potential activity spaces may be related to steeper increases in antisocial behaviour diversity over time. As predicted in both cases (school and activity spaces), contextual level effects are partially mediated by best friends antisocial behaviour, providing support for hypothesis 13. Results are consistent with the idea of a “geographic propinquity effect” suggesting that higher concentrations of antisocial peers in meaningful contexts may facilitate befriending antisocial peers. Through this mechanism social influence may help explaining steeper increases in antisocial behaviour diversity over time.

However, best friend’s antisocial behaviour only partially mediates the effect of contextual concentration of deviant peers. This may also be explained by co-offending.

The co-offending process relates to the fact that antisocial actions tend to be committed in groups, and co-offenders are likely to live close to each other (Reiss and Farrington, 1991). The co-offending literature suggests that friends may not necessarily be the only ones with whom someone may engage in antisocial behaviour. This literature suggests that groups of offenders are unstable: thus the sole availability of willing peers (not necessarily friends) may also be related to antisocial behaviour, which is conceived as a collective enterprise. The results are consistent with the idea that both types of processes may be at play: on one hand propinquity effects lead to increased chances to befriend deviant peers, and, on the other, the availability of deviant peers in the context may facilitate co-offending.

One last issue needs to be considered. Given the fact that routine activities are usually structured around key activity nodes, it was expected that contexts with low levels of supervision and social control would provide opportunities for unstructured socialising activities (Maimon et. al, 2010), thus facilitating the occurrence and reinforcement of antisocial behaviours. Contextual concentrated disadvantage was thought as a proxy of lower levels of social control (Sampson, Raudenbush and Earls, 1997; Sampson, 1999; Wikstrom, Oberwittler, Treiber and Hardie, 2012). Results from the present study are partially consistent with this idea (Hypothesis 14). The effect of interaction terms on antisocial behaviour are fully mediated by affiliation with deviant peers, suggesting that contextual concentration of deviant schoolmates in activity spaces may be a relevant factor in explaining affiliation with deviant peers, but only in the context of contextual concentrated disadvantage. This last result however loses its significance once concentration of school level deviant peers is dropped from the model to account for multicollinearity issues and thus needs to be regarded as tentative.

Results so far suggest that contextual disadvantage does not seem to have a direct role in explaining individual level outcomes, but might facilitate clustering of disadvantaged families that share similar problems related to poorer parenting skills. Families with poorer parenting skills (most notably low monitoring) might be more likely to raise children showing problem behaviour. Spatial clustering of these families may lead to spatial clustering of their children in schools and activity spaces, thus generating a developmental context with particular characteristics that may then facilitate steeper growth of antisocial behaviour over time.

In the next chapter a summary of key discussion points and conclusions will be presented. The limitations of the research, and the implications for policy, will be discussed.

Chapter 11: Conclusions: Summary, Discussion and Implications

This chapter aims to provide a summary of key conclusions, to examine their implications, and discuss their limitations.

The key questions that this thesis set out to answer are whether contextual level concentration of disadvantage influences youth antisocial behaviour, and if this potential influence could be understood as mainly direct, or indirect, and mediated by indicators of key criminogenic processes namely strain, informal social control and peer contagion effects.

These questions were grounded in the Chilean case-study (specifically the city of Santiago), where results of previous studies suggested that juveniles experiencing repeated delinquency-related police contacts, showed high levels of geographical concentration in particular districts and neighbourhoods (Hein and Sepulveda, 2005; Hein et al., 2009). Anecdotal evidence also suggested that these neighbourhoods also had the tendency to concentrate multiple social problems, and concentrated disadvantage amongst one of the most relevant ones. In this context, assessing if neighbourhood effects may influence individual level outcomes, specifically antisocial behaviour, was judged not only as being of scientific interest, but also of interest for Chilean policy development.

An initial review of the literature suggested that observed level of clustering was common in many countries and that there was a long research tradition studying the reasons behind this phenomenon (Shaw and McKay, 1969; Wilson, 1987; Petronis, et al., 2003; Reboussin, et al., 2010; Wells, et al., 2009; Petronis and Anthony, 2003; Reboussin, Preisser, Song and Wolfson, 2010; Wells, Degenhardt, Bohnert, Anthony and Scott, 2009).

The field of “neighbourhood effects” was found to be somewhat divided between those who believed that this patterns expressed purely compositional or contextual effects. Compositional effects referred to the idea that observed area effects are caused by selection effects where “at risk” or “vulnerable” individuals and families come to live into particular areas due to a complex interplay of labour and housing markets and government policies (Jargowsky, et al., 1997), such as, for example, social housing policies. Others argue that the concentration of disadvantaged individuals may facilitate the emergence of characteristics (known as contextual effects) that may have an independent effect on behaviour (Jargowsky, et al., 1997).

Given this, Santiago de Chile constitutes a highly interesting case study. The current spatial distribution of poverty across the city has been shaped by governmental housing and forced migration policies that contributed to the development of neighbourhoods with high levels of concentrated poverty (Hidalgo, 2004; Cepal, 2001).

In order to address the questions of this thesis, firstly a systematic review of longitudinal neighbourhood effects studies was conducted. Secondly, data from a longitudinal study following a representative sample of school population of Santiago de Chile was merged with independent contextual level information (Census tract, schools and police records) and analysed. New ideas to address contextual level effects on antisocial behaviour development, that explicitly consider spatial location of relevant developmental domains to study contextual effects, were tested.

Systematic Review of Longitudinal Studies: Summary of findings

Until now, only a limited number of reviews (systematic or not) have been conducted, (Mayer and Jencks, 1989; Kroneman, Loeber and Hipwell, 2004; Ingoldsby and Shaw, 2002; Gephardt, 1997; Murray and Farrington, 2010 and Jackson, Denny, and Ameratunga, 2014). In addition, findings of many basic studies have been limited by important methodological difficulties (Sampson, et al., 2002).

Consequently, the systematic review sought to gain a comprehensive picture of which conclusions may be drawn about neighbourhood level influences based on research that provides a higher level of confidence in the results. The specific review question addressed if high quality longitudinal studies provide evidence that neighbourhood level characteristics predict antisocial behaviour development in nine to twenty year old children and juveniles. Studies were carefully selected in order to avoid methodological characteristics that may weaken confidence in their results, including use of cross-sectional designs, “same source bias”, low variability between ecological units and unrepresentative samples, among others.

Systematic review findings were structured in five analytical domains according to the type of contextual level variable: i) concentrated poverty, neighbourhood structure and disorder; ii) Neighbourhood social capital; iii) Exposure to neighbourhood violence; iv) Neighbourhood institutions and resources; v) Neighbourhood culture - “street code”.

Evidence supporting the existence of a direct effect of poverty and concentrated disadvantage on antisocial behaviour is mixed and seems to be highly dependent on model specification. Studies finding significant main effects usually failed to include potentially relevant confounders in the regression equations. The most commonly

omitted confounders were related to baseline antisocial behaviour, family level social control and peer differential association.

Evidence from the review was also generally unsupportive of the idea that neighbourhood level residential instability may, by itself, have a main effect on antisocial behaviour. The same conclusion was reached regarding neighbourhood disorder and incivility, social capital and collective efficacy and exposure to violence. Mixed results were however found regarding institutional resources and some evidence was found supporting the impact of “subcultural” variables like community level tolerance to deviance on the reduction of individual level violence (see Wright et. al., 2013). In spite of this, the low number of included studies for some areas makes it difficult to draw firm conclusions on some of these findings. Also limited evidence regarding neighbourhood level variables as a moderator of the relationship between other risk factors and antisocial behaviour measures was found.

The results of the review provided little support for the idea that there is a neighbourhood level main and direct effect on behaviour that operates over and above individual level factors. Nevertheless, it was noted that the tested models seemed to reflect a somewhat simplistic way to conceptualise the way contexts like neighbourhoods may influence behaviour. In addition, the most included studies were based only in the USA. This may raise doubts on the generalisability of study findings to other countries.

Summary of findings: Empirical findings on Contextual Concentrated Disadvantage and Antisocial Behaviour

After conducting a secondary theoretical review it became clear that pervasive problems of neighbourhood effects research may not only be methodological, but also conceptual. Conceptual issues related to how spatial dimensions as neighbourhoods are assumed to affect behaviour were usually problematic, promoting the reification of the influence of space on individual level outcomes. It was thought that those results might also be responsible for the mixed and sometimes contradictory results found in neighbourhood effects research. As a result, and inspired by new research in the field (Oberwittler, 2007; Wikstrom, Ceccato, Hardie and Treiber, 2009; Mason et al. 2009 and 2010; Mennis and Mason, 2010; Wikström et. al 2012), the concept of potential activity spaces was investigated.

Several ideas regarding how contextual characteristics of activity spaces might relate to the growth of antisocial behaviour diversity over time were explored and tested. To test empirical hypothesis contextual level variables were aggregated based on a potential activity space approach, rather than the traditional approach (aggregating contextual variables based on the census tract of residence).

Even though both types of models (traditional and activity space) present remarkably similar results, the potential activity space provided some advantages, allowing to test several ideas regarding the exposure to specific types of contexts (area surrounding juveniles home or juveniles school), criminogenic processes and antisocial behaviour.

Main effects analysis suggested that higher levels of contextual concentrated disadvantage in activity spaces was significantly related to the growth of antisocial behaviour diversity over time. However, as expected, no support was found for the

existence of a direct contextual effect once other covariates have been controlled for. The effect of concentrated disadvantage on antisocial behaviour was found to be mainly indirect; that is, mediated by other covariates.

When exploring main characteristics of potential activity space models, no firm evidence could be found that would suggest that characteristics of different activity spaces types (e.g. school, home, best friend's home) might have differential effects on antisocial behaviour scores over time. This may however be related to the types of characteristics that were explored. Contextual concentrated disadvantage and contextual concentration of juveniles with arrest records showed high levels of spatial autocorrelation. It is therefore likely that school and home based activity space characteristics may be quite similar for particular cases. Other contextual characteristics like, for example, cultural level variables or community level social control may show more variability across activity spaces. In spite of this the idea of testing differential effects of different types of contexts is compelling not only for theoretical but also practical (policy related) reasons. To the best of the author's knowledge, no other studies have explored this issue. Future studies may be interested in looking at differential effects of other relevant contextual measures, for example, variations in contextual level social control.

As a next analysis, mediation and interaction effects between contextual characteristics and strain, social control, and contagion effects were explored.

Summary of findings: Contextual effects and Strain

Regarding contextual effects and strain, mixed and unexpected results were found. Only partial support for the idea that strain indicators may predict growth in antisocial behaviour diversity over time was obtained. Results suggested that it might be unlikely that the effect of contextual concentrated disadvantage on antisocial behaviour may be transmitted through increased strain levels. However, results seem to suggest that some strain variables might play a part in transmitting the effect of family level SES on the growth of antisocial behaviour diversity over time. Only a handful of studies (Weatherburn and Lind, 1997; Araya and Sierra, 2002; Thornberry and Farnworth, 1982; Crutchfield and Pitchford, 1997; Allan and Steffenmeister, 1989; Pratt and Godsey, 2003; Collier-Goubil, 2010) have examined the strain as a potential mediator of contextual effects. Only two previous studies assess if strain variables may mediate the effect of neighbourhood level stressors on individual outcomes (Warner and Fowler, 2003; Boardman, Finch, Ellison, Williams and Jackson, 2001). In consequence, this study contributes to the literature by assessing the usefulness of the strain theory as a mediator of the influence of contextual effects. Unfortunately, data limitations allow to only make tentative conclusions regarding the relationship between strain, contextual disadvantage and antisocial behaviour.

In spite of this, results do not seem to allow to completely disregard strain as a possible mediator linking disadvantage and antisocial behaviour. Therefore, some recommendations for future studies might be ventured. One potential explanation of some of the unexpected findings is that high strain levels may be related to an earlier initiation of antisocial behaviours. Future studies might want to consider studying the effect of strain on antisocial behaviour by introducing earlier waves of measures (before

7th grade) and longer follow up periods. In addition, future studies might also consider the need to use measures that may tap more directly on strain key constructs, like for example perception of blocked opportunities. It would also be interesting to explore the role of strain variables as a mediator of the effect of contextual characteristics on different types of antisocial behaviours (e.g. property crime, violence and drug related offences, among others).

Summary of findings: Contextual effects and Informal Social Control

In this study it was also tested if family level (parental attachment, monitoring and school level attachment) and school level social control (school attachment) variables may mediate the effect of contextual characteristics on antisocial behaviour. Evidence suggested that, even though family level monitoring predicts antisocial behaviour, neither parental attachment nor monitoring seemed to mediate the effect of contextual disadvantage on antisocial behaviour. Even though this result is unexpected, it is not unheard of in the literature (see for example Trucco et. al, 2014). There seems to be however a relationship between individual level low family SES, lower monitoring and the presence of higher concentrations of deviant peers (school – neighbourhood). Low SES might be a factor facilitating social sorting: low SES families (most likely displaying poor parenting skills) may face incentives and limitations pressuring them to live in disadvantaged neighbourhoods. This might result in particular disadvantaged neighbourhoods concentrating juveniles exposed to low adult monitoring and supervision and thus at a higher risk to engage in antisocial behaviours.

In relation to school level social control, neither of the relevant measures (school value added education and school attachment) significantly predicted antisocial behaviour in the fully specified model. In addition, none of the hypothesized mediation effects were significant. Compared to results of previous studies (Avenyard, 2004; Tobler, Komro, Dabroski, Aveyard and Markham, 2011) those results were also unexpected. It might seem that school level variables (value added education and school attachment) lose their significance once baseline antisocial behaviour and contagion effects were introduced in the model. One explanation of this finding is that the presence of a higher concentration of juveniles engaged in a variety of antisocial behaviours in schools may pose a bigger challenge to address by the school organization. Insufficient staffing, resources or experience may undermine school's capacity to address specific needs of this type of population, thus limiting the chances to provide value added education and influencing reduced levels of antisocial behaviour engagement. Results suggest that there might be a complex interplay between contextual concentrated disadvantage, school level segregation (related to neighbourhood level segregation), school value added education and antisocial behaviours. Future studies addressing neighbourhood effects may need to consider including schools as a relevant neighbourhood level organisation that might be contributing to the explanation of neighbourhood effects. This subject is relatively new and warrants more research that could help enhance the potential of school to act as preventive agents. In this context characteristics, location and relevance of other types of neighbourhood level organisations (Community, NGO's, Child services, youth programas) may also need to be considered.

Contextual Indirect Effects: Contagion Effects

This brings us to the last explored criminogenic factor, namely differential peer association as a measure of potential contagion effects. Peer effects as an indicator of contagion effects have been rarely considered in later neighbourhood studies. Most studies do not measure them. If they do, they are usually based on juveniles reporting on their friend's behaviour. Even though some studies have directly addressed peer effects as a mediator of the influence of contextual disadvantage on antisocial behaviour (Maimon and Browning, 2010; Haynie, Silver, and Teasdale, 2006) no study actually places friends in space. That is, no study explicitly acknowledges where friends live and or where friends actually spend their time. The most notable exception to this is Wikström et al.'s work (2012). To avoid these issues the present thesis introduces the use of independent peer measures (hence avoiding same source bias), and locates their residences in space. Both are uncommon strengths and allows to examine peer effects as a contextual effect.

Findings suggest that contagion effects may play a relevant part in explaining the effect of contextual concentrated disadvantage on the growth of antisocial behaviour diversity. Furthermore, contagion effects also seem to help in explaining the effect of contextual disadvantage and school value added education on antisocial behaviour. In addition, peer effects contributed to explaining the away the effect of family level SES on family level monitoring.

Despite the fact that macro level concentration of juveniles with arrest records failed to predict individual level growth in antisocial behaviour diversity over time, micro level concentration of antisocial peers in school and/or in activity spaces did. However, results on micro level concentration of antisocial peers were subject to multicollinearity

problems and thus assessed separately. Both variables (concentration in schools and concentration in activity spaces) suggest that high levels of contextual concentration of deviant peers seem to predict steeper increases in antisocial behaviour diversity over time. Results also suggest that the effect of contextual concentration of deviant peers (school or activity space) on antisocial behaviour scores is partially mediated by best friend's antisocial behaviour. In addition, concentrated disadvantage interacted with concentration of deviant schoolmates in activity space predicting a stronger relationship between affiliation to deviant peers and antisocial behaviour⁶¹.

Results are consistent with the idea of the existence of a geographic propinquity effect. High concentration of contextual deviant peers (school or activity space) may increase the chances to befriend juveniles with higher antisocial behaviour scores thus increasing the chances of influence effects. Contextual concentration of deviant peers (school or activity space), however, also shows a direct effect on antisocial behaviour, which is also consistent with the idea of co-offending process. Growth in antisocial behaviour diversity may be facilitated by the contextual availability of peers engaged in diverse antisocial behaviours. The effect of contextual concentration of deviant peers in activity space on antisocial behaviour scores might also be facilitated if it happens within disadvantaged neighbourhoods, a proxy for low contextual social control.

There has been some debate regarding the relevance of contagion effects in the context of neighbourhood effects studies (Kling, 2007). Despite this, results suggest that contagion effects (measured here through peer effects) may be more relevant in explaining the effect of contextual disadvantage on antisocial behaviour than previously thought. It is interesting to note that peer effects seem to constitute a good example of

⁶¹ This result loses its significance if concentration of deviant peers in school is dropped from the model in order to address multicollinearity problems.

an effect that is both compositional (concentration of juveniles engaging in antisocial behaviour across schools may be related to housing policies) and contextual (concentration may facilitate peer affiliation and co-offending at the same time).

It is possible to suggest the following explanatory hypothesis regarding the role of contextual concentrated disadvantage on antisocial behaviour. It may be ventured to propose that, in the Chilean context, concentrated disadvantage seems to be an expression of a clustering effect generated by housing and forced migration policies. These policies facilitated the spatial concentration of low SES families in disadvantaged neighbourhoods. According to the present study families living in disadvantaged neighbourhoods may display poorer monitoring skills. It seems likely that this concentration is related to a social sorting process. In addition, poor monitoring skills are related to steeper increases in antisocial behaviour diversity over time. It may be proposed that clustering of this type of families may explain why higher contextual concentration of antisocial peers (school or activity space) is observed. In turn this concentration seems to facilitate steeper growth in antisocial behaviour diversity.

Future neighbourhood studies might want to explicitly address the role of peer effects (and other potential contagion effects) as a mechanism explaining the link between macro level characteristics and antisocial behaviour. Regarding this, it also seems advisable to examine the utility of a social network approach to explore these issues. Little research has focused on exploring the impact of structural factors like concentrated disadvantage on how social ties are formed, maintained, or broken. This may be an interesting field of inquiry that might provide new insights into neighbourhood effects research.

Study strengths and limitations

The present thesis has strengths and limitations:

One important strength of this thesis is related to its initial focus on a systematic search, appraisal and synthesis of evidence regarding longitudinal neighbourhood studies. Using a systematic approach to literature review allows for more transparent, complete and less biased conclusions to be drawn from the literature. As regards to this, the review process not only allowed identification of relevant research gaps, but also to critically appraise how important model specification seems to be when drawing conclusions on contextual level effects. Conducting a systematic review also helped setting up the empirical part of the thesis. Inclusion and exclusion criteria guided methodological choices seeking to minimize risk of bias related design, measures and controlled confounders.

A second strength of this study relates to its longitudinal design. Longitudinal studies have a series of advantages regarding their capacity to study change and its determinants (Frees, 2008). In addition, longitudinal studies provide some alternatives for dealing with problems related to unmeasured variables (Dougherty, 2007). As the review results suggest, only a limited number of longitudinal studies addressing contextual effects on antisocial behaviour have been conducted.

In addition, within the context of data limitations, the present study also avoids other common methodological problems such as same source bias (on contextual measures) or failing to address how relevant confounders may change results.

Regarding same source bias, the present study focused on using independently generated measures of contextual characteristics. In particular, , one novel strength of

this thesis was the use of social network data to generate independent measures of peer effects as a way to address possible contagion effects.

Another strength of this study is related to explicitly addressing where relevant developmental domains are located. It was argued that in order to study potential mediators of contextual effects, those mediators needed to be spatially located. For example to address where peers live does not seem to be a trivial issue when attempting to assess their relevance in explaining the effect of contextual disadvantage on behavioural outcomes. Therefore, the present study also geocoded friends home addresses in space. Therefore, their spatial location could be explicitly examined as a relevant factor in explaining growth of antisocial behaviour diversity. This uncommon strength has been rarely addressed in the field of neighbourhood effects.

There are however several limitations that need to be addressed in order critically appraise the presented results. Most limitations are related to the fact that the data sets were not directly collected to test neighbourhood effects, or to measure exposure to particular activity spaces.

The first limitation refers to the systematic review. Considering the state of the current data, it was not judged advisable to perform a meta-analysis. Meta-analysis of regression slopes poses a series of requirements that would have led to the exclusion of many included studies. Therefore, only a narrative synthesis of results was attempted.

The next set of limitations refers to measurement issues. The first measurement limitation relates to the constructed antisocial behaviour measure. Since the present thesis focuses on the study of general antisocial behaviours, it was decided to build an

aggregated scale. However, questions of interest contained in the dataset were phrased in a way that they would only capture lifetime engagement in antisocial behaviours. To deal with this problem a measure that was sensitive to the growth of antisocial behaviour diversity over time was constructed. Among its restrictions was that it only could remain stable or increase over time.

Consequently, the scale was unable to capture decreasing levels of antisocial behaviour or frequent involvement in one particular type of antisocial behaviours. Thus, results may only refer to this type of change in antisocial behaviours over time. The way the scale was constructed made it also somewhat difficult to interpret negative coefficients. Due to this, doubts remain regarding some results related specifically to the effect of strain measures on antisocial behaviour over time. Future studies might want to consider including early wave measures to address the effect of strain on antisocial behaviour over time. Specific effects on particular antisocial behaviour types will be examined in future studies by the author.

Another measurement limitation refers to family SES and contextual disadvantage variables. In both cases, no direct measures of income were available to the author. One possible concern with this issue is that disadvantage indicators may not be capturing more extreme forms of deprivation. This might be the case with family level SES, that although is correlated with income, does not necessarily reflect lower positions in the social structure. However, regarding contextual disadvantage, the variable does include indicators measuring more extreme forms of disadvantage such as for example, being unable to read or write.

There are some relevant contextual measures that were not available to the author. These are variables related to contextual level social control and neighbourhood “cultural variables”. Unlike disadvantage measures, these types of variables may show substantial variability across activity spaces. Future studies might address the problem of whether variations in social control across activity spaces or certain cultural traits may have some measurable effects on antisocial behaviour.

Another relevant measure that was unavailable refers to “out of school friends”. Network data was only available for peers attending the same school. Studies addressing the role that out of school friends play in the explanation of neighbourhood effects are still limited. Future studies might want to address this issue further, this time using a network based approach. Traditional census tract based studies face the same challenge, since most of them do not actually study where friends live. Actual exposure to contextual characteristics tends not to be addressed, but assumed.

The next limitation is related to the way “potential activity spaces” were constructed. As the name expresses it, “potential” acknowledges the fact that there is no measure of effective exposure to these spaces. Based on previous research it was thought to be highly likely that juveniles would be exposed mainly to the environments surrounding their home and schools. This is however an assumption. Nevertheless, it could be pointed out that this assumption is also regularly made by most of the current neighbourhood studies using census tracts as meaningful spatial aggregation units.

Another issue related to activity spaces refers specifically to how the variable concentrated disadvantage was constructed. In order to do so, disadvantage measures for each activity space used information on a variable number of census blocks. The risk of this strategy is to use information from a more extensive area than the one the subject

has been actually exposed to. These issues may affect the observed results just because of lack of consistency regarding the size of the used ecological units . In spite of this, substantive conclusions drawn from an activity space and a census tract approach were remarkably similar.

A substantial number of cases from the original sample were lost, mostly due to the inability to geocode their addresses. Therefore, results may be generalized to a population that is slightly more disadvantaged than the original sample. Nevertheless, sensitivity analysis suggests that using weights to address this issue did not change substantive interpretation of the model. Hence data was assumed to be missing at random and that the dependence of the chance of missing data on the value of the studied variables was broken once the rest of the fully observed variables of interest were taken into account. Nevertheless loss of cases may have affected precision of estimated coefficients. Thus cautious interpretation is warranted especially in the case of interaction effects.

A final matter relates to multicollinearity which seems to have been an issue in some of the conducted analysis. If it was suspected to be present, identified variables were examined in separated models. In most cases conclusions did not change. This was not the case for contextual concentration of antisocial schoolmates in activity space. This variable showed a direct and mediated effect on growth of antisocial behaviour scores, but only when concentration of deviant schoolmates was dropped from the model. In addition, this variable also obtains low econometric reliability. Results regarding this variable need to be interpreted with caution and regarded as tentative.

Some Potential Policy Implications: desegregation or focused interventions?

Evidence suggests that housing and forced migration policies may have had a major impact in shaping the present distribution of contextual disadvantage throughout Santiago. The examination and mapping of official statistics and data also suggests that there is a moderate correlation between contextual concentrated disadvantage and the spatial concentration of juveniles with arrest records. It is plausible to suggest that the current distribution of homes of arrested juveniles may have been at least partially affected by the same governmental interventions.

As has been argued before, a key mechanism that might explain this correlation seems to be related to the clustering of particular families (with poor monitoring skills) and their children (showing higher initial levels of antisocial behaviour engagement). This initial selection effect might lead to higher contextual concentration of juveniles engaging in diverse antisocial behaviours. In turn this condition may pose particular challenges for communities to exert social control. These communities may also show low capabilities to exert this social control. These concentration effects may also pose challenges to the nearest schools and other institutions that may have inadequate resources to deal with the needs of this population. Concentration effects of deviant peers in school or activity spaces may play a key role in explaining steeper growth in antisocial behaviour diversity, thus providing a potential mechanism that linking compositional and contextual effects.

If we accept this as one potential explanatory mechanism, it might be interesting to consider some possible policy responses. The first possible response would be to generate neighbourhood focused interventions targeting known protective factors such as, for example, parental monitoring. Although it was not part of the planned analysis, it

was found that monitoring significantly moderated the relationship between best friend's antisocial behaviour and respondent's antisocial behaviour scores over time. The same result was observed in the case of concentration of deviant schoolmates. In both circumstances, parental monitoring significantly weakened these relationships (result not shown). Nevertheless monitoring did not moderate the effect of activity space level concentration of deviant peers on antisocial behaviour scores over time. Focused interventions on parenting skills might help reducing the impact of contextual concentration of deviant peers on behavioural outcomes. There are several evidence based early prevention and intervention programs available that target parenting such as for example Triple P Positive Parenting (Graaf, Speetjens, Smit, Wolff y Tavecchio, 2008). In addition, there are other programs such as Multisystemic Therapy (Curtis, Ronan y Borduin, 2004) that focus on families as a key context to promote behavioural change in high risk youth. Furthermore recent studies suggest that providing structured cognitive-behavioural group sessions for selected at risk children and behavioural parenting training, may not only reduce children's aggressive behaviour, but also might achieve larger effects in neighbourhoods with poorer social organisation. (Lochman, Wells, Qu, Chen, 2013).

Thesis results also suggest that schools, and especially those located near disadvantaged neighbourhoods, may play a key role as a potential protective agent. Beyond targeting individual students, school based interventions may consider universal ecologically based strategies focused on strengthening organisational capabilities to produce value added education. Universal ecologically based strategies are designed to change practices in entire cultural networks such as, classroom culture, school culture, or community culture. Beyond focusing on youth behaviour, these interventions address the actions of adults, peers, families, and actors within larger systems (Mattaini, M.,

Mcguire, M., 2006). Examples of this type of strategies are, Good Behaviour Game (Lannie, A. McCurdy, 2007) or Effective (Positive) Behaviour Support (Bradshaw, Koth, Thornton, y Leaf, 2009).

There are several community based interventions that also have shown to be effective in promoting reduced antisocial behaviour engagement. Interesting examples (juts to name a few) are After School programs and Mentoring programs. After school programs, such as for example “LA BEST” (Goldschmidt, Huang y Chinen, 2007) provide safe and secure environments where juveniles engage in challenging reading, math, sports science and art related activities. Also Mentoring programs (Tolan Henry, Schoeny y Bass, 2008) provide access to prosocial role models with whom juveniles engage in prosocial activities.

Community based interventions might also consider developing strategies to target peer networks either within schools or neighbourhoods. In this context, “peer led” or “peer network interventions” aiming to reduce risk behaviours like smoking or drug use have been developed. These types of interventions take advantage of network characteristics and social learning/ social influence principles in order to achieve diffusion of intervention effects across social networks beyond, for example, the classrooms. Among other actions, peer led interventions may train influential students to act as peer supporters during informal interactions outside the classroom or schools. Peer supporters are expected to encourage their peers to not engage in risky behaviour (Campbell, Starkey, Holliday, Audrey, Bloor, Parry-Langdon, and Moore, 2008). Some promising results on smoking (Campbell, Starkey, Holliday, Audrey, Bloor, Parry-Langdon, and Moore, 2008) and even depression (German, Sutcliffe, Sirirojn, Sherman, Latkin, Aramrattana, and Celentano, 2012) have been found. In spite of this, peer led

interventions need to be carefully assessed. Other studies suggest that peer led interventions may have harmful effects accelerating substance use when juveniles are already embedded in a drug using friendship network (Valente, Ritt, Olson, Stacy, Unger, Okamoto, and Sussman, 2007). Extending these experiences to address peer differential affiliation may seem to be an interesting conceptual and practical challenge to pursue by future studies.

There are however other alternatives that might be also considered. These are related to desegregation strategies, inspired (but not similar to) “Moving to Opportunity” (MTO) (Ludwig et. al 2008). Results from the MTO desegregation initiative suggest that juveniles moving out of high poverty areas did show a temporary reduction in delinquency involvement (Kling and Ludwig, 2005). Increased levels of delinquency involvement were observed again two years after moving. Speaking strictly about antisocial behaviour outcomes, if contextual effects are at least partially driven by peer effects (school and possibly neighbourhood), it might be cost effective to consider limited desegregation strategies.

While full desegregation strategies may not be cost effective or currently feasible to implement in Chile, interventions focusing on changing juveniles routine activity patterns (on a case by case basis) might be considered. Juvenile already attending an intervention program because of delinquency involvement might benefit from switching schools, thus altering his/her routine activity pattern and therefore reducing his/her exposure to peers that might be facilitating antisocial affiliation and co-offending. Since the overall prevalence of juvenile arrest records in a given neighbourhood/activity space is usually small, it may not make sense to implemented radical measures like the MTO program in order to desegregate an entire neighbourhood. Government may consider

developing a program that could facilitate moving particular families out of particular neighbourhoods. Following the same logic as the last example, juveniles already engaging in high levels of antisocial behaviours that are linked with neighbourhood level peers, may also benefit from moving to a different neighbourhood (in addition to changing schools). This could provide a temporary effect that may facilitate the operation of other ongoing interventions. Recent qualitative studies in the field have described that parents living in high risk contexts actually may use the “exile strategy” to reduce risk for their children (Richardson, Van Brakle, 2014). Parents may send temporarily or permanently their children away from the neighbourhood (e.g. to live with relatives) in order to have the necessary time and separation needed to cope with their living conditions in a violent community. Little evidence is available on the effects of this type of strategies. As a result, it would be interesting to evaluate if this type of intervention may provide the intended effect in specific cases. Such an initiative would require careful evaluation in order to assess potential beneficial as well as harmful effects.

Some final remarks may be proposed. Contextual effects research may be facing new challenges in relation to the study of contextual effects. Further pursuing the idea of activity spaces may pose some new challenges for researchers. The most notable one relates to the measurement of activity space characteristics. A key issue that future studies might want to address is how to construct adequate measures based on representative sampling for activity spaces. A measurement strategy developed by Wikstöm et al. (2012) in the PADS+ study may only be applicable in small cities, but not large cities like the case of Santiago where sampling of spatial units might be needed.

In addition, social network analysis may also provide an interesting and insightful framework that could help to address emergent issues regarding the study of exposure to contextual characteristics. Future studies may also need to expand into different countries and cities in order to address possible relevant contextual differences in neighbourhood effects.

One final challenge is the need to improve on present conceptualizations regarding how spatial characteristics may affect human behaviour. These conceptualizations need to explicitly address how characteristics of space and place may shape human experience and thus affect individual level outcomes.

References

1. Agencia de Calidad de la Educación (2014): Informe Técnico Simce 2012. Retrieved from https://s3.amazonaws.com/archivos.agenciaeducacion.cl/documentos-web/Informe_Tecnico_Simce_2012.pdf
2. Agencia de Calidad de la Educación (n.d.): Informe Técnico Simce 2013. Retrieved from http://archivos.agenciaeducacion.cl/documentos-web/InformeTecnicoSimce_2013.pdf
3. Agnew, R. (1992). Foundation For A General Strain Theory Of Crime And Delinquency. *Criminology*, 30(1), pp. 47-88.
4. Agnew, R. (1999). A General Strain Theory Of Community Differences In Crime Rates. *Journal of Research in Crime and Delinquency*, 36(2), pp. 123-155.
5. Agnew, R. Thaxton, S. (2004). The Nonlinear Effects of Parental and Teacher Attachment on Delinquency: Disentangling Strain From Social Control Explanations. *Justice Quarterly*. 21 (4)
6. Agnew, R., Cullen F., Burton, V., Evans D., Dunaway G. (1996). A New Test of Classic Strain Theory. *Justice Quarterly* 13(4).
7. Ailshire J., Bader, M., Morenoff, J., Melendez R. (2010). ***Do Neighborhood Effects Depend On The Definition Of The Neighbourhood?*** Conference paper presented at the Population Association of America 2010 meeting. University of Michigan
8. Aisenberg, E., & Herrenkohl, T. (2008). Community Violence In Context: Risk And Resilience In Children And Families. *Journal of Interpersonal Violence* 23 (3).
9. Akers, R., Krohn, M., Kaduce, L., Radosevich, M. (1979). Social Learning and Deviant Behaviour: A Specific Test of a General Theory. *American Sociological Review*. 44 (4)
10. Akers, R., Sellers C. (2004). ***Criminological Theories: Introduction, Evolution and Application***. Roxbury Publishing Company, 4th ed. Los Angeles: California
11. Alarid, L., Burton V., Cullen, F. (2000). Gender and Crime among Felony Offenders: Assessing The Generality of Social Control and Differential

- Association Theories. *Journal of Research in Crime and Delinquency*. 37 (2)
12. Alda, E. y Beliz, G. (2007). *¿Cuál es la salida? La agenda inconclusa de la seguridad*. Banco Interamericano de Desarrollo.
 13. Allan, E., Steffenmeister, S. (1989). Youth Unemployment and Property Crime: Differential Effects of Job Availability and Job Quality on Juveniles and Young Adult Arrest Rates *American Sociological Review* 54 (1).
 14. Allard, S. W., & Danziger, S. (2002). Proximity And Opportunity: How Residence And Race Affect The Employment Of Welfare Recipients. *Housing Policy Debate*, 13(4), pp. 675-700.
 15. Altman, D. G. (1995). Strategies For Community Health Intervention: Promises, Paradoxes, Pitfalls. *Psychosomatic Medicine*, 57(3), pp. 226.
 16. Anderson, E. (1990). *Streetwise: Race, Class, And Change In An Urban Community*. University of Chicago Press, Chicago, IL.
 17. Anderson, E. (2002). The Code Of The Streets. *African American Classics in Criminology and Criminal Justice*, pp. 293-305.
 18. Andresen, M. (2006). Crime Measures and the Spatial Analysis of Criminal Activity. *British Journal of Criminology*. 46 pp. 258-285.
 19. Andresen, M. A., & Felson, M. (2010). The impact of co-offending. *British Journal of Criminology*, 50(1), pp. 66-81.
 20. Antunes, M. J., & Ahlin, E. M. (2014). Family Management and Youth Violence: Are Parents or Community More Salient? *Journal of Community Psychology*, 42(3), pp. 316–337. doi:10.1002/jcop.21612
 21. Araos, C., Cea, M., Valenzuela, E. (2009). El Rol Del Contexto Escolar en el Uso de Marihuana en Chile: Análisis a Nivel de Curso. *Núcleo Científico Milenio de Investigación Socioeconómica en uso y abuso de Drogas. Instituto de Sociología, Pontificia Universidad Católica de Chile*. Santiago
 22. Araya, R; Sierra, D (2002). Influencia de los Factores de Riesgo Social en el Origen de las Conductas Delincuenciales, *División de Seguridad Ciudadana, Ministerio del Interior*. Santiago
 23. Arditti, J., Burton, L., & Neeves-Botelho, S. (2010). Maternal distress and parenting in the context of cumulative disadvantage. *Family Process*, 49(2), pp. 142-164.
 24. Arriagada, I. (2001), “Seguridad Ciudadana y Violencia en América Latina”. Presentado a LASA 2001 XXIII International Congress Session LAW 12,

Washington 6-8 Septiembre.

25. Aspy, C. B., Tolma, E. L., Oman, R. F. & Vesely, S. K. (2014). The Influence of Assets and Environmental Factors on Gender Differences in Adolescent Drug Use. *Journal of Adolescence*, 37(6), pp. 827–37. doi:10.1016/j.adolescence.2014.05.006
26. Atisba (2010). “Guetos en Chile”. *Estudios y Proyectos Urbanos Ltda.*
27. Aveyard, P. Markham, W. Lancashire, E. Bullock, A., Macarthur, C., Cheng, K., Daniels, H., (2004) The influence of school culture on smoking among pupils. *Social Science & Medicine* 58, pp. 1767–1780
28. Ayala, R. (2009) *The theory and Practice of Item Response Theory*, The Guilford Press, New York
29. Ayer, L., Rettew, D., Althoff, R. R., Willemsen, G., Ligthart, L., Hudziak, J. J., & Boomsma, D. I. (2011). Adolescent Personality Profiles, Neighborhood Income, and Young Adult Alcohol Use: A Longitudinal Study. *Addictive Behaviors*, 36(12), pp. 1301–1304. doi:10.1016/j.addbeh.2011.07.004
30. Baerveldt, C., Völker, B., & Van Rossem, R. (2008). Revisiting Selection and Influence: An Inquiry into the Friendship Networks of High School Students and Their Association With Delinquency. *Canadian Journal of Criminology and Criminal Justice/La Revue Canadienne De Criminologie Et De Justice Pénale*, 50(5), pp. 559-587.
31. Baldwin, J., & Bottoms, A. E. (1976). *The Urban Criminal*. London: Tavistock.
32. Bao, W., Haas, A., & Pi, Y. (2007). Life Strain, Coping, and Delinquency in the People's Republic of China: An Empirical Test of General Strain Theory From a Matching Perspective in Social Support. *International Journal of Offender Therapy and Comparative Criminology*, 51(1), pp. 9-24.
33. Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), pp. 1173-1182.
34. Bartlett J., Carpenter, J. (2013). *Missing Data Concepts*. LEMMA VLE Module 14, <http://www.bristol.ac.uk/cmm/learning/course.html>
35. Bauder, H. (2002) Neighbourhood Effects and Cultural Exclusion *Urban Stud* 39 pp. 85.
36. Baumer, E. P. (1999). Neighborhood Disadvantage, Neighborhood Instability,

- and Adolescent Behavior: Premarital Childbearing, Dropping Out of School, and Delinquency. *Dissertation Abstracts International. Section A: Humanities and Social Sciences*, 59(10), pp. 3980-3980.
37. Becker G. (1968). Crime and Punishment: An Economic Approach, *The Journal of Political Economy*, 76, (2) pp. 169-217
 38. Becker, B. J., & Wu, M. J. (2007). The Synthesis of Regression Slopes in Meta-Analysis. *Statistical Science*, 22(3), pp. 414-429.
 39. Beliz, G. (2007). *¿Hacia una Nueva Generación de Reformas en Seguridad Ciudadana? En ¿Cuál es la Salida? La Agenda Inconclusa de la Seguridad Ciudadana*. Eds. Alda E. Beliz G., Banco Interamericano de Desarrollo, Washington, DC.
 40. Bellair, P. E., & McNulty, T. L. (2005). Beyond the bell curve: Community disadvantage and the explanation of black-white differences in adolescent violence. *Criminology*, 43, (4), pp. 1135–1168
 41. Bellair, P. E., & McNulty, T. L. (2009). Gang Membership, Drug Selling, And Violence In Neighborhood Context. *Justice Quarterly*, 26(4), pp. 644-669
 42. Benoit, E., Randolph, D., Dunlap, E., & Johnson, B. (2003). Code Switching And Inverse Imitation Among Marijuana-Using Crack Sellers. *British Journal of Criminology*, 43(3) pp. 506
 43. Bernburg, J. G., Thorlindsson, T., & Sigfusdottir, I. D. (2009). The neighborhood effects of disrupted family processes on adolescent substance use. *Social Science & Medicine*, 69(1), pp. 129-137.
 44. Beshears, E., & Toro, P. (2005). *The mediating effects of poor parenting and disadvantaged neighborhoods on delinquent behaviours: A longitudinal model* PhD Dissertation Wayne State University, Detroit, Michigan
 45. Beyers J.M., Loeber R., Wikstrom P.O. & Stouthamer-Loeber M. (2001). What predicts adolescent violence in better-off neighborhoods? *Journal of Abnormal Child Psychology*, 29, (5), pp. 369–381
 46. Beyers, J.M., Bates J.E., Pettit G.S., & Dodge K.A. (2003). Neighborhood structure, parenting processes, and the development of youths' externalizing behaviors: A multilevel analysis. *American Journal of Community Psychology*, 31(1-2), 35-53.
 47. Bichler, G., Schwartz, J., & Orosco, C. (2010). Delinquents On the Move: Examining Subgroup Travel Variability. *Crime Patterns and Analysis*, 3(1), 14-

- 37.
48. Bjarnason, T. (2009). Anomie Among European Adolescents: Conceptual And Empirical Clarification Of A Multilevel Sociological Concept1. Paper presented at the *Sociological Forum*, 24. (1) pp. 135-161.
49. Boardman, J. D., Menard, S., Roettger, M. E., Knight, K. E., Boutwell, B. B., & Smolen, A. (2014). Genes in the Dopaminergic System and Delinquent Behaviors Across the Life Course: The Role of Social Controls and Risks. *Criminal Justice and Behavior*, 41(6), pp. 713–731. doi:10.1177/0093854813514227
50. Bolger, K. E., Patterson, C. J., Thompson, W. W., & Kupersmidt, J. B. (1995). Psychosocial Adjustment Among Children Experiencing Persistent and Intermittent Family Economic Hardship. *Child Development*, 66(4), pp. 1107-1129. Retrieved from <http://www.jstor.org/stable/1131802>
51. Bonito, J. A., Ruppel, E. K., & Keyton, J. (2012). Reliability estimates for multilevel designs in group research, *Small Group Research*, DOI: 10.1177/1046496412437614.
52. Bowers, E. P., Von Eye, A., Lerner, J. V, Arbeit, M. R., Weiner, M. B., Chase, P., & Agans, J. P. (2011). The Role of Ecological Assets in Positive and Problematic Developmental Trajectories. *Journal of Adolescence*, 34(6), pp. 1151–65. doi:10.1016/j.adolescence.2011.07.007
53. Bradshaw, C. , Koth, C., Thornton, L., Leaf, P. (2009): Altering School Climate through School-Wide Positive Behavioral Interventions and Supports: Findings from a Group-Randomized Effectiveness Trial. *Prevention Science* 10:100–115
54. Braithwaite, J. (1981) The Myth of Social Class and Criminality Reconsidered, *American Sociological Review*, 46 (1). pp. 36-57.
55. Brantingham, P. J.; Brantingham, P.L., eds. (1981). *Environmental Criminology*. Waveland Press. Sage, Beverly Hills
56. Brantingham, P. L., & Brantingham, P. J. (1984). *Patterns in Crime*. New York, NY: Macmillan.
57. Brantingham, P. L., & Brantingham, P. J. (1993a). Environment, Routine, And Situation: Toward A Pattern Theory Of Crime. In: *Routine Activity and Rational Choice*, edited by Clarke, R. V. & Felson, M. New Brunswick, NJ: Transaction Publishers.
58. Brantingham, P. L., & Brantingham, P. J. (1993b). Nodes, Paths And Edges:

- Considerations On The Complexity Of Crime And The Physical Environment. *Journal of Environmental Psychology*, 13(1), pp.3-28.
59. Brener, N. D., Kann, L., McManus, T., Kinchen, S. A., Sundberg, E. C., & Ross, J. G. (2002). Reliability Of The 1999 Youth Risk Behavior Survey Questionnaire. *Journal of Adolescent Health*, 31(4), pp.336-342.
 60. Brezina, T. (1998) Adolescent maltreatment and delinquency: The question of intervening process, *Research in Crime and Delinquency* Vol. 35.
 61. Brezina, T., Agnew, R., Cullen, F. T., & Wright, J. P. (2004). The code of the street. *Youth Violence and Juvenile Justice*, 2(4), pp. 303-328.
 62. Brody, G. H., Conger, R., Gibbons, F. X., Ge, X., McBride Murry, V., & Gerrard, M. (2001). The Influence of Neighborhood Disadvantage, Collective Socialization, And Parenting on African American Children's Affiliation With Deviant Peers. *Child Development*, 72(4), pp. 1231-1246.
 63. Brody, G. H., Ge, X., Kim, S. Y., Murry, V. M. B., Simons, R. L., & Gibbons, F. X., (2003). Neighborhood Disadvantage Moderates Associations Of Parenting And Older Sibling Problem Attitudes And Behavior With Conduct Disorders In African American Children. *Journal of Consulting and Clinical Psychology*, 71(2), pp. 211-221.
 64. Brooks-Gunn J., Duncan G.J., Aber J.L., (1997a). *Neighborhood Poverty: Vol. I: Context and Consequences for Children*. New York: Russell Sage Found.
 65. Brooks-Gunn J., Duncan G.J., Aber J.L., (1997b). *Neighborhood Poverty: Vol. II: Policy Implications in Studying Neighborhoods. Context and Consequences for Children*. New York: Russell Sage Found.
 66. Brooks-Gunn, J., Duncan, G. J., Klebanov, P. K., & Sealander, N. (1993). Do Neighborhoods Influence Child And Adolescent Development? *American Journal of Sociology*, 99(2), pp. 353-395.
 67. Brunton-Smith, I., Jackson, J., & Sutherland, A. (2014). Bridging Structure and Perception On the Neighbourhood Ecology of Beliefs and Worries About Violent Crime. *British Journal of Criminology*, azu020.
 68. Brunton-Smith, I., Sutherland, A., & Jackson, J. (2013). *The role of neighbourhoods in shaping crime and perceptions of crime* (pp. 67-87). Springer Netherlands. in Maarten van Ham (ed.) Neighbourhood effects or neighbourhood based problems? A policy context. London: Springer.

69. Burdzovic Andreas, J., & Watson, M. (2010). Etiology Of Adolescent Substance Use: Neighborhood Effects On Initiation. ***European Psychiatry, Conference: 18th European Congress of Psychiatry*** Munich Germany.
70. Burdzovic Andreas, J., & Watson, M. W. (2011). Interaction Between Personality, Family, And Neighborhood Factors In Substance Use Initiation Among Adolescents. ***European Psychiatry, Conference, 19th.***
71. Burk, W. J., Kerr, M. & Stattin, H. (2008). The co-evolution of early adolescent friendship networks, school involvement, and delinquent behaviors. ***Revue Française de Sociologie***, 49,pp. 499-522.
72. Burk, W., Steglich, C. Snijders, T. (2007). Beyond dyadic interdependence: Actor-oriented models for co-evolving social networks and individual behaviours. ***International Journal of Behavioral Development***, 2007, 31 (4), pp. 397–404
73. Burt, M. L. (2012). ***A Longitudinal Examination Of The Relationships Among Disadvantaged Neighborhoods, Supervision , Peer Associations , And Patterns Of Ethnic Minority Adolescent Substance Use.*** Unpublished doctoral dissertation, University of Oregon, Oregon.
74. Buvinic, M; Morrison, A; Shifter M. (1999). ***La violencia en América Latina y el Caribe. Un marco de referencia para la acción*** Banco Interamericano de Desarrollo Washington D.C
75. Caldeira, G. A., & Patterson, S. C. (1987). Political friendship in the legislature. ***The Journal of Politics***, 49(4), pp. 953-975.
76. Calvert, Wilma J. (2002). ***Neighborhood Disorder, Individual, Family, and Peer Behavior Protective Factors, and the Risk of Adolescent Delinquent Behavior.*** University of Missouri, St. Louis. Dissertation.
77. Campbell, R., Starkey, F., Holliday, J., Audrey, S., Bloor, M., Parry-Langdon, N., ... & Moore, L. (2008). An informal school-based peer-led intervention for smoking prevention in adolescence (ASSIST): a cluster randomised trial. ***The Lancet***, 371(9624), 1595-1602.
78. Cantillon, D. (2003). The multiple pathways of neighborhood effects. ***Psychology*** 37 (1-2), pp. 111-127
79. Chuem-JimSheu (1988) Juvenile Delinquency in the Republic of China. A Chinese Empirical Study of Social Control Theory. ***International Journal of Comparative and Applied Criminal Justice***. 12, (1 y 2)

80. Clark, W. (2005) Intervening in the Residential Mobility Process: Neighborhood Outcomes for Low-Income Populations. Proceedings of the National Academy of Sciences of the United States of America, ***Residential Mobility of Low-Income Populations*** 102 (43), pp. 15307- 15312
81. Clarke R.V., Felson M. (1993). ***Routine Activity and Rational Choice***. New Brunswick, NJ. Transaction
82. Cloward, R., Ohlin, L. (1960). ***Delinquency and Opportunity: A Theory of Delinquent Gangs***. The Free Press of Glencoe.
83. Cohen, G. L., & Prinstein, M. J. (2006). Peer Contagion Of Aggression And Health Risk Behavior Among Adolescent Males: An Experimental Investigation Of Effects On Public Conduct And Private Attitudes. ***Child Development***, 77(4), pp. 967-983.
84. Cohen, L. E., & Felson, M. (1979). Social change and crime rate trends: A routine activity approach. ***American Sociological Review***, pp. 588-608.
85. Coleman, J. S. (1966) ***Equality of educational opportunity***. Washington, DC: , pp.1066-5684.
86. Coleman, J. S. (1968). Equality of educational opportunity. ***Integrated Education***, 6(5), 19-28.
87. Coleman, J. S. (1988). Social capital in the creation of human capital. ***American Journal of Sociology***, 94(1), 95-120.
88. Collier-Goubil, D., (2010). ***A Spatial Analysis Of The Effects Of Neighborhood Deprivation And Home Foreclosures On Domestic Violence***. Thesis unpublished Howard University, Washington, D.C
89. CONACE (2003). ***Quinto Estudio de Drogas en Población Escolar***. Consejo Nacional Para el Control de Estupefacientes, Ministerio del Interior, Gobierno de Chile.
90. CONACE (2005). ***Sexto Estudio de Drogas en Población Escolar***. Consejo Nacional Para el Control de Estupefacientes, Ministerio del Interior, Gobierno de Chile.
91. CONACE (2007). ***Séptimo Estudio de Drogas en Población Escolar***. Consejo Nacional Para el Control de Estupefacientes, Ministerio del Interior, Gobierno de Chile.
92. CONACE (2008). ***Octavo Estudio de Drogas en Población General***. Consejo Nacional Para el Control de Estupefacientes, Ministerio del Interior, Gobierno

- de Chile.
93. CONACE (2009). **Octavo Estudio de Drogas en Población Escolar**. Consejo Nacional Para el Control de Estupefacientes, Ministerio del Interior, Gobierno de Chile.
 94. Congdon, P. (1996). Suicide and Parasuicide in London: A Small-Area Study. **Urban Studies**, 33(1), pp. 137-158.
 95. Conger, R. D., Conger, K. J., Elder Jr, G. H., Lorenz, F. O., Simons, R. L., & Whitbeck, L. B. (1992). A Family Process Model Of Economic Hardship And Adjustment Of Early Adolescent Boys. **Child Development**, 63(3), pp. 526-541.
 96. Conway, K. P., & McCord, J. (2002). A longitudinal examination of the relation between co-offending with violent accomplices and violent crime. **Aggressive Behavior**, 28(2), pp. 97-108.
 97. Cooper, Doris (1994). **Juventud, Delincuencia Y Violencia**. Congreso Nacional de Investigadores Sociales y Medico - Sociales sobre la Juventud Chilena.
 98. Costello, B. Vowell (1999). Testing Control Theory and Differential Association: Reanálisis Of the Richmond Youth Project Data. **Criminology** 37(4)
 99. Coster, S. D., Heimer, K., & Wittrock, S. M. (2006). Neighborhood disadvantage, social capital, street context, and youth violence. **Sociological Quarterly**, Vol. 47(4), 723-753.
 100. Crowder, K., & South, S. J. (2003). Neighborhood Distress And School Dropout: The Variable Significance Of Community Context. **Social Science Research**, 32(4), pp. 659-698.
 101. Crutchfield, Robert; Pitchford, Susan (1997). Work And Crime: The Effects Of Labor Stratification. **Social Forces**, 76 (1)
 102. Cummins, S. (2007). Commentary: investigating neighbourhood effects on health—avoiding the ‘local trap’. **International Journal of Epidemiology**, 36(2), 355-357.
 103. Cummins, S. (2007). Commentary: investigating neighbourhood effects on health--avoiding the “local trap”. **International Journal of Epidemiology**, 36(2), 355–7. doi:10.1093/ije/dym033
 104. Curriero, F. C., Kulldorff, M., Boscoe, F. P., & Klassen, A. C. (2010). Using Imputation To Provide Location Information For Nongeocoded Addresses. **PloS one**, 5(2), pp. 8998.

105. Curry, A. D., & Latkin, C. A. (2003). Stressful Neighborhoods And Depression: A Prospective Study Of The Impact Of Neighborhood Disorder. *Journal of Health and Social Behavior*, 44(1), pp. 34-44.
106. Curtis, L. J., Dooley, M. D., & Phipps, S. A. (2004). Child well-being and neighbourhood quality: Evidence from the canadian national longitudinal survey of children and youth. *Social Science & Medicine*, 58(10), pp. 1917-1927.
107. Curtis, N. , M., Ronan, Kevin R.; Borduin, Charles M. Multisystemic treatment, an Analysis of Outcome Studies. *Journal of Family Psychology*. Vol. 18(3), Sep 2004, 411-419.
108. Dark, S. J., & Bram, D. (2007). The modifiable areal unit problem (MAUP) in physical geography. *Progress in Physical Geography*, 31(5), pp. 471-479.
109. De Marco M. & De Marco A. (2009) Welcome to the Neighbourhood: Does Where you Live Affect the Use of Nutrition, Health, and Welfare Programs? *Journal of Sociology & Social Welfare*, 36 (1).
110. Deeks, J., Dinnes, J., D'amico, R., Sowden, A., Sakarovitch, C., & Song, F., (2003). Evaluating non-randomised intervention studies. *Health Technology Assessment*, 7(27), pp. 1-179.
111. Demuth, S. A. (2003): "Racial and ethnic differences in pretrial release decisions and outcomes: A comparison of hispanic, black, and white felony arrestees", *Criminology* 41 (3), American Society of Criminology.
112. Desmond, S. A. (2004). Neighborhoods, families, and delinquency. Dissertation Abstracts International Section A: *Humanities and Social Sciences*, 65(07), 2774-2774.
113. Desmond, S. A., & Kubrin, C. E. (2009). THE POWER OF PLACE: Immigrant Communities and Adolescent Violence. *The Sociological Quarterly*, 50(4), 581-607.
114. Deutsch, A. R., Crockett, L. J., Wolff, J. M., & Russell, S. T. (2012). Parent and Peer Pathways to Adolescent Delinquency: Variations By Ethnicity And Neighborhood Context. *Journal of Youth and Adolescence*, 41(8), pp. 1078–94. doi:10.1007/s10964-012-9754-y
115. Dishion, T. J., & Tipsord, J. M. (2011). Peer contagion in child and adolescent social and emotional development. *Annual Review of*

- Psychology*, 62, 189-214.
116. Dishion, T. J., Andrews, D. W., & Crosby, L. (1995). Antisocial boys and their friends in early adolescence: Relationship characteristics, quality, and interactional process. *Development*, 66, 139-151.
 117. Dougherty, Christopher (2007) *Introduction to Econometrics*. 3rd edition. Oxford University Press, Oxford.
 118. Drost, Ellen (2011). Validity and Reliability in Social Science Research. *Education Research and Perspectives*, Vol.38, No.1: 105-123.
 119. Droppelmann, C. Hein, A. (2010) *Validación Del Inventario POSIT Para La Detección De Adolescentes Con Problemas De Uso De Drogas*. Núcleo Científico Milenio de Investigación Socioeconómica en uso y abuso de Drogas. Instituto de Sociología, Pontificia Universidad Católica de Chile.
 120. Drukker M., Kaplan C.D., Feron F.J., Van Os, J. & Korebrits A. (2010). Delinquency in context; neighbourhood and gender interactions among adolescents. *Epidemiology Psychiatric Soc.* 19(2):148-58.
 121. Duncan, G. J., & Raudenbush, S. W. (1999). Assessing the effects of context in studies of child and youth development. *Educational Psychologist*, 34(1), 29-41.
 122. Dunway, G.; Cullen, F.; Burton, V. & Evans D. (2000) The myth of social class and crime revisited: An examination of class and adult criminality. *Criminology*, 38(2): 589-632.
 123. Dupéré, V., Leventhal, T., & Vitaro, F. (2012). Neighborhood Processes, Self-Efficacy, And Adolescent Mental Health. *Journal of Health and Social Behavior*, 53(2), pp. 183–98. doi:10.1177/0022146512442676
 124. Eamon, M. K. (2002). Poverty, parenting, peer, and neighborhood influences on young adolescent antisocial behavior. *Journal of Social Service Research*, 28(1), 1-23.
 125. Ebbesen, E., Kjos, G. & Konečni V. (1975) Spatial ecology its effects on the choice of friends and enemies. *Journal of Experimental Social Psychology* (12) 6, pp. 505–518.
 126. Ecob, R., & Macintyre, S. (2000). Small Area Variations In Health Related Behaviours; Do These Depend On The Behaviour Itself, Its Measurement, Or On Personal Characteristics? *Health & Place*, 6(4), 261-274.
 127. Elisa M . Trucco , M . A. (2011) *Running head : Contextual Factors In*

- Substance Use I Contextual Factors In Substance Use : How Neighborhoods , Parents And Peers Impact Substance Use In An Early Adolescent* by. A dissertation submitted to the Faculty of the Gradu.
128. Ellaway, A., Morris, G., Curtice, J., Robertson, C., Allardice, G., & Robertson, R. (2009). Associations between health and different types of environmental incivility: A scotland-wide study. *Public Health*, 123(11), 708-713. doi:DOI: 10.1016/j.puhe.2009.09.019
 129. Elliot, D. S., & Huizinga, D. (1983). Social class and delinquent behavior in a national youth panel: 1976-1980. *Criminology*, 21(2), 149-177.
 130. Elliott, D. S., Huizinga, D., & Morse, B. (1986). Self-reported violent offending. *Journal of Interpersonal Violence*, 1(4), 472-514.
 131. Engel, R. & Calnon J. (2004): "Examining the influence of drivers characteristics during traffic stops with police: Results from a national survey", *Justice Quarterly*, 21 (1), Academy of Criminal Justice Sciences.
 132. Fabio, A., Loeber, R., Balasubramani, G. K., Roth, J., Fu, W., & Farrington, D. P. (2006). Why Some Generations Are More Violent Than Others: Assessment Of Age, Period, And Cohort Effects. *American Journal of Epidemiology*, 164(2), 151-160.
 133. Fabio, A., Tu, L. C., Loeber, R., & Cohen, J. (2011). Neighborhood Socioeconomic Disadvantage And The Shape Of The Age–Crime Curve. *Journal Information*, 101(1).
 134. Fagg, J., Curtis, S., Clark, C., Congdon, P., & Stansfeld, S. A. (2008). Neighbourhood perceptions among inner-city adolescents: Relationships with their individual characteristics and with independently assessed neighbourhood conditions. *Journal of Environmental Psychology*, 28(2), 128-142. doi:DOI: 10.1016/j.jenvp.2007.10.004
 135. Fagg, J., Curtis, S., Stansfeld, S. A., Cattell, V., Tupuola, A. M., & Arephin, M. (2008). Area Social Fragmentation, Social Support For Individuals And Psychosocial Health In Young Adults: Evidence From A National Survey In England. *Social Science & Medicine*, 66(2), 242-254. doi:DOI: 10.1016/j.socscimed.2007.07.032
 136. Farnworth, M., Thornberry, Krohn, M., Lizotte, M. (1994) Measurement In The Study Of Class And Delinquency: Integrating Theory And Research. *Journal of Research in Crime and Delinquency*, 31 (1).

137. Farnworth, Margaret; Michael Leiber (1989) Strain Theory Revisited: Economic goals, education means and delinquency *American Sociological Review*. 54 (2).
138. Farrington, D. (1993) *Have any Individual, Family or Neighbourhood Influences on Offending Demonstrated Conclusively?*, In: Farrington, D., Sampson, R., Wikstrom, P. (Eds.) Integrating Individual and Ecological; Aspects of Crime, National Council For Crime Prevention, Stockholm.
139. Farrington, D. P. (2007). Childhood risk factors and risk-focused prevention. *The Oxford Handbook of Criminology*, 4, pp. 602-640.
140. Farrington, D. P., Loeber, R., Yin, Y., & Anderson, S. J. (2002). Are Within-Individual Causes Of Delinquency The Same As Between-Individual Causes? *Criminal Behaviour and Mental Health*, 12(1), pp. 53-68.
141. Fauth, R. C., Leventhal, T., & Brooks-Gunn, J. (2007). Welcome to the neighborhood? long-term impacts of moving to low-poverty neighborhoods on poor children's and adolescents' outcomes. *Journal of Research on Adolescence*, 17(2), 249-284.
142. Fauth, R. C., Roth, J. L., & Brooks-Gunn, J. (2007). Does the neighborhood context alter the link between youth's after-school time activities and developmental outcomes? A multilevel analysis. *Developmental Psychology*, 43(3), 760-777.
143. Festinger, L. (1950). Informal social communication. *Psychological Review*, 57(5), 271.
144. Florax, R., Folmer, H. (1992) Specification And Estimation Of Spatial Linear Regression Models: Monte Carlo Evaluation Of Pre-Test Estimators. *Regional Science and Urban Economics* 22 pp. 405-432.
145. Flores, C. (2008) *Residential Segregation and the Geography of Opportunities: A Spatial Analysis of Heterogeneity and Spillovers in Education*. PhD Dissertation University of Texas at Austin.
146. Fotheringham S., Charlton M. Brunsdon. C. (2005). *Quantitative Geography: Perspectives on Spatial Data Analysis*, Sage Publications, London.
147. Fowler, P. J., Tompsett, C. J., Braciszewski, J. M., Jacques-Tiura, A. J., & Baltes, B. B. (2009). Community Violence: A Meta-Analysis On The Effect Of Exposure And Mental Health Outcomes Of Children And Adolescents. *Development and Psychopathology*, 21(01), 227.

148. Frank, F., Furstenberg, J., Morgan, S. P., & Allison, P. D. (1987). Paternal Participation And Children's Well-Being After Marital Dissolution. *American Sociological Review*, 695-701.
149. Frees, Edward (2008). *Longitudinal and Panel Data: Analysis and Applications in the Social Sciences*. Cambridge University Press, Cambridge.
150. Freisthler, B. (2004). A Spatial Analysis Of Social Disorganization Alcohol Access, And The Rates Of Child Maltreatment In Neighborhoods. *Children And Youth Services Review* 26, pp. 803-819.
151. FurrHolden, C. D. M., Lee, M. H., Milam, A. J., Johnson, R. M., Lee, K., & Ialongo, N. S. (2011). The Growth Of Neighborhood Disorder And Marijuana Use Among Urban Adolescents: A Case For Policy And Environmental Interventions. *Journal of Studies on Alcohol and Drugs*, 72(3), 371-379.
152. Furstenberg, R. Hughes, M (1997) The Neighborhood Influences on Child development: A Theoretical Perspective and a Research Agenda, in: Brooks-Gunn J, Duncan GJ, Aber JL, eds. (1997a). *Neighborhood Poverty: Vol. I: Context and Consequences for Children*. New York: Russell Sage Found.
153. Gabor, T., & Gottheil, E. (1984). Offender characteristics and spatial mobility: An empirical study and some policy implications. *Canadian J. Criminology*, 26, pp. 267.
154. Gans, H. J. (2002). The Sociology of Space: A Use-Centered view. *City & Community*, 1(4), pp. 329-339.
155. George, R. (1995). Potential and Problems in Developing Indicators on Child Well-Being from Administrative Data. In: Institute for Research on Poverty (Ed.) *Indicators of Children's Well-Being Conference Papers: Volume III: Cross-Cutting Issues; Population, Family, and Neighborhood; Social Development and Problem Behaviors* pp. 5 -16 University of Wisconsin-Madison.
156. Gephart, M. (1997) Neighbourhoods as contexts for development, In: Brooks-Gunn J, Duncan GJ, Aber JL, Eds. (1997a) *Neighborhood Poverty: Vol. I: Context and Consequences for Children*. New York: Russell Sage Found.
157. Gerard, J. M., & Buehler, C. (2004). Cumulative environmental risk and youth maladjustment: The role of youth attributes. *Child Development*, 75(6), pp. 1832-1849.

158. German, D., Sutcliffe, C. G., Sirirojn, B., Sherman, S. G., Latkin, C. A., Aramrattana, A., & Celentano, D. D. (2012). Unanticipated effect of a randomized peer network intervention on depressive symptoms among young methamphetamine users in Thailand. **Journal of Community Psychology**, 40(7), 799-813.
159. Gibson, C. L., Sullivan, C. J., Jones, S., & Piquero, A. R. (2010). "Does it take a village?" assessing neighborhood influences on Children's self-control. **Journal of Research in Crime and Delinquency**, 47(1), 31.
160. Gieryn, T. F. (2000). A Space For Place In Sociology. **Annual Review of Sociology**, 26, pp. 463-496.
161. Glanville, J. L. (2004). Voluntary Associations And Social Network Structure: Why Organizational Location And Type Are Important. **Sociological Forum**, 19(3), pp. 465-491.
162. Glaser, R.R, Van Horn, M.L., Arthur M.W, Hawkins J.D., Catalano R.F. (2005). Measurement Properties of the Communities That Care Youth Survey Across Demographic Groups. **Journal of Quantitative Criminology**, 21 (1),pp. 73-102.
163. Godfredson, M, Hirschi (1990) **A General Theory of Crime**. Stafdord University Press, California.
164. Gorman-Smith, D., & Tolan, P. (1998). The Role Of Exposure To Community Violence And Developmental Problems Among Inner-City Youth. **Development and Psychopathology**, 10(01), pp. 101-116.
165. Goldschmidt, P. Huang, D., Chinen, M (2007): The Long-Term Effects of After-School Programming on Educational Adjustment and Juvenile Crime: A Study of the LA's BEST After-School Program. Study Brief CRESST/University of California, Los Angeles.
166. Gotham, K. F. (2003). Toward An Understanding Of The Spatiality Of Urban Poverty: The Urban Poor As Spatial Actors. **International Journal of Urban and Regional Research**, 27(3), pp. 723-737
167. Graaf, I. Speetjens, P., Smit, P. Wolff, M. Tavecchio, L.: Effectiveness of the Triple P Positive Parenting Program on behavioral problems in children: meta-analysis. *Behavior Modification*, Vol. 32, No. 5, 714-735 (2008)
168. Groff, E. R., & McEwen, T. (2007). Integrating Distance Into Mobility Triangle Typologies. **Social Science Computer Review**, 25(2), pp. 210-238.

169. Grogan-Kaylor, A. (2005). Relationship Of Corporal Punishment And Antisocial Behavior By Neighborhood. *Archives of Pediatrics & Adolescent Medicine*, 159(10), pp. 938-942.
170. Grootaert, C., & Van Bastelaer, T. (2002). *Understanding And Measuring Social Capital: A Multidisciplinary Tool For Practitioners* World Bank Publications.
171. Grusky, David. (2001) The Past, Present, and Future of Social Inequality. pp. 3-51 In: Grusky, David ed. *Social Stratification: Class, Race, and Gender in Sociological Perspective* (Second Edition) Boulder: Westview Press.
172. Gujarati, D. N., & Porter, D. C. (2011). *Econometria Básica-5*. McGraw Hill Brasil.
173. Haegerich, T. M., Oman, R. F., Vesely, S. K., Aspy, C. B., & Tolma, E. L. (2014). The Predictive Influence Of Family And Neighborhood Assets On Fighting And Weapon Carrying From Mid- To Late Adolescence. *Prevention Science. The Official Journal of the Society for Prevention Research*, 15(4), pp. 473–84. doi:10.1007/s11121-013-0400-z
174. Hart, D., & Marmorstein, N. R. (2009). Neighborhoods And Genes And Everything In Between: Understanding Adolescent Aggression In Social And Biological Contexts. *Development and Psychopathology*, 21 (03), pp. 961-973.
175. Hawkins, J. D., Horn, M. L. V., & Arthur, M. W. (2004). Community Variation In Risk And Protective Factors And Substance Use Outcomes. *Prevention Science*, 5(4), pp. 213-220.
176. Hay, C., Fortson, E. N., Hollist, D. R., Altheimer, I., & Schaible, L. M. (2006). **Impact of community disadvantage on the relationship between the family and juvenile crime**. United States: Retrieved from National Criminal Justice Reference Service Abstracts database.
177. Haynie, D. L. (2002). Friendship Networks And Delinquency: The Relative Nature Of Peer Delinquency. *Journal of Quantitative Criminology*, 18(2), 99-134.
178. Haynie, D. L., Silver, E., & Teasdale, B. (2006). Neighborhood characteristics, peer networks, and adolescent violence. *Journal Of Quantitative Criminology* 22 (2) pp. 147-169
179. Hein .A, Sepúlveda, M. (2005): *Caracterización De Menores De Edad Ingresados A Una Comisaría Entre Los Años 2001 Y 2004 En El Marco Del*

- Seguimiento Del Programa Protección 24 Horas De Carabineros De Chile: Implicancias Para La Prevención De La Violencia De Y Contra Niños, Niñas Y Adolescentes.*** [ONLINE] Available at: <http://www.pazciudadana.cl/documentos/ProgramaProteccion24horas.pdf> [Last Accessed 31 August 14]
180. Hein, A (2014) ***Informe De Resultados: Análisis Preliminar De Resultados Del Programa Terapia Multisistémica.*** Unidad de Reinserción Social, Subsecretaría de Seguridad Pública, Ministerio del Interior, Gobierno de Chile.
 181. Hein, A. (2007) ***Robo Escolar Como Forma De Desviación Social: Análisis De Factores Asociados*** . Tesis para Optar al Grado de Magister en Sociología, Instituto de Sociología, Pontificia Universidad Católica de Chile.
 182. Hein, A. Farren, D.(2007) Familia y conductas de riesgo adolescente: ¿un problema de estructura o funcionalidad? In: ***Familia y Felicidad, un Círculo Virtuoso***, Rosita Camhi (Ed); Instituto Libertad y Desarrollo. Santiago Chile. Instituto Libertad y Desarrollo
 183. Hein, A. Gardner F. (2011, July): ***“Neighbourhood Effects on Antisocial Behaviour Development: Preliminary Results of a Systematic Review of Selected Longitudinal Studies”*** Poster presented at the conference Evidence-Based Prevention of Bullying and Youth Violence: European Innovations and Experiences. University of Cambridge, Institute of Criminology.
 184. Hein, A., Barrientos, G. (2004) ***Violencia y delincuencia Juvenil: Conductas de Riesgo Autoreportadas y Factores Asociados*** [ONLINE] Available at: http://www.pazciudadana.cl/docs/pub_20120410170714.pdf [Last Accessed 31 August 14]
 185. Hein, A., Rojas, P., Fuentealba, O., Ortega, V., Yau. R. (2009) ***Orientaciones Metodológicas Para el Desarrollo de Acciones a Favor de la Infancia y Adolescencia a Partir del Programa Seguridad Integrada para Niños, Niñas y Adolescentes “24 Horas” de Carabineros de Chile.*** Office of the Undersecretary for the Police (Subsecretaría de Carabineros) and the Police Family Protection Unit (Dirección de Protección Policial de la Familia de Carabineros de Chile).
 186. Herrero, J. García, E. (2006) ***Perceived neighbourhood social disorder and residents’ attitudes toward reporting child physical abuse.*** *Abuse &*

187. Hidalgo Dattwyler, R. (2004) Título La vivienda social en Santiago de Chile en la segunda mitad del siglo XX: Actores relevantes y tendencias espaciales Tipo de documento Artículo Área de publicación Santiago de Chile, Ediciones SUR, Colección Ediciones SUR - [ONLINE] Available at: <http://www.sitiosur.cl/publicacionescatalogodetalle.php?PID=2818&doc=&lib=&rev=&art=&doc1=&vid=&autor=&coleccion=&tipo=&nunico=20081#sthash.ZagZpR7q.dpuf> [Last Accessed 31 August 14]
188. Higgins, J. P. and Altman, D. G. (2008) *Assessing Risk of Bias in Included Studies, in Cochrane Handbook for Systematic Reviews of Interventions*, Cochrane Book Series (eds. J. P. Higgins and S. Green), John Wiley & Sons, Ltd, Chichester, UK.
189. Higgins, J. P. T., Green, S., & Collaboration, C. (2008) *Cochrane handbook for systematic reviews of interventions* Wiley Online Library.
190. Hill, T. D., Ross, C. E., & Angel, R. J. (2005). Neighborhood disorder, psychophysiological distress, and health. *Journal of Health and Social Behavior*, 46(2), pp. 170-186.
191. Hirschi, Travis (2004) *Causes of Delinquency*. Transaction Publishers, New Brunswick, New Jersey.
192. Hughes, G., McLaughlin, E. Muncie, J. (2002) *Crime Prevention and Community Safety: New Directions*. London: Sage.
193. Ingoldsby, E. M., & Shaw, D. S. (2002). Neighborhood contextual factors and early-starting antisocial pathways. *Clinical Child and Family Psychology Review*, 5(1), 21-55.
194. Ingoldsby, E. M., Shaw, D. S., Winslow, E., Schonberg, M., Gilliom, M., & Criss, M. M. (2006). Neighborhood disadvantage, parent–child conflict, neighborhood peer relationships, and early antisocial behavior problem trajectories. *Journal of Abnormal Child Psychology*, 34(3), 293-309.
195. Ingoldsby, E., Shaw. D. (2002) Neighborhood Contextual Factors and Early-Starting Antisocial Pathways *Clinical Child and Family Psychology Review*, Vol. 5, No. 1
196. Jaffee, S. R., Caspi, A., Moffitt, T. E., Polo-Tomás, M., & Taylor, A. (2007). Individual, family, and neighborhood factors distinguish resilient from non-resilient maltreated children: A cumulative stressors model. *Child Abuse &*

- Neglect*, 31(3), 231-253. DOI: 10.1016/j.chiabu.2006.03.011
197. Jain, S., Buka, S. L., Subramanian, S. V. & Molnar, B. E. (2010). Neighborhood Predictors Of Dating Violence Victimization And Perpetration In Young Adulthood: A Multilevel Study. *American Journal of Public Health*. 100(9):1737-44.
 198. Jang, S. J., & Johnson, B. R. (2001). Neighborhood Disorder, Individual Religiosity, And Adolescent Use Of Illicit Drugs: A Test Of Multilevel Hypotheses. *Criminology*, 39 (1), 109.
 199. Jargowsky, P. A. (1997). *Poverty And Place: Ghettos, Barrios, And The American City* Russell Sage Foundation Publications.
 200. Jason D. Boardman, Finch, B. K., Ellison, C. G., Williams, D. R., & Jackson, J. S. (2001). Neighborhood Disadvantage, Stress, And Drug Use Among Adults. *Journal of Health and Social Behavior*, 42(2), pp. 151-165.
 201. Jenkins, P. (1995) School Delinquency and School Commitment. *Sociology of Education* Vol 68 N°3.
 202. Jennings, W. G. (2008). Trajectories of two racine birth cohorts: A theoretically integrated model for explaining offending. *Dissertation Abstracts International, A: The Humanities and Social Sciences*, 69 (03).
 203. Johnson, C., & Raudenbush, S.W. (2006). A repeated measures, multilevel Rasch model with application to selfreported criminal behavior. In: C.S. Bergeman & S.M. Boker (Eds.) *Methodological Issues in Aging Research*. pp.131-164 New York, NY: Routledge.
 204. Jones, R., Hofner, S. (Eds.) *Longitudinal Data Analysis: A Practical Guide For Researchers In Aging, Health, and Social Sciences*. Routledges, New York.
 205. Jorquera, C. (2008): *Efectos de la Segregacion Residencial Socioeconomica en los jóvenes de Extracción Popular en Santiago de Chile (1992-2002)*. Tesis de Magister en Desarrollo Urbano. Instituto de Estudios Urbanos y Territoriales de la Pontificia Universidad Católica de Chile.
 206. Junger, M., Marshall I.H. (1997): The Interethnic Generalizability of Social Control Theory: An Empirical Test. *Journal of Research in Crime and Delinquency*. 4(1).
 207. Kandel, D. B. (1978). Homophily, selection, and socialization in adolescent friendships. *American Journal of Sociology*, pp. 427-436.

208. Karriker-Jaffe, K. J., Foshee, V. A., & Ennett, S. T. (2011). Examining How Neighborhood Disadvantage Influences Trajectories Of Adolescent Violence: A Look At Social Bonding And Psychological Distress. *Journal Of School Health*, 81(12), 764-773.
209. Kazdin, A. E. (1987). Treatment Of Antisocial Behavior In Children: Current Status And Future Directions. *Psychological Bulletin*, 102(2), pp. 187.
210. Kaztman R. (2001) Seducidos Y Abandonados: El Aislamiento Social De Los Pobres Urbanos. *Revista Cepal* Vol. 75
211. Keenan, K., Loeber, R., Zhang, Q., Stouthamer-Loeber, M., & van Kammen, W. B. (1995). The Influence Of Deviant Peers On The Development Of Boys' Disruptive And Delinquent Behavior: A Temporal Analysis. *Development and Psychopathology*, 7(04), 715.
212. Kim, S., Brody, G. H., & Murry, V. M. B. (2003). Longitudinal Links Between Contextual Risks, Parenting, And Youth Outcomes In Rural African American Families. *Journal of Black Psychology*, 29(4), 359.
213. Kirk, D. S. (2008). The Neighborhood Context Of Racial And Ethnic Disparities In Arrest. *Demography*, 45(1), pp. 55-77.
214. Kling, J., Ludwig, J. (2005) Neighborhood Effects on Crime for Female and Male Youth: Evidence from a Randomized Housing Voucher Experiment. The Quarterly Journal of Economics. *Quarterly Journal of Economics*, 120(1) pp.87-130.
215. Knecht, A., Snijders, T.A.B., Baerveldt, C., Steglich, C., Raub, W. (2010). Friendship and Delinquency: Selection and Influence Processes in Early Adolescence. *Social Development*, 19, pp. 494-514.
216. Kochel, T. R., Wilson, D. B., & Mastrofsky, S. D. (2011). Effect of Suspect Race on Officer's Arrest Decisions. *Criminology*, 49(2), pp. 473-512.
217. Kohen, D. E., Leventhal, T., Dahinten, V. S., & McIntosh, C. N. (2008). Neighborhood Disadvantage: Pathways Of Effects For Young Children. *Child Development*, 79(1), 156-169.
218. Kroneman L., Loeber R. & Hipwell A.E. (2004). Is Neighborhood Context Differently Related To Externalizing Problems And Delinquency For Girls Compared With Boys. *Clinical Child and Family Psychology Review*,. 7(2) pp. 109-122
219. Kupersmidt, J. B., DeRosier, M. E., & Patterson, C. P. (1995). Similarity

- As The Basis For Children's Friendships: The Roles Of Sociometric Status, Aggressive And Withdrawn Behavior, Academic Achievement And Demographic Characteristics. *Journal of Social and Personal Relationships*, 12(3), pp. 439-452.
220. Kurlychek, M. C., Krohn, M. D., Dong, B., Hall, G. P., & Lizotte, a. J. (2011). Protection From Risk: Exploration of When and How Neighborhood-Level Factors Can Reduce Violent Youth Outcomes. *Youth Violence and Juvenile Justice*, 10(1), pp.83–106. doi:10.1177/1541204011422088
 221. Lannie, A. McCurdy, (2007) B Preventing Disruptive Behavior in the Urban Classroom: Effects of the Good Behavior Game on Student and Teacher Behavior. *EDUCATION AND TREATMENT OF CHILDREN* Vol. 30, No. 1
 222. Larry, O., Feins, J., Jacob, R., Beecroft, E., Sanbonmatsu, L., Katz, L., Rey, B. Liebman, Rey J., & Kling.R. (2003) *Moving to Opportunity for Fair Housing Demonstration: Interim Impacts Evaluation*. Washington, DC: U.S. Department of Housing and Urban Development.
 223. Larzelere, R., Patterson, G. (1990): Parental Management: Mediator of the Effect of Socioeconomic Status on Early Delinquency. *Criminology*, 28 (2), pp. 301–324
 224. Latané, B., Liu, J. H., Nowak, A., Bonevento, M., & Zheng, L. (1995). Distance Matters: Physical Space And Social Impact. *Personality and Social Psychology Bulletin*, 21(8), 795.
 225. Le Blanc Marc (1997) Socialization or propensity: Does Integrative Control Theory Apply to Adjudicated Boys? *Studies on Crime and Crime Prevention*. 6 (2).
 226. Leckie, G. (2013). Cross-Classified Multilevel Models – MLwiN Practical. LEMMA VLE Module 12, pp.1-60. [ONLINE] Available at: <http://www.bristol.ac.uk/cmm/learning/course.html> [Last Accessed 31 August 14]
 227. Leckie, G. and French, R. (2013). Three-Level Multilevel Models – MLwiN Practical. LEMMA VLE Module 11, pp.1-56. [ONLINE] Available at: <http://www.bristol.ac.uk/cmm/learning/course.html> [Last Accessed 31 August 14]
 228. Leckie, G. and Owen, D. (2013). Multiple Membership Multilevel Models – MLwiN Practical. LEMMA VLE Module 13, 1-48. [ONLINE]

Available at: <http://www.bristol.ac.uk/cmm/learning/course.html> [Last Accessed 31 August 14]

229. Leventhal, T., & Brooks-Gunn, J. (2000). The Neighborhoods They Live In: The Effects Of Neighborhood Residence On Child And Adolescent Outcomes. *Psychological Bulletin*, 126(2), 309-337.
230. Leventhal, T., & Brooks-Gunn, J. (2003). Moving To Opportunity: An Experimental Study Of Neighborhood Effects On Mental Health. *American Journal of Public Health*, 93(9), 1576.
231. Leventhal, T., & Brooks-Gunn, J. (2011). Changes In Neighborhood Poverty From 1990 To 2000 And Youth's Problem Behaviors. *Developmental Psychology*, 47(6), pp.1680–98. doi:10.1037/a0025314
232. Levine Coley, R., Eileen Morris, J., & Hernandez, D. (2004). Out-Of-School Care And Problem Behavior Trajectories Among Low-Income Adolescents: Individual, Family, And Neighborhood Characteristics As Added Risks. *Child Development*, 75(3), 948-965.
233. Li, X., Wong W., Lamoureux E. Wong, T (2012) 1,2,3Are Linear Regression Techniques Appropriate for Analysis When the Dependent (Outcome) Variable Is Not Normally Distributed? *Investigative Ophthalmology & Visual Science*, 53 (6)
234. Lim, U. (2003) *Knowledge Spillovers, Spatial Dependence and Regional Economic Growth in U.S. Metropolitan Areas*. PhD Dissertation. Community and Regional Planning, The University of Texas at Austin.
235. Lloyd J.J., & Anthony J.C. (2003). Hanging Out With The Wrong Crowd: How Much Difference Can Parents Make In An Urban Environment? *J Urban Health*. 80(3)pp. 383-99.
236. Lobao, L. M., Hooks, G., & Tickamyer, A. R. (2007). *The Sociology Of Spatial Inequality* State Univ of New York Press
237. Lobao, L., & Saenz, R. (2002). Spatial Inequality And Diversity As An Emerging Research Area. *Rural Sociology*, 67(4), pp. 497-511.
238. Lochman, J. E., Wells, K. C., Qu, L., & Chen, L. (2013). Three year follow-up of coping power intervention effects: evidence of neighborhood moderation?. *Prevention Science*, 14(4), 364-376.
239. Lockwood, B. (2011). *Too Far To Travel?: An Investigation Of The Effects Of Distance To Community-Based Treatment Programs For Juvenile*

- Offenders.** Dissertation, Department of Criminal Justice at Temple University
240. Loeber, R., Wikstrom, P.O.(1993) Individual Pathways to crime in Different Types of Neighbourhood, In: Farrington, D., Sampson, R., Wikstrom, P. (Eds.) ***Integrating Individual and Ecological; Aspects of Crime, National Council For Crime Prevention***, Stockholm.
 241. Loeber, R.; Dishion, T. (1983): Early Predictors Of Male Delinquency: A Review. ***Psychological Bulletin***, Vol 94(1), pp. 68-99.
 242. Luc Anselin (1999) ***Spatial Econometrics***. Bruton Center, School of Social Sciences, University of Texas at Dallas Richardson.
 243. Ludwig, J. , Kling, J (2007): Is Crime Contagious? ***Journal of Law and Economics***, Vol. 50(3), pp. 491-518.
 244. Ludwig, J., Liebman, J. B., Kling, J. R., Duncan, G. J., Katz, L. F., Kessler, R. C., et al. (2008). What Can We Learn About Neighborhood Effects From The Moving To Opportunity Experiment. ***American Journal of Sociology***, 114(1) pp. 144-188.
 245. Lunecke, A. (2009) Historia De La Población Santa Adriana: Exclusión Social, Cultura De La Violencia Y Trayectoria Delictual. ***Urvio, Revista Latinoamericana de Seguridad Ciudadana***. No. 7 pp. 61-73.
 246. Lynam, D. R., Caspi, A., Moffitt, T. E., Wikstrom, P. -. H., Loeber, R., & Novak, S. (2000). The Interaction Between Impulsivity And Neighborhood Context On Offending: The Effects Of Impulsivity Are Stronger In Poorer Neighborhoods. ***Journal of Abnormal Psychology***, 109(4) pp. 563-574.
 247. Macintyre, S., Ellaway, A., & Cummins, S. (2002). Place Effects On Health: How Can We Conceptualise, Operationalise And Measure Them? ***Social Science & Medicine***, 55(1), pp. 125-139. DOI: 10.1016/S0277-9536(01)00214-3.
 248. MacKinnon, David (2008). ***Introduction to Statistical Mediation Analysis (Multivariate Applications Series)***, Taylor & Francis. Kindle Edition.
 249. Mahoney, J. L., Stattin, H., & Lord, H. (2004). Unstructured Youth Recreation Centre Participation And Antisocial Behaviour Development: Selection Influences And The Moderating Role Of Antisocial Peers. ***International Journal of Behavioral Development*** 28 (6), 553–560.
 250. Mahoney, J. L., Stattin, H., & Magnusson, D. (2001). Youth Recreation Centre Participation And Criminal Offending: A 20-Year Longitudinal Study Of

- Swedish Boys. *International Journal of Behavioral Development*, 25(6) pp. 509-520.
251. Maimon, D., & Browning, C. R. (2010). Unstructured Socializing, Collective Efficacy, And Violent Behavior Among Urban Youth *Criminology*, 48(2) pp. 443-474.
 252. Manzano, L (2009) *Violencia En Barrios Críticos*. Centro de Estudios en Seguridad Ciudadana, Instituto de Asuntos Públicos, Universidad de Chile.
 253. Margolin, G., Vickerman, K. A., Oliver, P. H., & Gordis, E. B. (2010). Violence Exposure In Multiple Interpersonal Domains: Cumulative And Differential Effects. *Journal of Adolescent Health*, 47(2), pp. 198-205.
 254. Mason, M. J., Mennis, J., Coatsworth, J. D., Valente, T., Lawrence, F., & Pate, P. (2009). The Relationship Of Place To Substance Use And Perceptions Of Risk And Safety In Urban Juveniles. *Journal of Environmental Psychology*, 29(4),pp. 485-492.
 255. Mason, M. J., Valente, T. W., Coatsworth, J. D., Mennis, J., Lawrence, F., & Zelenak, P. (2010). Place-Based Social Network Quality And Correlates Of Substance Use Among Urban Juveniles. *Journal of Adolescence*, 33(3),pp. 419-427.
 256. Mattaini, M., Mcguire, M. (2006): Behavioral Strategies for Constructing Nonviolent Cultures With Youth A Review BEHAVIOR MODIFICATION, Vol. 30 No. 2, March; 184-224
 257. Mateu-Gelabert, P., Lune, H., (2003) School Violence: The Bidirectional Conflict Flow Between Neighborhood and School. *City & Community*, Vol. 2, N° 4
 258. Matthews, S. A. (2011). Spatial polygamy and the heterogeneity of place: studying people and place via egocentric methods. In *Communities, Neighborhoods, and Health* (pp. 35-55). Springer New York.
 259. Maume, M., Ousey, G., Beaver, K. (2005) Cutting the Grass: A Reexamination Of The Link Between Marital Attachment, Delinquent Peers And Desistance From Marijuana Use. *Journal of Cuantitative Criminology*. Vol 21 N°1. Pp. 27-53.
 260. Mayer, S. E., & Jencks, C. (1989). Growing Up In Poor Neighborhoods: How Much Does It Matter? *Science (Washington)*, 243(4897) pp. 1441-1441.
 261. Mazerolle, P., & Maahs, J. (2000). General strain and delinquency: An

- alternative examination of conditioning influences. *Justice Quarterly*, 17(4), pp. 753-778.
262. McCaskill, P. A., Toro, P. A., & Wolfe, S. M. (1998). Homeless And Matched Housed Adolescents: A Comparative Study Of Psychopathology. *Journal of Clinical Child Psychology*, 27(3) pp. 306-319.
 263. McConnell, P. (2009). *Toward a Holistic Vectored Geography of Homicide*, Dissertation, Department of Criminal Justice at Temple University
 264. McGloin, J., Sullivan, C. J., Piquero, A. R., & Bacon, S. (2008). Investigating the Stability of Co-Offending and Co-Offenders Among a Sample of Youthful Offenders. *Criminology*, 46(1), pp. 155-188.
 265. Mcleod, Jane, Shanahan, Michael (1993): "Poverty, Parenting and Childrens Mental Health" *American Sociological Review*, Vol. 58, N°3.
 266. McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a feather: Homophily in social networks. *Annual Review of Sociology*, , 415-444.
 267. Menard, S. (1995) A Developmental Test of Mertonian Anomie Theory. *Journal of Research in Crime and Delinquency*. Vol. 32, N°2.
 268. Mennis, J., & Mason, M. J. (2011). People, Places, And Adolescent Substance Use: Integrating Activity Space And Social Network Data For Analyzing Health Behavior. *Annals of the Association of American Geographers*, 101(2), pp. 272-291.
 269. Mercken, L., Candel, M., Willems, P., & De Vries, H. (2007). Disentangling Social Selection And Social Influence Effects On Adolescent Smoking: The Importance Of Reciprocity In Friendships. *Addiction*, 102(9) pp. 1483-1492.
 270. Mercken, L., Snijders, T.A.B. Steglich, C., Vertiainen, E., de Vries, H., (2010) Smoking-Based Selection And Influence In Gender-Segregated Friendship Networks: A Social Network Analysis Of Adolescent Smoking. *Addiction* 105 (2010), 1280-1289.
 271. Merrell, K. W., & Walker, H. M. (2004). Deconstructing A Definition: Social Maladjustment Versus Emotional Disturbance And Moving The EBD Field Forward. *Psychology in the Schools*, 41(8), pp. 899-910.
 272. Merton, R. K. (1957) *Social Theory and Social Structure*. Ed. Glencoe, Ill. : The Free Press.
 273. Messner, S. F., & Rosenfeld, R. (1997). Political Restraint Of The

- Market And Levels Of Criminal Homicide: A Cross-National Application Of Institutional-Anomie Theory. ***Social Forces***, 75(4), pp. 1393-1416.
274. MINVU, (2004) ***Chile, Un siglo de políticas en Vivienda y Barrio*** Depto. de Estudios, División Técnica de Estudios y Fomento Habitacional-DITEC.
 275. Mitra, R., & Buliung, R. N. (2012). Built Environment Correlates Of Active School Transportation: Neighborhood And The Modifiable Areal Unit Problem. ***Journal of Transport Geography***, 20(1), pp. 51-61.
 276. Molnar, B. E., Cerda, M., Roberts, A. L., & Buka, S. L. (2008). Effects Of Neighborhood Resources On Aggressive And Delinquent Behaviors Among Urban Youths. ***American Journal of Public Health***, 98(6), pp. 1086-1093.
 277. Molnar, B., Browne A., Cerda, M., & Buka, S. (2005). Violent behavior by girls reporting violent victimization: A prospective study. ***Arch Pediatr Adolesc Med***, 159(8), 731-9.
 278. Mrug, S., Loosier, P. S., & Windle, M. (2008). Violence Exposure Across Multiple Contexts: Individual And Joint Effects On Adjustment. ***American Journal of Orthopsychiatry***, 78(1), pp. 70-84.
 279. Murray, J., & Farrington, D. P. (2010). Risk Factors For Conduct Disorder And Delinquency: Key Findings From Longitudinal Studies. ***Can J Psychiatry***. Vol. 55(10) pp. 619-21.
 280. Murray, J., Farrington, D. P., & Eisner, M. P. (2009). Drawing Conclusions About Causes From Systematic Reviews Of Risk Factors: The Cambridge Quality Checklists. ***Journal of Experimental Criminology***, Vol. 5(1), pp. 1-23.
 281. Neckelmann, M., (2009) ***El efecto protector de la religión frente consumo de alcohol y drogas en adolescentes chilenos***. Tesis para optar al grado de Magíster en Sociología. Pontificia Universidad Católica de Chile
 282. Nichols, W. (1980). ***Mental Maps, Social Characteristics, And Criminal Mobility***. In ***Crime: A Spatial Perspective***, edited by Georges-Abeyie, D. E. & Harries, K. D. New York, NY: Columbia University Press.
 283. Oberwittler, D. & Wikström, P.-O. (2009). Why Small Is Better: Advancing the Study of the Role of Behavioral Contexts in Crime Causation. In: Weisburd, D., Bernasco, W. & G. Bruinsma (Hg.), ***Putting Crime in its Place***. Units of Analysis in Geographic Criminology. New York: Springer, pp. 35-59

284. Oberwittler, D. (2007). The effects of neighbourhood poverty on adolescent problem behaviours: A multi-level analysis differentiated by gender and ethnicity. *Housing Studies*, 22(5), pp. 781-803.
285. Odgers, C. L., Moffitt, T. E., Tach, L. M., Sampson, R. J., Taylor, A., Matthews, C. L., et al. (2009). The Protective Effects Of Neighborhood Collective Efficacy On British Children Growing Up In Deprivation: A Developmental Analysis. *Developmental Psychology*, 45(4), pp. 942.
286. OECD (2011) OECD Family Database, OECD, Paris. [Online Version Available] [ONLINE] Available at: http://www.oecd.org/document/4/0,3746,en_2649_37419_37836996_1_1_1_37419,00.html#child_outcomes. [Last Accessed 31 August 14]
287. OECD (2012) *OECD Economic Surveys: Chile 2012 Reducing poverty in Chile: Cash transfers and better Jobs*. OECD, Paris.
288. Organización de los Estados Americanos (2008) *Seguridad Pública en las Américas: Retos y Oportunidades*. [ONLINE] Available at: http://www.oas.org/dsp/espanol/cpo_mispa2.asp [Last Accessed 31 August 14]
289. Owens, A. (2010). Neighborhoods And Schools As Competing And Reinforcing Contexts For Educational Attainment. *Sociology of Education*, 83(4), 287.
290. Ozer, E. J., & Fernald, L. C. H. (2008). Alcohol And Tobacco Use Among Rural Mexican Adolescents: Individual, Familial, And Community Level Factors. *Journal Adolescent Health*. 43(5), pp. 98-505.
291. Parra, M.T. (2003). *Neighborhood Effects on Violence and Delinquency: An Ecological Analysis of a National Sample of Adolescents*. Add Health Users Workshop. Bethesda, MD.
292. Paschall, M, Ornstein, M., Flewelling, R., (2001) African American Male Adolescents Involvement in the Criminal Justice System: The Criterion Validity of Self Report Measures in a prospective Study. *Journal of Research in Crime and Delinquency*, Vol 38 N°2.
293. Perchoux, C., Chaix, B., Cummins, S., & Kestens, Y. (2013). Conceptualization and measurement of environmental exposure in epidemiology: accounting for activity space related to daily mobility. *Health & Place*, 21, 86–93. doi:10.1016/j.healthplace.2013.01.005
294. Petersilia, J. (1980). Criminal career research: A review of recent

- evidence. *Crime &Just.*, Vol. 2, pp. 321.
295. Petronis, K. R., & Anthony, J. C. (2003). A Different Kind Of Contextual Effect: Geographical Clustering Of Cocaine Incidence In The USA. *Journal of Epidemiology and Community Health*, 57(11), pp. 893-900.
 296. Phillips, P. D. (1980). *Characteristics And Typology Of The Journey To Crime*. In *Crime: A Spatial Perspective*, edited by Georges-Abeyie, D. E. & Harries, K. D. New York, NY: Columbia University Press.
 297. Piacentini, J., Shaffer, D., Fisher, P., Schwab-Stone, M., Davies, M., & Gioia, P. (1993). The Diagnostic Interview Schedule For Children-Revised Version (DISC-R): III. Concurrent Criterion Validity. *Journal of the American Academy of Child & Adolescent Psychiatry*, 32(3), pp. 658-665.
 298. Pinderhughes, E. E., Nix, R., Foster, E. M., & Damon Jones. (2001). Parenting In Context: Impact Of Neighborhood Poverty, Residential Stability, Public Services, Social Networks, And Danger On Parental Behaviors. *Journal of Marriage and Family*, 63(4), pp. 941-953.
 299. Plunkett, S.(1999) Family stressor events, family coping and adolescent adaptation in farm and ranch families *Adolescence* 34(133) pp. 147-68.
 300. Plybon, L. E., & Kliwer, W. (2001). Neighborhood Types And Externalizing Behavior In Urban School-Age Children: Tests Of Direct, Mediated, And Moderated Effects. *Journal of Child and Family Studies*, 10(4), pp. 419-437.
 301. Portes, A. (1998). Social Capital: Its Origins And Applications In Modern Sociology. *Annual Review of Sociology*, 24(1)
 302. Poulin, F., Kiesner, J., Pedersen, S., & Dishion, T. J. (2011). A Short-Term Longitudinal Analysis Of Friendship Selection On Early Adolescent Substance Use. *Journal of Adolescence*, 34(2), pp. 249-256.
 303. Pratt, T. C., & Godsey, T. W. (2003). Social Support, Inequality, and Homicide: A Cross-National Test of an Integrated Theoretical Model. *Criminology*, 41(3), pp. 611-644.
 304. Prior D., and Paris A. (2005): Preventing Children's Involvement in Crime and Anti-Social Behaviour: A literature Review A paper produced for the National Evaluation of the Children's Fund. Department for Education and Skills, Institute of Applied Social Studies [\[ONLINE\]](http://dera.ioe.ac.uk/5557/1/RR623.pdf)
<http://dera.ioe.ac.uk/5557/1/RR623.pdf> [Last Accessed 31 August 14]

305. Quevedo, F., & Rodríguez, C. (2009) *Efectos Intertemporales E Intratemporales Del Consumo De Alcohol Y Cigarrillo En La Demanda Por Marihuana*. Núcleo Científico Milenio de Investigación Socioeconómica en uso y abuso de Drogas. Instituto de Sociología, Pontificia Universidad Católica de Chile.
306. Rahdert, E. Czechowicz, D. (1995). Adolescent Drug Abuse: Clinical Assessment and Therapeutic Interventions. *Maryland, National Institute on Drug Abuse. NIDA Research Monograph* 156.
307. Rasbash, J., Steele, F., Browne W. Goldstein, H (2009) *A User's Guide to MLwiN, Version 2.10*
308. Raudenbush SW , Sampson RJ (1999) Econometrics: Toward a science of assessing ecological settings, with application to the systematic social observation of neighborhoods. *Sociology Methodology* Vol. 29 pp. 1–41
309. Raudenbush, S.W., Johnson, C., & Sampson, R. J. (2003). A multivariate, multilevel Rasch model for self-reported criminal behavior. *Sociological Methodology*, 33(1),pp. 169-211.
310. Reboussin, B. A., Preisser, J. S., Song, E. Y., & Wolfson, M. (2010). Geographic clustering of underage drinking and the influence of community characteristics. *Drug and Alcohol Dependence*, 106(1), 38-47.
311. Reijneveld, S. A., Veenstra, R., de Winter, A. F., Verhulst, F. C., Ormel, J. & de Meer, G. (2010). Area Deprivation Affects Behavioral Problems Of Young Juveniles In Mixed Urban And Rural Areas: The TRAILS Study. *J. Adolesc Health*. Vol. 46(2) 189-96.
312. Reiss Jr, A. J., & Farrington, D. P. (1991). Advancing Knowledge About Co-Offending: Results From A Prospective Longitudinal Survey Of London Males. *J.Crim.L.& Criminology*, 82, 360.
313. Richardson, J. B., Jr., Van Brakle, M.,&St. Vil, C. (2014). Taking boys out of the hood: Exile as a parenting strategy for African American male youth. In K. Roy & N. Jones (Eds.), *Pathways to adulthood for disconnected young men in low-income communities*. NewDirections for Child and Adolescent Development, 143, 11–31.
314. Ridenour, T. A., Tarter, R. E., Reynolds, M., Mezzich, A., Kirisci, L., & Vanyukov, M. (2009). Neurobehavior Disinhibition, Parental Substance Use Disorder, Neighborhood Quality And Development Of Cannabis Use Disorder

- In Boys. ***Drug & Alcohol Dependence***, 102(1-3), pp. 71-77.
315. Ripley, R., Snijders, T.A.B. Preciado, P. (2012) ***Manual for R Siena***. University of Oxford: Department of Statistics; Nuffield College.
 316. Ripley, R.M., and Snijders, T.A.B. (2011). ***Manual for SIENA version 4.0***. Oxford: University of Oxford, Department of Statistics; Nuffield College.
 317. Riva, M., Gauvin, L., & Barnett, T. A. (2007). Toward the next generation of research into small area effects on health: A synthesis of multilevel investigations published since July 1998. ***Journal of Epidemiology and Community Health***, 61(10), pp. 853.
 318. Robert M. G. (1995) Potential and Problems in Developing Indicators on Child Well-Being from Administrative Data. In: Institute for Research on Poverty (Ed.) Indicators of Children's Well-Being Conference Papers: Volume III: Cross-Cutting Issues; ***Population, Family, and Neighborhood; Social Development and Problem Behaviors*** pp. 5 -16 University of Wisconsin-Madison.
 319. Robinson, D. (2011). The Spatial Routines of Daily Life in Low-income Neighbourhoods: Escaping the “Local Trap.” ***Space and Polity***, 15(2), 125–141. doi:10.1080/13562576.2011.625223
 320. Roosa, M. Deng, S., Ryu, E. Lockhart, G. Tun Tien, J. Jones, S. Lopez, V, Crowder (2005) S. Family and Child Characteristics Linking Neighborhood Context and Child Externalizing Behavior ***Journal of Marriage and Family*** Vol. 67 pp. 515–529.
 321. Ross, Catherine (2000) Neighborhood Disadvantage and Adult Depression ***Journal of Health and Social Behavior***. Vol. 41
 322. Roth, D., & MacKinnon, D. (2012): Mediation Analysis with Longitudinal Data, in Newsom, J., Jones, R., Hofner, S. (Eds.) ***Longitudinal Data Analysis: A Practical Guide For Researchers In Aging, Health, and Social Sciences***. Routledges, New York.
 323. Rubin, D. (1976) Inference en Missing Data. ***Biometrika*** 63,3,pp. 581-92.
 324. Rutter, M. (1997) Nature-nurture integration: The example of problem behaviour. ***American Psychologist*** Vol. 52, N°4, pp. 390-398
 325. Rutter, M., Giller, H., & Hagell, A. (1998). ***Antisocial behavior by young people: A major new review***. Cambridge University Press.

326. Sabatini, F. (2000). Reforma De Los Mercados De Suelo En Santiago, Chile: Efectos Sobre Los Precios De La Tierra Y La Segregación Residencial **EURE, Revista Latinoamericana de Estudios Urbanos y Regionales** (Santiago: Instituto de Estudios Urbanos y Territoriales, P. Universidad Católica de Chile) 26, no. 77 pp. 49–80.
327. Sabatini, F., Cáceres, G., & Cerda, J. (2001). Segregación Residencial En Las Principales Ciudades Chilenas: Tendencias De Las Tres Últimas Décadas Y Posibles Cursos De Acción. **Eure, Revista Latinoamericana de Estudios Urbanos y Regionales** Santiago: Instituto de Estudios Urbanos y Territoriales 27(82), pp. 21-42.
328. Sampson Robert (1986): Effects of Socioeconomic Context on Oficial Reactrion to Juvenile Delinquency. **American Sociology Review** Vol. 51 N°6.
329. Sampson, R. J. (1997). Collective Regulation Of Adolescent Misbehavior. **Journal of Adolescent Research**, 12(2), 227.
330. Sampson, R. J., & Groves, W. B. (1989). Community Structure And Crime: Testing Social-Disorganization Theory. **The American Journal of Sociology**, 94(4), pp. 774-802.
331. Sampson, R. J., & Raudenbush, S. W. (1999). Systematic Social Observation Of Public Spaces: A New Look At Disorder In Urban Neighborhoods. **American Journal of Sociology**, pp. 603-651.
332. Sampson, R. J., Morenoff, J. D., & Earls, F. (1999). Beyond social capital: Spatial dynamics of collective efficacy for children. **American Sociological Review**, 64(5), pp. 633-660.
333. Sampson, R. J., Morenoff, J. D., & Gannon-Rowley, T. (2002). Assessing neighborhood effects: Social processes and new directions in research. **Annual Review of Sociology**, pp. 443-479.
334. Sampson, R. J., Raudenbush, S. W., & Earls, F. (1997). Neighborhoods And Violent Crime: A Multilevel Study Of Collective Efficacy. **Science**, 277(5328), 918.
335. Sampson, R. J., Sharkey, P., & Raudenbush, S. W. (2008). Durable Effects Of Concentrated Disadvantage On Verbal Ability Among African-American Children. **Proceedings of the National Academy of Sciences**, 105(3), 845.
336. Sampson, R., Groves, B. (1989) Community Structure and Crime;

- Testing Social Disorganization Theory. *The American Journal of Sociology* Vol 94, N°4 (Jan) 774 - 802.
337. Sampson, R.; Laub, J.(1993) ***Crime in the Making, Pathways and turning points through life.*** Harvard University press Cambridge Massachusetts, London England
 338. Sanhueza C. y Larrañaga O. (2007) ***Residential Segregation Effects on Poor's Opportunities in Chile*** Facultad de Economía Universidad de Chile.
 339. Sariaslan, A., Långström, N., D'Onofrio, B., Hallqvist, J., Franck, J., & Lichtenstein, P. (2013). The Impact Of Neighbourhood Deprivation On Adolescent Violent Criminality And Substance Misuse: A Longitudinal, Quasi-Experimental Study Of The Total Swedish Population. *International Journal of Epidemiology*, 42(4) pp.1057–66. doi:10.1093/ije/dyt066
 340. Sarnecki, J. (2001) ***Delinquent Networks: Youth Co-Offending in Stockholm.*** Cambridge University Press. Cambridge United Kingdom.
 341. Schneiders, J., Drukker, M., Ende, J. v. d., Verhulst, F. C., Os, J. v., & Nicolson, N. A. (2003). Neighbourhood socioeconomic disadvantage and behavioural problems from late childhood into early adolescence. *Journal of Epidemiology and Community Health* 57(9), pp. 699-703.
 342. Schonberg, M. A., & Shaw, D. S. (2007). Do The Predictors Of Child Conduct Problems Vary By High- And Low-Levels Of Socioeconomic And Neighborhood Risk? *Clinical Child Family Psychology Review*. 10(2):101-36.
 343. Schwab-Stone, M., Fisher, P., Piacentini, J., Shaffer, D., Davies, M., & Briggs, M. (1993). The Diagnostic Interview Schedule For Children-Revised Version (DISC-R): II. Test-Retest Reliability. *Journal of the American Academy of Child & Adolescent Psychiatry*, 32(3), 651-657.
 344. Scott J. South and Kyle D. (1999), Crowder Neighborhood Effects on Family Formation: Concentrated Poverty and Beyond. *American Sociological Review*, 64 (1)
 345. Scott, L., Janikas, M. (2010) Spatial Statistics in ArcGIS, In: Fischer, M., Getis, A. Eds. ***Handbook of Applied Spatial Analysis: Software Tools, Methods and Applications.*** Springer-Verlag Berlin Heidelberg
 346. Seidman, E., Yoshikawa, H., Roberts, A., Chesir–Teran, D., Allen, L., Friedman, J. L., et al. (1998). Structural And Experiential Neighborhood Contexts, Developmental Stage, And Antisocial Behavior Among Urban

- Adolescents In Poverty. *Development and Psychopathology*, 10(02), pp. 259-281.
347. SENDA (2011) *Noveno Estudio de Drogas en Población Escolar*. Servicio Nacional de Drogas y Alcohol, Ministerio del Interior, Gobierno de Chile.
 348. Sepúlveda, D. (1998). De Tomas De Terreno A Campamentos: Movimiento Social Y Político De Los Pobladores Sin Casa, Durante Las Décadas Del 60 Y 70, En La Periferia Urbana De Santiago De Chile. *Revista INVI*, 13(35)
 349. Shaw C., McKay, H. (1969) *Juvenile Delinquency and Urban Areas: A Study of Delinquents in Relation to Differential Characteristics of Local Communities in American Cities*. Revised Edition. The University of Chicago Press, Chicago.
 350. Shaw, B., Liang, J. (2012) Growth Models with Multilevel Regression. In Newsom, J.,
 351. Sieving, R. E., Perry, C. L., & Williams, C. L. (2000). Do Friendships Change Behaviors, Or Do Behaviors Change Friendships? Examining Paths Of Influence In Young Adolescents' Alcohol Use. *Journal of Adolescent Health*, 26(1), 27-35.
 352. Simons, L. G., Simons, R. L., Conger, R. D., & Brody, G. H. (2004). Collective Socialization And Child Conduct Problems. *Youth & Society*, 35(3), 267-292
 353. Simons, R. L., Simons, L. G., Burt, C. H., Brody, G. H. & Cutrona, C. (2005). Collective efficacy, authoritative parenting and delinquency: A longitudinal test of a model integrating community - and family-level processes. *Criminology* (43) 4.
 354. Simons, R., Gordon, L., Ebert, L., (2004) *Families, Delinquency and Crime*, Roxbury Publishing Company, Los Angeles California.
 355. Simons-Morton, B., & Farhat, T. (2010). Recent findings on peer group influences on adolescent substance use. *The Journal of Primary Prevention*, 31(4), 191.
 356. Skinner, W., Fream, Anne (1997): A Social Learning Theory Analysis of Computer Crime Among Students. *Journal of Research in Crime and Delinquency*. (34) 4.

357. Smith, D. (2004) The Links Between Victimization and Offending, ***The Edinburgh Study of Youth Transitions and Crime***, No 5.
358. Snijders, T. A. B., & Bosker, R. J. (1999). *Multilevel analysis: An introduction to basic and advanced multilevel modeling* SAGE publications Ltd.
359. Snijders, T. A. B., & Bosker, R. J. (2012). *Multilevel analysis: An introduction to basic and advanced multilevel modeling* SAGE publications Ltd.
360. Snijders, T.A.B., (2001) ***The Statistical Evaluation of Social Network Dynamics*** Pp. 361-395 In: Sociological Methodology , edited by M.E. Sobel and M.P. Becker. Boston and London: Basil Blackwell.
361. Snijders, T.A.B., van de Bunt, G., & Steglich, C. (2010). Introduction To Actor-Based Models For Network Dynamics. ***Social Networks***, 32, 44-60.
362. Snook, B., Cullen, R. M., Mokros, A., & Harbort, S. (2005). Serial Murderers' Spatial Decisions: Factors That Influence Crime Location Choice. ***Journal of Investigative Psychology and Offender Profiling***, 2(3), 147-164.
363. South, S. J., & Crowder, K. D. (1999). Neighborhood Effects On Family Formation: Concentrated Poverty And Beyond. ***American Sociological Review***, pp. 113-132.
364. South, S. J., Baumer, E. P., & Lutz, A. (2003). Interpreting Community Effects On Youth Educational Attainment. ***Youth & Society***, 35(1), pp. 3-36.
365. Spohn, R. E. (2004). ***Strain and deviant adaptations: The conditioning role of social and economic factors***. Dissertation Abstracts International, A: The Humanities and Social Sciences, 64(7).
366. Stark, Rodney (1996) Deviant places: A Theory of the Ecology of Crime, published In: Cordella, Peter and Siegel, Larry., eds. ***Readings in Contemporary Criminological Theory***. Boston, Mass., Northeastern University Press, pp. 128-142.
367. Steele, F. (2008). ***Module 5: Introduction to multilevel modelling concepts***. *LEMMA* Learning Environment for Multilevel Methodology and Applications, Centre for Multilevel Modelling, University of Bristol.
368. Steglich, C., Snijders, T., Pearson, M. (2010) Dynamic Networks and Behaviour: Separating Selection From Influence, ***Sociological Methodology***, 40 (1), pp. 329–393
369. Stewart (1941) An Inverse Distance Variation for

Certain Social Influences,
Science, Vol. 93.

370. Stewart, E. A., & Simons, R. L. (2006). Structure And Culture In African American Adolescent Violence: A Partial Test Of The "Code Of The Street" thesis. *Justice Quarterly*, 23(1), pp. 1-33.
371. Stewart, E. A., & Simons, R. L. (2010). Race, Code Of The Street, And Violent Delinquency: A Multilevel Investigation Of Neighbourhood Street Culture And Individual Norms Of Violence. *Criminology*, 48(2), pp. 569-605.
372. Stopher, K. V., Walling, C. A., Morris, A., Guinness, F. E., Clutton-Brock, T. H., & Pemberton, J. M., (2012). Shared Spatial Effects On Quantitative Genetic Parameters: Accounting For Spatial Autocorrelation And Home Range Overlap Reduces Estimates Of Heritability In Wild Red Deer. *Evolution* 66(8)pp. 2411-26.
373. Stults, B. J., & Baumer, E. P. (2008). Assessing the relevance of anomie theory for explaining spatial variation in lethal criminal violence: An aggregate-level analysis of homicide within the United States. *International Journal of Conflict and Violence*, 2(2), pp. 215-247.
374. Sullivan, C. J. (2013). Individual, Social, and Neighborhood Influences on the Launch of Adolescent Antisocial Behavior. *Youth Violence and Juvenile Justice*, 12(2), pp.103–120. doi:10.1177/1541204013483779
375. Suplee, L. Unikel, E. Shaw, D. (2007) Physical Environmental Adversity And The Protective Role Of Maternal Monitoring In Relation To Early Child Conduct Problems *Journal of Applied Developmental Psychology* 28 pp. 166–183.
376. Sutherland, A., Brunton-Smith, I., & Jackson, J. (2013). Collective efficacy, deprivation and violence in London. *British journal of criminology*, azt050.
377. Sutherland, E.H., Cressey, D.R., Luckenbill D.F. (1992) *Principles of Criminology* (11th ed.) General Hall, Dix Hills, NY.
378. Takeuchi, David, Williams, David, Adair, Russell (1991) Economic Stress In The Family And Children's Emotional And Behavioural Problems *Journal of Marriage and the Family*, 53 (4)
379. Thornberry, T, Farnworth M. (1982) Social Correlates of criminal involvement: further evidence on the relationship between social status and

- criminal behavior. *American Sociological Review*. 47 (4)
380. Thornberry, T. P., & Penly Hall, G. (2005). *Joint impact of family and community structure on violent delinquency*. Office of Juvenile Justice and Delinquency Prevention.
 381. Thornberry, T., & Krohn, M., (2000). The self-report method of measuring delinquency and crime. En: Measurement and analysis of crime and justice *Criminal Justice Series 4*, pp. 33-83 National Institute of Justice.
 382. Thornberry, T., Penly Hall, G. (2005) *The Joint Impact of Family and Community Structure on Violent Delinquency*, Office of Juvenile Justice and Delinquency Prevention.
 383. Tilley N. (2002) *Crime Prevention in Britain: 1975-2010: breaking out, breaking in, breaking down*. Crime Prevention and Community Safety: New Directions.
 384. Tita, G., & Griffiths, E. (2005). Traveling To Violence: The Case For A Mobility-Based Spatial Typology Of Homicide. *Journal of Research in Crime and Delinquency*, 42(3), 275-308.
 385. Tobler, A. L., Komro, K. A., & Maldonado-Molina, M. M. (2009). Relationship between neighborhood context, family management practices and alcohol use among urban, multi-ethnic, young adolescents. *Prevention Science*, 10(4), pp. 313-324.
 386. Tobler, A., Komro, K., Dabroski, A., Aveyard, P., Markham, W. (2011) Preventing the Link Between SES and High-Risk Behaviors: “Value-Added” Education, Drug Use and Delinquency in High-Risk Urban Schools. *Prevention Science* (2011) 12, pp.211–221
 387. Tolan, P. H., Gorman-Smith, D., & Henry, D. B. (2003). The Developmental Ecology Of Urban Males' Youth Violence. *Developmental Psychology*, 39(2), pp. 274.
 388. Tolan, P., Henry, D. Schoeny, M. Bass, A. (2008): Mentoring Interventions to Affect Juvenile Delinquency and Associated Problems. Campbell Systematic Reviews 2008:16, The Campbell Collaboration [www.campbellcollaboration.org/].
 389. Tolson, J. M., & Urberg, K. A. (1993). Similarity between adolescent best friends. *Journal of Adolescent Research*, 8(3), pp. 274-288.
 390. Trawick, M., Howsen, R. (2006) Crime And Community Heterogeneity:

- Race, Ethnicity And Religion. *Applied Economics Letters*, 13 341-345.
391. Trucco, E. M., Colder, C. R., Wieczorek, W. F., Lengua, L. J., & Hawk, L. W. (2014). Early Adolescent Alcohol Use In Context: How Neighborhoods, Parents, And Peers Impact Youth. *Development and Psychopathology*, 26(2), pp. 425–36. doi:10.1017/S0954579414000042
 392. Tucker, J. S., Pollard, M. S., de la Haye, K., Kennedy, D. P., & Green, H. D. (2013). Neighborhood Characteristics And The Initiation Of Marijuana Use And Binge Drinking. *Drug and Alcohol Dependence*, 128(1-2), pp. 83–9. doi:10.1016/j.drugalcdep.2012.08.006
 393. Valente, T. W., Ritt- Olson, A., Stacy, A., Unger, J. B., Okamoto, J., & Sussman, S. (2007). Peer acceleration: effects of a social network tailored substance abuse prevention program among high- risk adolescents. *Addiction*, 102(11), 1804-1815.
 394. Valenzuela, E., & Ayala, C. (2011). Homofilia, selección e influencia en un estudio longitudinal de drogas en población escolar. *Psyke*, 20(2), 101-114.
 395. Van Ham, M., & Manley, D. (2012). Neighbourhood effects research at a crossroads. Ten challenges for future research. *Environment and Planning A*, 44(12), 2787–2793. doi:10.1068/a45439
 396. Van Koppen, P. J., & Keijser, J. A. N. W. (1997). Desisting Distance Decay: On the Aggregation of Individual Crime Trips. *Criminology*, 35(3), 505-515.
 397. Vanderbilt, E, Shaw, A, Shaw D. (2008) Protective Factors and the Development of Resilience in the Context of Neighborhood Disadvantage *Journal of Abnormal Child Psychol.* 36(6): 887–901.
 398. Vazsonyi, A. T., Cleveland, H. H. & Wiebe, R. P. (2006). Does the effect of impulsivity on delinquency vary by level of neighborhood disadvantage? *Criminal Justice and Behavior* 33 (4) 511-541
 399. Vogt Yuan, A. S. (2002). Black-white differences in social support and mental health among adolescents: Is neighborhood context important? *Dissertation Abstracts International, The Humanities and Social Sciences*, 63(4), 1576-A.
 400. Wagle, U. (2002). Volver a pensar la pobreza: definición y mediciones [ONLINE] <http://www.campus-oei.org/salactsi/wagle.pdf> [Last Accessed 31 August 14]

401. Wang, X., Khattak, A. Chen, J. (2013) ***Accuracy of Geoimputation. An Approach to Capture Microenvironment.*** Journal of the Transportation Research Board No2382, Transportation Research Board of The National Academies, Washington D.C, pp. 10-19.
402. Ward, M., Skrede, K. (2008) ***Spatial Regression Models. Quantitative Applications in the Social Sciences.*** Sage Publications, California.
403. Warner, B. D., & Fowler, S. K. (2003). Strain and violence: Testing a general strain theory model of community violence. ***Journal of Criminal Justice***, 31(6), 511-521.
404. Warner, T. D., Swisher, R. R., Buerger, M. E., Giordano, P. C., Kuhl, D. C., & Manning, W. D. (2012). ***A Neighborhood-Centered Approach To Developmental Contexts: An Application To Three Risk Behaviors In Adolescence And Young Adulthood*** Submitted to the Graduate College of Bowling Green State University
405. Warren, J., Reboussin, R., Hazelwood, R. R., Cummings, A., Gibbs, N., & Trumbetta, S. (1998). Crime scene and distance correlates of serial rape. ***Journal of Quantitative Criminology***, 14(1), pp. 35-59.
406. Weerman, F. M. (2003). Co-Offending As Social Exchange. Explaining Characteristics Of Co-Offending. ***British Journal of Criminology***, 43(2), 398-416.
407. Wells, J. E., Degenhardt, L., Bohnert, K. M., Anthony, J. C., & Scott, K. M. (2009). Geographical Clustering Of Cannabis Use: Results From The New Zealand Mental Health Survey 2003–2004. ***Drug and Alcohol Dependence***, 99(1), 309-316.
408. Wiatrowski, M. Griswold, D, Roberts, M (1981) Social Control Theory and Delinquency. ***American Sociological Review***. 46 (5)
409. Wiesner, M., Silbereisen, R. K., & Weichold, K. (2008). Effects Of Deviant Peer Association On Adolescent Alcohol Consumption: A Growth Mixture Modeling Analysis. ***Journal of Youth and Adolescence***, 37(5), 537-551.
410. Wight, R., Botticello, A., Aneshensel, C. (2006) Socioeconomic Context, Social Support, and Adolescent Mental Health: A Multilevel Investigation. ***Journal of Youth and Adolescence***, 35 (1), pp 109-120
411. Wikstrom, P. O. H.& Loeber, R. (2000). Do Disadvantaged

- Neighbourhoods Cause Well-Adjusted Children To Become Adolescent Delinquents? A Study Of Mal Juvenile Serious Offending, Individual Risk And Protective Factors, And Neighbourhood Context. *Criminology*, 38(4), 1109-1142.
412. Wikström, P. O. H., Ceccato, V., Hardie, B., & Treiber, K. (2010). Activity fields and the dynamics of crime. *Journal of Quantitative Criminology*, 26(1), 55-87.
413. Wikström, P-O H., Oberwittler, D., Treiber, K. and Hardie, B. (2012) *Breaking Rules: The Social And Situational Dynamics Of Young People's Urban Crime*. Oxford: Oxford University Press.
414. Wiles, P., & Costello, A. (2000). *The 'road to nowhere': The evidence for travelling criminals* Research, Development and Statistics Directorate, Home Office London.
415. William J., Christian S., & Snijders, T. (2007) Beyond Dyadic Interdependence: Actor-Oriented Models For Co-Evolving Social Networks And Individual Behaviors. *International Journal of Behavioral Development* 31: 397-404.
416. Wilson, J., W. (1991) Another Look at The Truly Disadvantaged. *Political Science Quarterly*, 106,(4) pp. 639-656
417. Wilson, M. N., Hurtt, C. L., Shaw, D. S., Dishion, T. J. & Gardner, F. (2009) Analysis And Influence Of Demographic And Risk Factors On Child Problem Behaviors. *Prevention Science*, 10 (4) pp. 353-365.
418. Wilson, W. J. (1987) *The Truly Disadvantaged: The Inner City, The Underclass, And Public Policy*. University of Chicago Press, Chicago, United States.
419. Winslow, E. B., & Shaw, D. S. (2007). Impact of neighborhood disadvantage on overt behavior problems during early childhood. *Aggressive Behavior*, 33(3), 207-219.
420. Wright, E. M., & Fagan, A. a. (2013). The Cycle of Violence in Context: Exploring the Moderating Roles of Neighborhood Disadvantage and Cultural Norms. *Criminology*, 51(2), pp. 217-249. doi:10.1111/1745-9125.12003
421. Wright, R. G., Botticello, A. L., & Aneshensel, C. S. (2006). Socioeconomic Context, Social Support, And Adolescent Mental Health:

- A Multilevel Investigation. *Journal of Youth and Adolescence*, 35(1), pp. 115–126
422. Wu, A., Zumbo, B., (2008): Understanding and Using Mediators and Moderators. *Social Indicators Research* 87(3), pp. 367-392
 423. Yonas M.A., (2010). Perceptions of neighborhood collective efficacy moderate the impact of maltreatment on aggression. *Child Maltreat* 15 (1) pp. 37-47
 424. Yuet-Wah Cheung Agnes M.C. (1988) Social Factors in Adolescent Deviant Behavior in Hong Kong. *International Journal of Comparative And Applied Criminal Justice*. 12, (1 y 2)
 425. Yun, I., & Lee, J. (2013). IQ and Delinquency: The Differential Detection Hypothesis Revisited. *Youth Violence and Juvenile Justice*, 11(3), pp. 196–211. doi:10.1177/1541204012463410
 426. Zhang, L. Messner, S. (1996) School Attachment and Official Delinquency Status in the People's Republic of China. *Sociological Forum*. 11 (2).
 427. Zimmerman, G. M. (2009). *Impulsivity, offending, and the neighborhood: Investigating the person-context nexus*. U.S. Department of Justice.

Appendix 1: Systematic Review: data extraction and critical appraisal tool

Dimension	Item		Description
Conceptual model	CM.1	CM-Aim	Reference to theories explaining why RF is related to outcome
	CM.2	CM-Guiding theory	Relationships between RF RM and outcomes are clearly anticipated before the results section
	CM.3	CM-Hypothesis	Summarize hypothesis
	CM.AP	CM-Appraisal	Are relevant theoretical variables left out?
Design	D.1	D-Dataset	Origin of data/study
	D.2	Draw methodological model	Draw tested model specifying variables, time ordering and analytical strategy
	D.3	D-Number of Waves	Specify the number of waves
	D.4	D-Average Time between of follow ups (years)	Specify average time between data collection points
	D.AP	Is the design adequate to test the hypothesis	D-Appraisal (Y,N,U, NA)
Outcome(s)	O.1	DV-Outcome	Specify i) Name ii) Type [(SR) Self report; (PR) Parent report; (CR) Community report; (PolR) Police report; (C) Census; (Obs) Observation] iii) Wave measured iv) Level of measurement [(Du)=dummy, (Mn)=multinomial, (Or)=Ordered, (Co)=Count, (Sc)=Scale] v) Instrument or measure description
	O.2	O-Outcome measurement level	Dummy (Du), Multinomial (Mn), Ordered (Or), Count (Co), Scale (Sc).
	O.3	O-Outcome Type	Violence drug/alcohol use, general delinquency/conduct disorder and externalizing behaviour
	O.AP.a	DVAP-Are the proxies used reasonable?	Assessment of adequacy of proxies
	O.AP.b	DVAP-Is the face validity reasonable?	Assessment of face validity
	O.AP.c	DVAP-Evidence of reliability or internal consistency	Assessment of provided evidence of reliability
	O.AP.d	DVAP-Evidence of convergent or discriminant validity	Assessment of provided evidence of validity
	O.AP.e	DVAP-Comment	Comment
Neighbourhood variable (s)	NBH.1	NBH-Neighbourhood variables	Specify i) Name ii) Type [(SR) Self report; (PR) Parent report; (CR) Community report; (PolR) Police report; (C) Census; (Obs) Observation] iii) Wave measured iv) Level of measurement [(Du)=dummy, (Mn)=multinomial, (Or)=Ordered, (Co)=Count, (Sc)=Scale] v) Instrument or measure description
	NBH.2	NBH variable type	Income/poverty, residential instability (measured on neighbourhood), neighbourhood structure/disadvantage, crime/violence and safety, disorder/incivility, social capital/collective efficacy, neighbourhood culture, neighbourhood resources and neighbourhood satisfaction.
	NBH.AP.a	NBHAP-Are the proxies used reasonable?	Assessment of adequacy of proxies

	Item	Description	Dimension
	NBH.AP.b	NBHAP-Is the face validity reasonable?	Assessment of face validity
	NBH.AP.c	NBHAP-Evidence of reliability or internal consistency	Assessment of provided evidence of reliability
	NBH.AP.d	NBHAP-Evidence of convergent or discriminant validity	Assessment of provided evidence of validity
	NBH.AP.e	NBHAP-Risk of multicollinearity among NBH variables?	Assessment of the likelihood that neighbourhood level variables might induce multicollinearity problems. Usually a high correlation among independent variables ($>+/-0.5$) will be considered as a sign of risk of multicollinearity. Even when correlations are not reported, risk of multicollinearity might also be assessed as present as long as variables have been known to be highly correlated in other studies.
	NBH.AP.F	NBHAP-Comment	Comment
Other independent variables	IV.1	IV-Other IV	Specify i) Name ii) Type [(SR) Self report; (PR) Parent report; (CR) Community report; (PoR) Police report; (C) Census; (Obs.) Observation] iii) Wave measured iv) Level of measurement [(Du)=dummy, (Mn)=multinomial, (Or)=Ordered, (Co)=Count, (Sc.)=Scale] v) Instrument or measure description
	IV.2	Relevant controls	Sex, age, race, family or individual level SES, Parenting, peer deviance an prior involvement in antisocial behaviour
	C.AP.b	Is any NBH measure depended on the outcome?	Assessment on same source bias. Only nondependent variables are included in the study. If all neighbourhood level variables are dependent on the outcome, then the study is excluded from the analysis.
	IV.AP.a	IV-Are the proxies used reasonable?	Assessment of adequacy of proxies
	IV.AP.b	IV-Is the face validity reasonable?	Assessment of face validity
	IV.AP.c	IV-Evidence of reliability or internal consistency	Assessment of provided evidence of reliability
	IV.AP.d	IV-Evidence of convergent or discriminant validity	Assessment of provided evidence of validity

	Dimension	Item	Description
	IV.AP.e	IV-Comment	Assessment of the likelihood that neighbourhood level variables might induce multicollinearity problems. Usually a high correlation among independent variables ($>+/-0.5$) will be considered as a sign of risk of multicollinearity. Even when correlations are not reported, risk of multicollinearity might also be assessed as present as long as variables have been known to be highly correlated in other studies.
Sample	S.1	Sample strategy	Specify if the sample is Intensive (neighbourhood level representative) or extensive (population level representative that is matched with NBH information), random, multistage or convenience.
	S.2	Original Sample (N of individuals by wave)	Specify the sample of the original study for each wave.
	S.3	Analytical Sample (N)	Specify the sample that is used in the analysis, after attrition, missing cases and information, and selection of special cases or imputation.
	S.4	Sample description (N)	Description of relevant characteristics of the analytical sample
	S.5	Age range (W1) (N)	Age range at wave 1
	S.6	Age average (W1) (N)	Age average at wave 1
	S.7	Sample size (neighbourhoods) (N)	Number of neighbourhoods represented. This information is usually only available for studies with a intensive sampling strategy.
	S.8	Average Nbh size (N)	Average neighbourhood size
	S.9	Nbh description	If available, describe distribution of general NBH general characteristics
	S.10	Nbh unit	Identify what kind of neighbourhood unit is used: Census Tract, Community perception, Convenience
	S.11	Attrition (N)	Percentage of loss of cases between the first and the last wave
	S.12	How is attrition treated?	Specify if list wise deletion, or imputation is used. Do authors examine if missing data is attributable to chance?
	S.AP.a	Sample strategy ensures between NBH variability?	Does the sample strategy assure between neighbourhood variability?
	S.AP.b	Is the sampling free of bias?	Could be sampling strategy introduce bias due to sampling strategy, management of missing data or attrition?
	S.AP.c	S-Comment	Comment
Analysis	A.1	A-Nested data	Does data have a nested structure?
	A.2	A-Treatment of longitudinal data	Specify if i) Pooled, ii) Time series, iii) Track individual changes (fixed or random effects, mixed [HLM] or iv) or prediction
	A.3	Other Missing Cases	Missing cases not due to attrition (e.g. incomplete data)
	A.4	A-Treatment of missing cases	Specify if list wise deletion or imputation is used. Do authors examine if missing data is attributable to chance?

	Dimension	Item	Description
	A.5	A- Is Neighbourhood moving modelled	Assess if models incorporate information about people moving between neighbourhoods
	A.5	A-Regression model	Specify used regression model (e.g. OLS, binary logistic, multinomial logistic, HLM, etc.)
	A.6	A- Is NBH variable used as fixed, time variant or predictor	Specify if the neighbourhood variable is treated as fixed, time variant or as a predictor of future outcomes
	A.AP.a	A-Was modelling procedure pertinent?	Assessment of adequacy of employed modelling procedure
	A.AP.b	A-Does analysis establishes the risk factor precedes outcome?	Assess if analysis strategy allows to infer time ordering
	A.AP.c	A-Confounders measured before risk factor?	Assessment if confounders have been measured before the risk factor (neighbourhood)
	A.AP.d	A-Within individual change analysis performed?	Assess if analysis does model individual change
	A.AP.e	A-Is group change analysis performed (between individuals)?	Assess if analysis does model group change
	A.Ap.f	A-Comment	Comment
Results	R.1	R-Key Results	Describe key results
	R.2	R-Comment on Results	Comment
	R.AP.a	RAP-Reporting bias?	Assess if there is evidence of reporting bias
	R.AP.b	General comments	General comments on the paper

Appendix 2: Observed percentage of non-response by question

Individual level measures	%
2008: Class membership	0.00
2009: Class membership	0.00
2010: Class membership	0.00
2008 Age	0.00
2009 Age	0.00
2010 Age	5.93
2008: Sex	0.00
2009: Sex	0.00
2010: Sex	0.00
2008: How happy/content do you come to school?	0.38
2009: How happy/content do you come to school?	0.22
2010: How happy/content do you come to school?	0.47
2008: How important is it for you to get good grades in school?	0.63
2009: How important is it for you to get good grades in school?	0.57
2010: How important is it for you to get good grades in school?	0.42
2008: How like do you think it is that you will go to university?	1.85
2009: How like do you think it is that you will go to university?	1.16
2010: How like do you think it is that you will go to university?	0.44
2008: With whom do you live right now?	2.89
2009: With whom do you live right now?	2.48
2010: With whom do you live right now?	2.73
2008: How would you describe your relationship with your father?	7.14
2009: How would you describe your relationship with your father?	8.17
2010: How would you describe your relationship with your father?	9.04
2008: How would you describe your relationship with your mother?	2.84
2009: How would you describe your relationship with your mother?	2.70
2010: How would you describe your relationship with your mother?	3.12
2008: When you were a child, did you felt loved by your mother?	0.70
2009: When you were a child, did you felt loved by your mother?	1.19
2010: When you were a child, did you felt loved by your mother?	1.55
2008: When you were a child, did you felt loved by your father?	4.28
2009: When you were a child, did you felt loved by your father?	4.83
2010: When you were a child, did you felt loved by your father?	6.14
2008: ¿How aware are your parents (or one of them) of what you do in school?	1.32
2009: ¿How aware are your parents (or one of them) of what you do in school?	0.92
2010: ¿How aware are your parents (or one of them) of what you do in school?	1.20
2008: Would you say that you parents (or one of them) know your closes friends?	1.35
2009: Would you say that you parents (or one of them) know your closes friends?	1.16
2010: Would you say that you parents (or one of them) know your closes friends?	1.20
2008: Would you say that you parents (or one of them) monitor what you watch on TV?	1.61
2009: Would you say that you parents (or one of them) monitor what you watch on TV?	1.25

Individual level measures	%
2010: Would you say that you parents (or one of them) monitor what you watch on TV?	1.50
2008: When you go out after school or on weekends, do your parents know where you go?	0.67
2009: When you go out after school or on weekends, do your parents know where you go?	0.42
2010: When you go out after school or on weekends, do your parents know where you go?	1.08
2008: When you go out do your parents know with whom you are going out?	0.82
2009: When you go out do your parents know with whom you are going out?	0.77
2010: When you go out do your parents know with whom you are going out?	1.13
2008: When you go out do your parents know at what time you will be coming home?	0.96
2009: When you go out do your parents know at what time you will be coming home?	0.66
2010: When you go out do your parents know at what time you will be coming home?	1.01
2008: Fathers educational level	1.40
2009: Fathers educational level	1.63
2010: Fathers educational level	1.40
2008: Mother's educational level	0.02
2009: Mother's educational level	0.20
2010: Mother's educational level	8.89
Del 1 2008. Painted graffiti's or signs on someone else's' property or on public place.	0.00
Del 1 2009. Painted graffiti's or signs on someone else's' property or on public place.	0.09
Del 1 2010. Painted graffiti's or signs on someone else's' property or on public place.	0.00
Del 2 2008. Damaged someone else's property on purpose.	0.00
Del2 2009. Damaged someone else's property on purpose.	0.00
Del 2 2010. Damaged someone else's property on purpose.	0.00
Del 3 2008. Taken something from a store without paying for it .	0.00
Del 3 2009. Taken something from a store without paying for it .	0.09
Del 3 2010. Taken something from a store without paying for it .	0.00
Del 4 2008. Broke into house or a building to steal something.	0.00
Del 4 2009. Broke into house or a building to steal something.	0.00
Del 4 2010. Broke into house or a building to steal something.	0.00
Del 5 2008. Threatened someone with a weapon in order to get something.	0.00
Del 5 2009. Threatened someone with a weapon in order to get something.	0.00
Del 5 2010. Threatened someone with a weapon in order to get something.	0.00
Del 6 2008. Used a knife to threaten or mug someone.	0.00
Del 6 2009. Used a knife to threaten or mug someone.	0.00
Del 6 2010. Used a knife to threaten or mug someone.	0.27
Life time use of alcohol 2008	0.00
Life time use of alcohol 2009	0.00
Life time use of alcohol 2010	0.00

Individual level measures	%
Life time use of marihuana 2008	0.00
Life time use of marihuana 2009	0.00
Life time use of marihuana 2010	0.66
Life time use of cocaine paste 2008	0.00
Life time use of cocaine paste 2008	0.00
Life time use of cocaine paste 2008	0.00
Contextual measures	%
Zone Level Disadvantage2008	0.00
Zone Level proportion of juveniles with arrest records 2008	0.00
ZoneLevelDisadvantage2009	0.00
Zone Level Proportion juveniles with arrest records 2009	0.00
Zone Level Disadvantage 2010	2.88
Zone Level Proportion juveniles with arrest records 2008	3.68
Activity Space level disadvantage 2008	0.00
Activity Space level proportion of juveniles with arrest records 2008	0.00
Activity Space level disadvantage 2009	0.00
Activity Space level proportion of juveniles with arrest records 2009	0.00
Activity Space level disadvantage 2010	0.47
Activity Space level proportion of juveniles with arrest records 2010	4.32
School Activity Space Disadvantage	0.00
Activity Space level proportion of juveniles with arrest records 2009	0.17
School level value added score	0.00
Best friend 2008	7.72
Best friend 2009	16.82
Best friend 2010	24.66
Distance to best friend's home 2008	9.29
Distance to best friend's home 2008	19.60
Distance to best friend's home 2008	26.48

Appendix 3: Analysis of Missing Data Patterns

As has been described in the previous section, the current dataset presents missing data due to dropped cases (lost to follow up), missing measurement occasion, and missing data due to nonresponse. In this section the question of whether the presence of missing data may bias the results will be explored. Following on Bartlett & Carpenter (2013), the validity of statistical analysis, where data is missing, depends critically on why it is missing. The authors add that one key issue in missing data analysis is that the observed data cannot definitively help us to conclusively identify the reason nor the mechanism causing its missing data. Therefore the analysis needs to make assumptions about the mechanism causing the missing data process.

Three main types of missing data mechanisms have been described (Rubin, 1976) data missing completely at random (MCAR), data missing at random (MAR) and data missing not at random (MNAR). Data is considered to be MCAR if missing data is independent from the variables in the model of interest. It has been stressed that, since it cannot be explored if missing data patterns depend on unmeasured variables, this assumption can never be completely proven (Bartlett & Carpenter, 2013). On the other hand, data is considered to be MAR if the chance of missing data on a unit of observation is dependent on the value of the measured variables. However given the values of the other fully observed variables, this association is broken. Finally, data is considered to be MNAR when missing data depends on the underlying value of another variable even after taking into account other fully observed measures.

As described at the end of the last section, the two main missing data problems found in this data set were related to missing measurement occasions (and dropped cases), and high levels of non-response, specifically related to the identification of the respondents

best friend. The rates of non-response in all other variables are low enough to be considered as non-problematic.

Therefore, it was judged necessary to assess if missing data patterns may significantly depend on other critical variables. In order to do so, the following strategy was followed.

Firstly the dataset was transformed into a “wide” format, where each row represents a single case, and each column contains information on different variables for each of the three waves. Secondly, for each wave, two variables were constructed. The first variable (“MissingM”) identified if a particular subject had a missing measurement occasion at a particular wave (1 if he had, 0 if not). The second variable (“MissingF”) measured, also for each wave, if a particular subject had a missing value on the variable “best friend identification” (1 if he had, 0 if not).

Thirdly, for each wave, these variables were regressed on baseline age, gender (e.g. being male vs. female), baseline SES (mid and high vs. low), and average delinquency⁶².

Six two level hierarchical logistic regressions were estimated to model “MissingM” and “MissingF”. Regressions were defined as two level models where students are considered as nested within schools. Regression intercept is also allowed to vary across schools (random intercept). Equations A1 and A2 respectively detail the model specification to estimate “MissingM” and “MissingF”.

⁶² Antisocial behaviour was measured using an aggregated scale. For each subject, an average delinquency measure was created in order to enable to predict missingness of one wave based on the information present in other waves. This was achieved by averaging available information on the antisocial behaviour index in the remaining waves for a particular case.

Equation A.1 displays the employed model. $\text{Logit}(\pi_{ij})$ refers to the logistic link function $\log\left(\frac{\pi_{ij}}{(1-\pi_{ij})}\right)$, where the quantity $\pi_{ij}/(1-\pi_{ij})$ is the odds that the variable MissingM is equal to 1 for subject i in school j. The model includes a random intercept (β_{0j} cons) that is allowed to vary between schools (j), where u_{0j} is the random effect capturing between schools variability. The random effect is assumed to follow a normal distribution with a mean of 0 and a respective variance of δ^2_{u0} . The fixed part of this model includes the variables baseline age (β_1), sex (being male, β_2), SES (β_3 and β_4) and average antisocial behaviour index across available waves (β_5). The same specification is used to model To model MissingF (equation A.2).

Equation A.1

MissingM_{ij} ~ Binominal (n_{ij} , π_{ij})

$\text{Logit}(\pi_{ij}) = \beta_{0j} \text{ cons} + \beta_1 \text{ Baseline Age}_{ij} + \beta_2 \text{ Male}_{ij} + \beta_3 \text{ SES (mid)}_{ij} + \beta_4 \text{ SES (High)}_{ij} + \beta_5 \text{ Average Antisocial Behaviour Index}_{ij}$

$\beta_{0j} = \beta_0 + u_{0j}$

$[u_{0j}] \sim N(0, \delta^2_{u0})$

$\text{Var}(\text{MissingM}_{ij} | \pi_{ij}) = \pi_{ij}(1 - \pi_{ij}) / n_{ij}$

Equation A.2

MissingF_{ij} ~ Binominal (n_{ij} , π_{ij})

$\text{Logit}(\pi_{ij}) = \beta_{0j} \text{ cons} + \beta_1 \text{ Baseline Age}_{ij} + \beta_2 \text{ Male}_{ij} + \beta_3 \text{ SES (mid)}_{ij} + \beta_4 \text{ SES (High)}_{ij} + \beta_5 \text{ Average Antisocial Behaviour Index}_{ij}$

$\beta_{0j} = \beta_0 + u_{0j}$

$[u_{0j}] \sim N(0, \delta^2_{u0})$

$\text{Var}(\text{MissingM}_{ij} | \pi_{ij}) = \pi_{ij}(1 - \pi_{ij}) / n_{ij}$

Estimations were conducted using MLWin 2.28.⁶³. Results are presented in table A1.

This time, only the fixed part of the model is presented.

⁶³ IGLS estimation method

Table A.1: Multilevel Logistic Model Results Predicting Missing Measurement Occasions and Nonresponse (N=5928)

Response	Missing Best F. 2008	S.E.	Missing Best F. 2009	S.E.	Missing Best F. 2010	S.E.	Missing meas. occasion 2008	S.E.	Missing meas. occasion 2009	S.E.	Missing meas. occasion 2010	S.E.
Fixed Part												
cons	-0,268*	0,097	-0,348*	0,11	-0,049*	0,13	-0,158*	0,082	-0,22*	0,09	-0,152*	0,110
Baseline Age	0,042*	0,007	0,056*	0,01	0,043*	0,01	0,029*	0,006	0,038*	0,01	0,037*	0,008
Male	0,037*	0,011	0,016	0,01	0,019	0,01	0,027*	0,009	0,024*	0,01	0,014	0,012
SES(Mid)	0,008	0,013	-0,024	0,02	0,004	0,02	0,004	0,010	-0,005	0,01	0,022	0,015
SES(High)	-0,008	0,015	0,001	0,02	-0,034	0,02	-0,004	0,013	-0,013	0,02	-0,016	0,018
Average Anti. B.	-0,02*	0,004	-0,012*	0,01	0,000	0,01	-0,029*	0,003	-0,027*	0,004	-0,02*	0,004

*p<0.05

Results suggest that having a higher baseline age and being male (only for 2008) increases the likelihood of presenting missing information on the identification of their best friend. Surprisingly though, reporting lower levels of average delinquency across waves is related to a higher probability of presenting non-response on this variable.

On the other hand, missing measurement occasions were significantly predicted by baseline age, being male (only 2008 and 2009) and, surprisingly lower levels of reported antisocial behaviour.

In order to address the potential impact of these differences, level 1 (L1) and level 2 (L2) inverse probability weights were constructed in order to address potential bias related to non-response and missing measurement and dropped cases.

Level 1 weights where constructed by calculating the inverse of the predicted probability of presenting missing information on friends ($1/P[MissingF]$). On the other hand level 2 weights where constructed by calculating the inverse of the predicted probability of being included in the analytical sample ($1/P[Included]$).

Sensitivity analysis was conducted in order to establish the impact that the use of weights may have on the estimation of the model of interest. Thus two (weighted-unweighted) simplified three level linear longitudinal growth models predicting general delinquency were estimated. The model had a three level structure, where measures have been defined as nested within persons and persons were defined as nested within schools. Equation A.3 presents the model specification.

The response variable GABI represents the General Antisocial Behaviour Index. The model includes a random intercept (β_{0ijk} cons) that was allowed to vary between schools (k) and between subjects (j), where v_{0k} is the random effect capturing between schools variability, u_{0jk} is the random effect capturing variability between individuals and e_{0ijk} is a Level-1 random effect representing the prediction error for unit of time i of subject j in school k. Random effects are assumed to follow a normal distribution with a mean of 0 and a variance of δ^2_{v0} , δ^2_{u0} , and δ^2_{e0} .

The fixed part of these models includes the measures of Wave (β_1 Wave_{ijk}), Contextual Concentrated Disadvantage (β_2 Nbh Disadvantage_{ijk}), School added value (β_3 School value added_j), age at baseline (β_4 Baseline Age_{ijk}), antisocial behaviour at baseline (β_5 Baseline GABI_{ijk}); gender (β_6 Male_{ijk}), SES (β_7 SES (mid)_{ijk} and β_8 SES (high)_{ijk}) educational aspirations (β_9 High Ed. Aspir_{ijk}), and education expectations (β_{10} Low Ed. Expec._{ijk}), parental attachment (β_{11} Parent Attach._{ijk}), parental monitoring (β_{12} Monitoring_{ijk}), school attachment (β_{13} School Attach._{ijk}) and best friend delinquency (β_{14} BFr.Delinq._{ijk}).

Equation A.3

$$GABI_{ijk} \sim N(XB, \Omega)$$

$$GABI_{ijk} = \beta_{0ijk} \text{cons} + \beta_1 \text{Wave}_{ijk} + \beta_2 \text{Nbh Disadvantage}_{ijk} + \beta_3 \text{School value added}_j + \beta_4 \text{Baseline Age}_{ijk} + \beta_5 \text{Baseline GABI}_{ijk} + \beta_6 \text{Male}_{ijk} + \beta_7 \text{SES (mid)}_{ijk} + \beta_8 \text{SES (high)}_{ijk} + \beta_9 \text{High Ed. Aspir}_{ijk} + \beta_{10} \text{Low Ed. Expec.}_{ijk} + \beta_{11} \text{Parent Attach.}_{ijk} + \beta_{12} \text{Monitoring}_{ijk} + \beta_{13} \text{School Attach.}_{ijk} + \beta_{14} \text{BFr.Delinq.}_{ijk} + e_{0ijk}$$

$$\beta_{0ijk} = \beta_0 + v_{0k} + u_{0jk}$$

$$v_{0k} \sim N(0, \delta^2_{v0})$$

$$u_{0jk} \sim N(0, \delta^2_{u0})$$

$$e_{0ijk} \sim N(0, \delta^2_{e0})$$

The same model was run with and without weights. Results are presented in table A.2.

Table A.2: Sensitivity Analysis of Using Inverse Probability Weights to Estimate Model of Interest (N=3272)

Fixed Part	Delinquency (Un weighted)	S.E.	Delinquency (weighted)	S.E.
Cons	1.242*	0.173	1.131*	0.163
Wave	0.305*	0.009	0.302*	0.013
Context. Disadvantage	-0.004	0.015	-0.001	0.016
School Attachment	-0.02	0.013	-0.014	0.014
Baseline Age	-0.039*	0.012	-0.032*	0.012
Baseline delinquency	0.943*	0.007	0.953*	0.006
Male	0.087*	0.018	0.085*	0.019
SES (mid)	-0.016	0.019	-0.01	0.025
Alto (high)	-0.032	0.024	-0.03	0.022
High Educational Aspirations	-0.173	0.032	-0.185*	0.042
Low Educational Expectations	0.032	0.019	0.031	0.015
Parent Attachment	-0.02	0.013	-0.016	0.015
Parent Monitoring	-0.224*	0.016	-0.221*	0.019
School attachment	-0.02*	0.009	-0.019*	0.01
Best friend's Antisoc. Behaviour	0.06*	0.005	0.061*	0.007
Random Part				
Level: Sch_ID				
cons/cons	0.002	0.001	0.002	0.001
Level: id				
cons/cons	0.107	0.007	1.309	0.167
Level: Wave				
cons/cons	0.435	0.008	0.626	0.032
-2*loglikelihood:	22646.129		22702.892	

Results suggest that most of the coefficients do not show substantial differences (less than 10% difference). Also, and with the only exception of the variable “Low Educational Expectations” that turns out to be significant in the weighted model, the substantive interpretation of the un-weighted model does not change. In addition, the weighted model shows a poorer fit (significant increase in log likelihood). Taken those facts together, the decision was made to assume that the missing pattern in the data is MAR. In other words, the dependence of the chance of missing data on the value of the

studied variables will break once the rest of the fully observed variables of interest are taken into account.

Although no imputation strategies were used, missing data due to nonresponse was addressed variable by variable. For example, in the case of time invariant variables, missing data was recovered using data on other measured waves. Specific strategies are described for each variable in chapter 6.

If nonresponse could not be recovered, complete records analysis was used. Hierarchical models allow accommodating data with this type of missing data as long as the type of missing data is MAR (Snijders & Bosker 1999)

Appendix 4: Systematic Review: list of excluded studies and reasons for exclusion

Study	Dataset	Reason for exclusion
Ayer, L., Rettew, D., Althoff, R. R., Willemsen, G., Ligthart, L., Hudziak, J. J., et al. (2011)	Netherlands Twin Register Longitudinal Survey Study on Health, Lifestyle and Personality	Does not control for Individual or family level SES.
Ayer, L., Rettew, D., Althoff, R. R., Willemsen, G., Ligthart, L., Hudziak, J. J., & Boomsma, D. I. (2011)	Netherlands Twin Register	Does not adjust for individual level SES
Bellair, P. E., & McNulty, T. L. (2005).	National Longitudinal Survey of Adolescent Health (Add Health)	Smaller sample than other studies based on Add health.
Beyers J.M., Loeber R., Wikstrom P.O. & Stouthamer-Loeber M. (2001).	Pittsburgh Youth Study (PYS)	Does no estimate an adjusted NBH coefficient.
Boardman, J. D., Menard, S., Roettger, M. E., Knight, K. E., Boutwell, B. B., & Smolen, a. (2014).	National Youth Survey Family Study (NYSFS)	Smaller sample than other studies based on NYSFS.
Bowers, E. P., von Eye, A., Lerner, J. V, Arbeit, M. R., Weiner, M. B., Chase, P., & Agans, J. P. (2011).	4-H Study of Positive Youth Development	Level 2 ecological units less than 30
Burdzovic Andreas, J., & Watson, M. (2010).	Brown University Community Health	It was not possible to gain access to presentation. Author was contacted twice.
Burdzovic Andreas, J., & Watson, M. W. (2011).	Brown University Community Health	It was not possible to gain access to presentation. Author was contacted twice.
Burt, M. L. (2012).	Project on Human Development in Chicago Neighbourhoods (PHDCN)	Does not control for individual level SES
Calvert, W.J. (2002).	National Youth Survey (NYS)	Does not control for Individual or family level SES.
Desmond, S. A. (2004).	National Longitudinal Survey of Adolescent Health (Add Health)	Smaller sample than other studies based on Add health.
Deutsch, A. R., Crockett, L. J., Wolff, J. M., & Russell, S. T. (2012)	National Longitudinal Survey of Adolescent Health (Add Health)	Analytical sample restricted to non-hispanic youth.
Dupéré, V., Leventhal, T., & Vitaro, F. (2012)	Project on Human Development in Chicago Neighbourhoods (PHDCN)	Smaller sample than other studies based on PHDCN.
Eamon, M. K. (2001).	National Longitudinal Survey of Youth (NLSY79)	Same source bias between Perception of neighbourhood problems and report of child problem behaviour (BPI).
Fabio, A., Loeber, R., Balasubramani, G. K., Roth, J., Fu, W., & Farrington, D. P. (2006).	Pittsburgh Youth Study (PYS)	Excluded because It falls outside of the age range.
Farrington, D. P., Loeber, R., Yin, Y., & Anderson, S. J. (2002)	Pittsburgh Youth Study (PYS)	Does no estimate an adjusted NBH coefficient.
Furr-Holden, C. D. M., Lee, M. H., Milam, A. J., Johnson, R. M., Lee, K. -, & Ialongo, N. S. (2011)	Baltimore Prevention Project (BPP)	Is based on data of an intervention.
Gerard, J. M., & Buehler, C. (2004)	National Longitudinal Survey of Adolescent Health (Add Health)	Pooled use of longitudinal data.
Grogan-Kaylor, A. (2005)	National Longitudinal Survey of Youth (NLSY79)	Same source bias between Perception of neighbourhood problems and report of child problem behaviour (BPI).

Study	Dataset	Reason for exclusion
Hay, C., Fortson, E. N., Hollist, D. R., Altheimer, I., & Schaible, L. M. (2006)	National Survey of Children (NSC)	Out of age range, does not report main effect, only interaction effects.
Haynie, D. L., Silver, E., & Teasdale, B. (2006)	National Longitudinal Survey of Adolescent Health (Add Health)	Smaller sample than other studies based on Add Health.
Jain, S., Buka, S. L., Subramanian, S. V. & Molnar, B. E. (2010)	Project on Human Development in Chicago Neighborhoods (PHDCN)	Smaller sample than other studies based on PHDCN.
Jennings, W. G. (2008)	Racine	Out of age range.
karriker-jaffe K. Foshee V. Ennett S (2011)	Adolescent Substance use study	Rural sample
Kia-Keating, B. (2006)	Project on Human Development in Chicago Neighborhoods (PHDCN)	Does not report main effects, only interaction effects.
Kurlychek, M. C., Krohn, M. D., Dong, B., Hall, G. P., & Lizotte, a. J. (2011)	Adolescent Substance use study	Does not control for individual level SES, predominantly rural sample
Leventhal, T., & BrooksGunn, J. (2011).	Project on Human Development in Chicago Neighborhoods (PHDCN)	Out of age range.
Lynam, D. R., Caspi, A., Moffitt, T. E., Wikstrom, P. - . H., Loeber, R., & Novak, S. (2000)	Pittsburgh Youth Study (PYS)	Includes only one race (African Americans).
Maimon, D., & Browning, C. R. (2010)	Project on Human Development in Chicago Neighbourhoods (PHDCN)	Lower analytical sample than other studies using the same data set.
Parra, M. T. (2003)	National Longitudinal Survey of Adolescent Health (Add Health)	Does no estimate an adjusted NBH coefficient.
Ridenour, T. A., Tarter, R. E., Reynolds, M., Mezzich, A., Kirisci, L., & Vanyukov, M. (2009)	Other	Out of age range.
Sariaslan, A., Långström, N., D'Onofrio, B., Hallqvist, J., Franck, J., & Lichtenstein, P. (2013)	Sweadish total population register	Intervention study
Sullivan, C. J. (2013)	Project on Human Development in Chicago Neighbourhoods (PHDCN)	Lower analytical sample than other studies using the same data set.
Thornberry, T. P., & Penly Hall, G. (2005)	Rochester Youth Development Study	Does not adjust for individual or family level SES.
Vazsonyi, A. T., Cleveland, H. H. & Wiebe, R. P. (2006)	National Longitudinal Survey of Adolescent Health (Add Health)	Does not adjust for individual or family level SES.
Vogt Yuan, A. S. (2002)	National Longitudinal Survey of Adolescent Health (Add Health)	Does not adjust for individual or family level SES.
Warner, T. D., Swisher, R. R., Buerger, M. E., Giordano, P. C., Kuhl, D. C., & Manning, W. D. (2012)	National Longitudinal Survey of Adolescent Health (Add Health)	Out of age range
Wikström, P-O H., Oberwittler, D., Treiber, K. and Hardie, B. (2012).	PADTS+	Does not control for individual level SES, unit of analysis is not the individual but delinquent acts.

Study	Dataset	Reason for exclusion
Wright, R. G., Botticello, A. L., & Aneshensel, C. S. (2006)	National Longitudinal Survey of Adolescent Health (Add Health)	Pooled use of longitudinal data.
Yonas M.A., et al. (2010)	Longitudinal study of child abuse and neglect (LONGSCAN).	Only uses data from one wave therefore is cross-sectional.
Yun, I., & Lee, J. (2013)	National Longitudinal Survey of Adolescent Health (Add Health)	Out of age range
Zimmerman, G. M. (2009)	Project on Human Development in Chicago Neighbourhoods (PHDCN)	Does not report main effects.