Enrolling in the Closest School or Not?

Implications of School Choice Decisions for Active Transport to School

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Abstract

Background: Absence of requirements to attend a local school combined with social factors driving school choice make distance to school less important in school choice decisions. This study examined correlates of adolescents' enrolment in the closest school in the absence of school zoning policies.

Methods: Adolescents (n=797; age: 15.2±1.4 years; 51.4% boys) from six non-integrated (regular) public secondary schools without school zoning in Dunedin, New Zealand, completed an online survey about school choice. Distance to school was calculated using Geographic Information Systems network analysis. Data were analysed using t-tests, Chi-square tests and mixed effects binary logistic regressions.

Results: Overall, 51.3% of adolescents enrolled in the closest school (range across schools: 28.3% to 81.6%). These adolescents had five times higher rates of active transport (46.5% vs. 8.8%) and lower rates of motorised transport to school (40.3% vs. 68.8%) compared to their counterparts (all $p<0.05$). In a multivariate analysis, enrolment in a co-educational school [OR (95%CI): 4.51 (2.60-7.80)] and choosing school because of its proximity to home [2.29 (1.97-2.66)] were positively associated with enrolment in the closest school, whereas distance to school [0.86 (0.82-0.90)] and negative comments from students at closest school [0.68 (0.47-0.98] were negatively associated.

Conclusions: In the absence of school zoning, shorter distance to school, importance of school's proximity to home, co-educational school status, and absence of negative peer feedback were associated with adolescents' enrolment in the closest secondary school. School choice decisions have implications not only for education but also for public health, transport and environmental sustainability. A multi-sector approach and extensive collaboration between educational policy makers, urban designers, health

promoters, and community groups is required to reduce the tensions between parental and students' school choice expectations of getting the best education possible and the goal of increasing rates of active transport to school.

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Keywords: School choice; active transport; adolescents; distance

Highlights

- Without school zoning, half of adolescents enrolled in the closest school.
- Distance to school and importance of school's proximity influenced school choice.
- Co-educational school status and peer feedback were also important.
- Students attending closest school had five times higher rates of active transport.
- School choice has implications for education, health, transport and environment.

1. Introduction

During the last few decades there has been a shift in travel mode to school in many developed countries, with decreased rates of walking and cycling to school and increased rates of motorised transport; especially driving children and adolescents to school (Gray et al., 2014; McDonald, 2007; Ministry of Transport, 2011). In New Zealand, the rates of adolescents being driven to secondary school have increased from 21% in 1989/1990 to 32% in 2010-2014 (Ministry of Transport, 2015). A shift away from neighbourhood schools led to increasing the distance that children and adolescents have to travel to get to school (McDonald, 2007), which can in part explain reduced rates of walking and cycling to school observed in developed countries over the last few decades (Davison, Werder, & Lawson, 2008; Panter, Jones, & van Sluijs, 2008; Pont, Ziviani, Wadley, Bennett, & Abbott, 2009; Wong, Faulkner, & Buliung, 2011). In addition to reducing opportunity for physical activity in young people, increased rates of travelling to school by private vehicles have also led to increased traffic volume, increased traffic congestion around schools at drop-off and pick up times, increased air pollution and increased safety concerns for children and adolescents who walk or cycle to school (Eyler et al., 2008; Frank & Engelke, 2007; Maibach, Steg, & Anable, 2009; Parusel & McLaren, 2010).

School choice is a multifaceted issue with socio-cultural, economic and political implications, particularly relating to equity and social justice (West, 2006). Access to educational opportunities, and particularly 'good' schools, is strongly related to housing, spatial form and transport (e.g. (DeLuca & Rosenblatt, 2010; Dougherty et al., 2009; Müller, Tscharaktschiew, & Haase, 2008; Phillippo & Griffin, 2016; Wilson, Marshall, Wilson, & Krizek, 2010). School choice is informed by a number of individual

and collective norms. In 'developed' countries, school choice policy has shifted in line with neoliberal ideals of individual choice and competition. Freedom of choice in education is a hotly contested public policy, and has been widely debated (Bunar, 2010). Freedom of choice in education has manifested in a range of policies including the removal of school zoning. This policy has resulted in attendance at schools that are geographically distanced from the child's place of residence. Thus freedom of choice has implications for transport to school mode choice and travel behaviour (Wilson et al., 2010).

Available evidence indicates that the role distance plays in the choice of, and access to, educational institutions is complex. For example, the Longitudinal Study of Australian Youth explored the association between distance to a university campus and university choice and admission, including enrolment in an elite university in ~12,000 adolescents (Parker, Jerrim, Anders, & Astell-Burt, 2016). The findings indicate that distance exerts an influence on students' choice beyond socioeconomic background and academic ability and suggest that distance affects aspirations well before issues related to cost and relocation become a barrier. In the US, research has shown that for elementary school children, mode of transport to school and parental school choice differ by school type, income and race (Wilson et al., 2010).

Unlike students who attended their closest 'neighbourhood' school, students attending schools for other reasons (e.g. not distance related) include students from a wider catchment area with lower rates of active transport (e.g. walking and cycling), identifying the "unintended influence of school district policy on school commute mode" (Wilson et al., 2010): 2168). Preliminary findings from the city of Dunedin (New

Zealand) show that social factors and school programmes/facilities rather than proximity to home influences secondary school choice decisions (unpublished findings). Therefore, absence of requirements to attend a local school combined with social factors driving school choice likely make distance to school less important in school choice decisions.

Research has also elucidated the relationship between school choice, distance to school, and transport-related emissions. Transport contributes over 20% to global greenhouse gas emissions, and 72% of transport sector greenhouse gas emissions arise from road-based transport (Sims et al., 2014). Wilson et al. (2007) examined the travel distance, greenhouse gas emissions and exposure to air pollution related with attending neighbourhood or city-wide schools. They found that attendance at a city-wide school, rather than a local school resulted in "six times fewer children walking, 4.5 times as many miles travelled, 4.5 times the system cost, and 3 to 4.5 times the amount of criteria air pollutants and greenhouse gas emissions" (Wilson et al., 2007): 506).

School choice in Aotearoa New Zealand is a complex and disputed field, with multiple factors influencing how parents and/or students choose a secondary school. The 1989 Education Act and subsequent legislation, which removed school zones, radically reshaped school choice (Stubbs & Strathdee, 2012). These school reforms underpinned by neo-liberal ideologies that emphasise the importance of individual choice, resulted in increased stratification between low- and high-decile schools[1]

[1] The decile rating of a school is a "measure of the socio-economic position of a school's student community relative to other schools throughout the country"(Ministry of Education, 2016, ¶ 4).

(Gordon, 2015; Harker, 2000; Nash & Harker, 2005) and a culture of parental school choice frequently driven by factors other than distance to school (e.g. characteristics of the school population, school's academic achievement, reputation, environment, and safety) (Gordon, 2015) rather than distance to school.

Taken together, school choice and school zoning policies have implications not only for education but also for public health, transport, and sustainability. This paper extends the literature by examining correlates of adolescents' enrolment in the closest secondary school in the absence of school zoning policies in the city of Dunedin, New Zealand, and its implications for active transport to school.

2. Methods

2.1 Setting

The study was conducted in the city of Dunedin (population: 130,000) on the South Island of New Zealand. The city of Dunedin has 12 public secondary schools and no private schools. All twelve secondary schools (100% school recruitment rate) participated in the Built Environment and Active Transport to School (BEATS) Study in 2014-2015 (Mandic et al., 2015; Mandic et al., 2016). Details on school recruitment have been described elsewhere (Mandic et al., 2015). For the purpose of this analysis, only six non-integrated (regular) public schools without school zoning / enrolment schemes at the time of the survey were included in this report (three co-educational, two single sex boys and one single sex girls' school).[2]

[2] In New Zealand, integrated schools are private schools that have become part of the state system. They have a special character, philosophical or religious, but teach the New Zealand curriculum. See http://parents.education.govt.nz/primary-school/schooling-in-nz/different-types-of-primary-and-intermediate-schools/

2.2 Participants

Adolescents (n=797; age: 15.2±1.4 years; 51.4% boys) were recruited through their schools. Details on adolescent recruitment have been described elsewhere (Mandic et al., 2016). All adolescents signed consent for taking part in the study. For those under 16 years of age, parents consented following opt-out or opt-in procedures based on the school's preference. The study was approved by the University of Otago Ethics Committee.

2.3 Procedures

Adolescents completed an online survey during class time under supervision of research staff (Mandic et al., 2016). The survey included questions about sociodemographic characteristics, home address, transport to school habits and reasons for school choice.

2.3.1 Sociodemographic characteristics

Age was calculated from date of birth at the time of the survey. Home address data were used to determine the New Zealand Index of Deprivation (a neighbourhood area deprivation score) as a surrogate for students' socioeconomic status (Salmond, Crampton, & Atkinson, 2007). The deprivation index was recoded from the original 10-point scale (1=least deprived to 10=most deprived) into quintiles. Adolescents reported the number of siblings enrolled in the same school and the number of bicycles and vehicles at home.

2.3.2 School-related factors

School-related variables included co-educational status (co-educational schools; boys only or girls only schools), school size and school decile (1=most deprived to 10=least deprived). School decile is an indicator of the socioeconomic status of the school

(Ministry of Education, 2016). School decile is based on the proportion of students at the school with low socioeconomic status as defined by the student's residential address. Decile 1 includes the 10% of schools with the highest proportion of students from low socioeconomic communities; decile 10 the lowest proportion.

2.3.3 Distance to school

Distance from home to school was determined using Geographic Information Systems network analysis, as described previously (Mandic et al., 2016). Distance was recorded both to the school where adolescents were enrolled and to the closest of the six non-integrated schools without school zoning in Dunedin (the smallest value of a set of shortest distances from home to each of the six schools). Enrolment in the closest school was determined based on comparing the distance to the school each student currently attends and closest school for each participant. Optimal walking distance (≤2.3 km) was calculated using Receiver Operating Curve analysis based on BEATS Study data (unpublished findings) and was similar to previous findings in British (Chillon, Panter, Corder, Jones, & Van Sluijs, 2015), Irish (Nelson, Foley, O'Gorman, Moyna, & Woods, 2008) and Belgian adolescents (Van Dyck, De Bourdeaudhuij, Cardon, & Deforche, 2010). The cut point for a reasonable cycling distance (≤4.0 km) to school was based on a previous study (Nelson et al., 2008).

2.3.4 Transport to school

Transport to school habits were assessed using an item *"How do you usually travel to school?"* for different transport modes with response categories *"never"*, *"rarely"*, *"sometimes"*, *"most of the time"* and *"all of the time"* (Mandic et al., [in press]). Dominant modes of transport to school (used "most/all of the time") and multi-modal transport were used to classify adolescents into active transport (walking, cycling, or riding a non-motorised scooter "most/all of the time"), motorised transport or combined

motorised and active transport (Mandic et al., [in press]). Adolescents also reported frequency of walking to school in the previous two weeks, as described previously (Mandic et al., [in press]).

2.3.5 School choice

Adolescents were asked about who chose the school and how much they agreed or disagreed with 14 items related to school choice (including proximity to home, preference for co-educational status of the chosen school, social connections (siblings/parents/friends attending/attended), positive comments about the school students attend from parents/students at that school and negative comments from parents/students at the closest school. Adolescents recorded their responses on a 5-point Likert scale ranging from 1=strongly disagree to 5=strongly agree. An additional response option (“I don’t know”) was provided. Adolescents were also given an opportunity to specify other reasons. Categorical variables were created by recoding original responses as follows: “strongly disagree” and “disagree” were recoded into "disagree"; “neither agree nor disagree” was coded as "neutral"; “strongly agree” and “agree” were recoded as "agree". “I don’t know” responses were reported separately where appropriate. School choice questions for this study were designed by the BEATS Study research team based on input from Dunedin secondary schools and school principals. All schools had the opportunity to provide feedback on the school choice questions.

2.4 Data analysis

Sociodemographic characteristics were analysed using descriptive statistics. School choice items related to siblings’ enrolment and preference for single-sex and co-educational school were analysed only in adolescents who had at least one sibling

and who attended single-sex or co-educational school, respectively. Differences in sociodemographic characteristics and school choice between adolescents who did and did not enrol in the closest school were compared using independent samples t-test or Mann Whitney-U test for continuous variables and Chi-square tests for categorical variables. Data are reported as mean±SD for continuous variables ("I don't know" responses were excluded from these analyses) and frequency (percentage) for categorical variables.

Mixed effects binary logistic regression models were used to identify factors associated with enrolment in the closest school. The models incorporated a random effect at the level of the intercept to account for the school-based cluster sampling design. Significant univariate correlates and sociodemographic characteristics (age, gender, ethnicity and neighbourhood level deprivation score) were entered into multivariate analysis. "I don't know" responses were coded as missing data and were excluded from the analysis. P-value <0.05 was considered statistically significant both in the univariate and multivariate analyses. Data analysis was performed using SPSS Statistical Package (Version 22).

3. Results

3.1 Sociodemographic characteristics

Data from 797 adolescents (age: 15.2±1.4 years; 51.4% boys; 73.4% New Zealand European; 12.7% Māori) were included in the analysis (**Table 1**). Overall, 72.1% of adolescents had at least one bicycle available at home, 63.2% had two or more vehicles at home and 28.5% had one or more siblings attending the same school (**Table 1**). Half of adolescents (51.3%) enrolled in the closest school. Among

adolescents who enrolled in the closest school there was a greater proportion of girls, adolescents enrolled in a co-educational school and adolescents with sibling(s) enrolled in the same school and a lower proportion of adolescents with two or more vehicles in the household compared to their peers who did not enrol in the closest school (**Table 1**). Age, ethnicity, socioeconomic status and availability of the bicycles at home were not significantly different between the groups.

3.2 Distance to school

In the total sample, median distance to school was 3.2 km (range: 0.3 km to 54.5 km) (**Table 2**). Approximately one third of adolescents lived within walkable distance (≤2.3 km) and more than one half lived within cycling distance (≤4.0 km) to school (**Table 2**). Median distance to school among adolescents who enrolled in the closest school was 4.0 km closer to school with 10 times more adolescents living within walkable distance to school and 2.6 times more adolescents living within cycling distance to school compared to their peers who did not enrol in the closest school.

3.3 Transport to school

In the total sample, nearly half of adolescents were usually driven to school, one third walked to school and one fifth used the school or public bus (**Table 2**). Overall, 54.2% of adolescents used motorised transport only, 28.1% active transport only and 17.7% combined motorised and active transport to school (**Table 2**). Adolescents who enrolled in the closest school had three times higher rates of walking as a part of their journey to school, five times higher rates of traveling to school by active transport only and lower rates of reliance solely on motorised transport to school compared to adolescents who did not enrol in the closest school (**Table 2**).

3.4 Reasons for school choice

Overall, two thirds of adolescents attending a co-educational school chose such a school due to its co-educational status. Approximately half of adolescents indicated friends' enrolment, positive comments from students and parents at school, school's facilities and sports programmes as important factors that influenced school choice (**Table 3**). Among adolescents who enrolled in the closest school, a significantly greater proportion reported choosing their school because of its proximity to home and existing social connections (siblings attended/enrolled; parents/other family members attended; friends enrolled) and a lower proportion chose their school because of schools' facilities, sports programmes, positive comments from parents at school and negative comments from parents or students at closest school compared to their counterparts (**Table 3**).

3.5 Correlates of enrolment in the closest school

In the univariate mixed effects binary logistic regression models, significant correlates of the enrolment in the closest school were co-education status of the school, sibling(s) enrolled in the same school, choosing school because siblings attended/attending the same school, parents attended the same school, friend's enrolment, negative comments from parents and students at the closest school, schools' proximity to home, and the actual distance to school. In a multivariate analysis, positive correlates of enrolment in the closest school were enrolment in a co-educational school (compared to enrolment in a single-sex school) and choosing school because of its proximity to home whereas negative correlates included distance to school and negative comments from students at closest school (**Table 4**). While not significant in

the fully adjusted multivariate model, the authors acknowledge a potential relationship between proximity of the school to the students' home, and the likelihood that friends, siblings and other family members attending or having attended the school.

4. Discussion

This study examined factors associated with adolescents' enrolment in the closest secondary school in the absence of school zoning in the city of Dunedin, New Zealand, and its implications for active transport to school. Key findings of this study are: 1) enrolling in the closest school was associated with three times higher rates of walking as a part of adolescents' journey to school, five times higher rates of traveling to school by active transport only and lower rates of reliance solely on motorised transport to school compared to not enrolling in the closest school; 2) choosing school because of its proximity to home and existing social connections were more frequently reported reasons for school choice among adolescents who enrolled in the closest school compared to their counterparts; and 3) in the absence of school zoning, shorter distance to school, choosing school because of its proximity to home, co-educational status of the school and absence of negative peer feedback were associated with adolescents' enrolment in the closest secondary school. These findings emphasise the implications of school choice and school zoning policies not only for education but also for public health, transport and environmental sustainability.

School choice policies coexist in tension with policies aimed at increasing active transport (Ferrari & Green, 2013). Existing evidence clearly shows the strong relationship between school choice policies, increased travel distances to school and decreased active transport (Wilson et al., 2010; Wilson et al., 2007; Yang, Abbott, &

Schlossberg, 2012). Previous studies used surveys (Marshall et al., 2010; Wilson et al., 2010; Yang et al., 2012), GIS data (Wilson et al., 2010; Yang et al., 2012), distance calculations (Sirard, McDonald, Mustain, Hogan, & Helm, 2015), observations (Sirard et al., 2015) and focus group discussions (Yang et al., 2012) to paint a clear portrait of the "side-effects of school choice programs" (Wilson et al., 2007): 516) . These side effects include increases in travel distance to school, traffic congestion, greenhouse gases and particulate emissions, along with decreased active transport for school children.

Promoting active transport addresses public health goals of increased physical activity, societal interest in alternatives to automobile transport and sustainability concerns. If feasible, active transport to school is a convenient way to maintain or increase physical activity (Faulkner, Buliung, Flora, & Fusco, 2009; Mendoza et al., 2011; Pabayo et al., 2012) and, in the long term, will contribute to improving health and wellbeing of adolescents whose physical activity levels tend to decline with age (van Mechelen, Twisk, Post, Snel, & Kemper, 2000). Safety concerns including traffic danger (Hopkins & Mandic, 2017; Kerr et al., 2006; Mandic et al., [in press]; Trapp et al., 2011) and concerns about strangers (Carver, Timperio, & Crawford, 2008) decrease the likelihood of active transport to school among children and adolescents. Increased reliance on motorized transport to school increases the volume of traffic on the roads, contributes to traffic congestion around schools at drop off and pick up times and worsens parental and adolescents' safety concerns for active transport, especially for cycling to school (Hopkins & Mandic, 2017; Mandic et al., [in press]; Mandic et al., [in press]).

From public health and transport perspectives, the results of this study emphasise the importance of considering distance to school in school choice decisions and in the design of education policy. In the present study, median distance to school for adolescents who enrolled in the closest school was 4.0 km closer to school with 10 times more adolescents living within walkable distance to school and 2.6 times more adolescents living within cycling distance to school compared to their counterparts. In addition, two-thirds of those adolescents reported choosing school because of its proximity to home compared to 14% of their peers who did not enrol in the closest school. Since distance to school is one of the strongest predictors of active transport to school (Davison et al., 2008; Mandic et al., 2015; Panter et al., 2008; Pont et al., 2009; Wong et al., 2011), it is not surprising that in the present study adolescents who enrolled in the closest school had three times higher rates of walking as a part of their journey to school, five times higher rates of traveling to school using active transport only and lower rates of reliance solely on motorised transport to school compared to adolescents who did not enrol in the closest school.

Previous studies have also emphasised the importance of school's proximity (U.S. Environmental Protection Agency, 2003) and school choice (Wilson et al., 2010) for travel to school behaviour, particularly for walking and cycling, in primary school children. Among parents of primary school children, more parents of children attending a neighbourhood school ranked the school's proximity to home as a reason for school choice compared to parents whose children attended a distant (magnet) school (Wilson et al., 2010). School choice led to longer commute and reduced rates of walking and cycling to school among primary school children in the United States (Wilson et al., 2007). Although locating schools within high density neighbourhoods

would lead to highest rates of active transport to school due to proximity to children's homes, school location strategy could be counterbalanced by school zoning policy that requires students to attend the closest school (Yang & Diez-Roux, 2013). However, a recent study that investigated a change in school choice policy resulted in shorter distances to school but without an associated increase in the rates of active transport to school (Sirard et al., 2015). These findings suggest that other policy levers and/or incentives (e.g. a policy-packaging approach (Givoni, 2014; Justen, Fearnley, Givoni, & Macmillen, 2014) may need to be included to achieve the desired effect.

School choice policies include a number of aspects including charter schools, vouchers, magnet schools and de-zoning (Waslander, Pater, & van der Weide, 2010). Charter schools have formed part of the choice landscape in the US since 1992 (Henig & MacDonald, 2002), but are a relative newcomer to the New Zealand school choice landscape (Ministry of Education, 2017). Currently there are no charter schools in Dunedin, with all 10 located in the North Island of New Zealand. The relationship between charter schools and active transport to school is unclear, as different countries, states and school districts have different policies in place with regard to transport. For instance, Makarewicz (2013) found 40% of students attending charter schools in the urban school district of Oakland, California were driven to school (1.6 times higher than students who attend a traditional public school) (p. 6); while other studies excluded charter schools from their school choice analysis (Wilson et al., 2007). What is clear, however, is that many of the options provided through school choice policies have the potential to increase the number of students who do not attend their neighbourhood school and therefore decrease the rate of active transport to school (Yang et al., 2012). An important area for future research is to expand the study

of the impact of school choice on active transport to school to include the charter schools and other selections on the school choice menu.

Interventions to address transport-related greenhouse gas emissions and to improve local air quality often seek to reduce private car transport and increase the uptake of active and public transport modes. A child's attendance at a school with close proximity to home increases the likelihood of using active transport, and thereby reduce the amount of fuel burnt and associated emissions. However, the complexity of school travel, including modal choice (Mitra, 2013) and parental trip-chaining (Buliung, Faulkner, Beesley, & Kennedy, 2011; Marique, 2013), i.e. combining transport to school with travel to work or to achieve other tasks, needs to be better understood when accounting for emissions-savings. For instance, the behavioural model of school transport presented by Mitra (2013) points to the interrelationships between various aspects of the external context, urban environment, the household, the child, and travel practices that will determine how a student will travel to school. Nevertheless, embedding social norms that promote physical activity and the use of public transport modes, whilst reducing symbolic and affective motivations for motorised transport (Steg, 2005) may have long term environmental benefits (Hopkins, 2016).

In the absence of school zoning, multivariate correlates of the enrolment in the closest school were shorter distance to school, choosing school because of its proximity to home, co-educational status of the school and absence of negative feedback from students. These findings suggest that in addition to distance to school and perceived importance of school's proximity to home, co-educational status of the school and

social factors are important determinants of enrolment in the closest school. Our work suggests that co-educational status of the school is one of the most commonly reported reasons for school choice among Dunedin adolescents who attended a co-educational school whereas a single-sex school status was not as frequently reported as a reason for school choice among adolescents who attended single-sex schools (unpublished findings). Due to Dunedin's unique context, it is difficult to find comparable studies. For example, a study from the UK reported that child's gender influenced the parents' choice (Jackson & Bisset, 2005). In that study, single-sex education was more frequently reported as an important factor affecting school choice decision among parents of girls whereas preference for coeducational schooling was more frequently reported by parents of boys. For the parents in that study, "the long-held view that single-sex education has advantages for girls whilst co-education has advantages for boys still prevails" (Jackson & Bisset, 2005): 208). Another UK-based study that explored young people and adults' perceptions and preferences for single-sex schooling found very mixed responses, complicated by gender, ethnicity and faith. In the Dunedin sample discussed in this paper, only non-integrated schools were included, removing religious affiliation from the complex set of factors influencing school choice. Nonetheless, two thirds of adolescents attending a co-educational school chose such a school due to its co-educational status. School choice decisions driven by the desire to attend a co-educational school clearly warrant further study.

In addition to consideration of the co-educational status of the school, school choice in Dunedin is related to a combination of the school's facilities, positive feedback about schools and existing social connections, rather than perceived proximity of school to home when analyses do not take into account whether students enrol in the closest

school or not (unpublished findings). However, findings from this study show that actual distance to school and perceived importance of school's proximity, but not school's facilities and programs, play an important role in decisions to enrol in the closest school. Future studies should examine differences in factors that influence school choice based on types of schools (private versus public; special character versus regular schools; co-educational versus single-sex schools) and who makes school choice decision(s) (adolescents, parents or adolescents-and-parents together).

In the present study, receiving negative comments from students at the closest school was associated with 1.5 times lower likelihood of enrolling in the closest secondary school in Dunedin. This novel finding suggests that negative feedback from students at the closest school plays an important role in school choice decisions. Previous studies reported that parental school choice in New Zealand is frequently driven by social factors such as characteristics of the school population, school's academic achievement, reputation, environment, and safety (Gordon, 2015) rather than distance to school. Wilson et al. (2010) speculated that while parents in the United States may prefer to send their children to a neighbourhood school, "magnet" schools may offer other dimensions (curriculum, academic quality and other factors) that suppress parental desire to send their child to the closest school. These findings have important policy implications beyond transport to school (Wilson et al., 2010).

In a complex school choice educational policy landscape where schools compete for students (Stubbs & Strathdee, 2012), there are no simplistic solutions for attracting parents and students to the closest school. Given that parents and students frequently report perceptions regarding the reputation (Reay & Lucey, 2000), quality (Phillippo &

Griffin, 2016) and academic achievement (Sattin-Bajaj, 2014) of the school as important to the decision-making process, schools will need multifaceted approaches to address these factors to increase enrolment from local students. Importantly, school choice alone will not improve school performance or quality (Gordon, 2015), and thus will not attract students to attend their local school. Overall, however, the finding that the effects of distance were statistically significant, even after adjustment for potential confounders in the multivariate model, lends credence to the distance effects that extend beyond socioeconomic background and academic ability, affecting also young people's aspirations, as previously reported among university students (Parker et al., 2016).

4.1 Implications for school choice policies

Taken together, these findings have significant implications for school zoning policies in New Zealand and elsewhere. In addition to their effects on education, school zoning policies have also substantial implications for addressing physical inactivity and health of adolescents, increased reliance on motorised transport, traffic congestion around schools, safety of active transport to school, air quality and greenhouse gas emissions (U.S. Environmental Protection Agency, 2003; Wilson et al., 2010). School choice policies should evaluate environmental, budgetary and transport mode choice implications, including children's physical activity, health and wellbeing, cost of private vehicle operation and transport infrastructure, and greenhouse gas emissions (Marshall et al., 2010; Wilson et al., 2010). Quantifying these "secondary effects" emphasise the broad implications of the school choice policy and its impact on other sectors (Wilson et al., 2010).

514 To maximise the rates of active transport to school, the school locations should be
515 evenly distributed in space and children should be assigned to the closest school
516 (Yang & Diez-Roux, 2013), which would require greater collaboration between the
517 Ministry of Education, and local and regional planners (McDonald, 2010). In addition,
518 school zoning policies have other consequences including implications for house
519 pricing in school areas and reinforcing class/wealth structures that require critical
520 attention to ensure inequalities are not perpetuated or increased (West, 2006). To
521 reduce the tensions between parental school choice expectations that "'getting the
522 right school or education for my child is worth driving for" (Yang et al., 2012, p. 1870)
523 and the goal of increasing active transport to school may take a great deal more
524 coordination between educational policy makers, town planners, health promoters,
525 and community groups.
526
527 **4.2 Study limitations**
528 This study has several limitations. The cross-sectional design prevents claims about
529 causality. This study examined school choice only in non-integrated public secondary
530 schools without school zoning (six out of twelve (50%) Dunedin secondary schools)
531 which limits generalisability of findings for school choice across the entire city
532 (including integrated ("special character") schools with enrolment schemes). The
533 unique setting of Dunedin itself may limit generalisability of findings to other New
534 Zealand cities and other countries with different school choice culture and school
535 zoning policies. Finally, parental perspectives on school choice have not been
536 addressed in this article. Despite the limitations, this study has notable strengths. The
537 strengths include consideration of adolescents' perspective on school choice, use of
538 a comprehensive survey of factors affecting school choice, a large representative

sample of adolescents from one city in New Zealand, 100% school participation and selection of non-integrated public schools without school zoning requirements. Future studies should examine the effects of closest school enrolment on the rates of active and motorised transport to school if school zoning policies were introduced and students enrolled into their closest school.

5. Conclusions

In the absence of school zoning, shorter distance to school, choosing a school because of its proximity to home, co-educational school status, and absence of negative peer feedback were associated with adolescents' enrolment in the closest secondary school. Policies that incentivise enrolment in the closest school could increase the rates of active transport and may contribute to addressing negative and life-long health impacts arising from physical inactivity among adolescents, as well as traffic congestion and sustainability concerns. Nevertheless, the unintended consequences of such policies including implications for house pricing in school areas and reinforcing class/wealth structures need to be considered. These findings have implications for planning decisions about the construction of new schools and renovation of the existing schools since the school location and consequently distance to school have significant implications for transport and health. Planning decisions should also consider the importance of infrastructure (e.g. walking tracks, bike paths) that support active transport between homes and schools. In addition, if active transport to school is not feasible due to distance, adolescents should be encouraged to use active transport to other destinations. A multi-sector approach and extensive collaboration between educational policy makers, urban designers, health promoters, and community groups is required to reduce the tensions between parental and

students' school choice expectations of getting the best education possible and the goal of increasing rates of active transport to school.

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Authors' contributions

SM is the principal investigator who conceptualized the overall study, led the project implementation and drafted this manuscript. SM, DH, GW and EGB contributed to the design of the study and questionnaires. SM, AM and EGB obtained research funding in collaboration with other members of the wider BEATS Research Team. SM, SS, DH and GW conceptualized this particular study. SM and EGB were responsible for statistical analysis. AM and JR were responsible for Geographic Information Systems data analysis. All authors have read and approved the final version of the manuscript, and agree with the order of presentation of the authors.

Competing interests

Mr Gordon Wilson works as the manager of the Dunedin Secondary Schools' Partnership and has been a part of the BEATS Study research team from the study inception. Other authors do not have any competing financial interests.

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Table 1. Sociodemographic characteristics

	Total sample n=797	Enrolled in the closest school n=409	Not enrolled in the closest school n=388	p-value
Age (years)	15.2 ± 1.4	15.1 ± 1.4	15.2 ± 1.4	0.201
Gender [n(%)]				
Boys	410 (51.4)	185 (45.2)	225 (58.0)	
Girls	387 (48.6)	224 (54.8)	163 (42.0)	<0.001
Ethnicity [n(%)]				
New Zealand European	585 (73.4)	302 (73.8)	283 (72.9)	
Māori	101 (12.7)	48 (11.7)	53 (13.7)	
Other	111 (13.9)	59 (14.4)	52 (13.4)	0.686
Neighbourhood deprivation score [n(%)]	(n=782)	(n=405)	(n=377)	
1-2 (least deprived)	200 (25.6)	99 (24.4)	101 (26.8)	

3-4	184 (23.5)	87 (21.5)	97 (25.7)	
5-6	184 (23.5)	95 (23.5)	89 (23.6)	
7-8	128 (16.4)	69 (17.0)	59 (15.6)	
9-10 (most deprived)	86 (11.0)	55 (13.6)	31 (8.2)	0.124
Co-educational status of the school [n(%)]				
Co-Ed	314 (39.4)	229 (56.0)	85 (21.9)	
Girls only	210 (26.3)	90 (22.0)	120 (30.9)	
Boys only	273 (34.3)	90 (22.0)	183 (47.2)	<0.001
One or more siblings attending the same school [n(%)]	227 (28.5)	144 (35.2)	83 (21.4)	<0.001
Number of bicycles available to use to get to school (n)				
None	223 (28.0)	121 (29.6)	102 (26.3)	
One	171 (21.5)	90 (22.0)	81 (20.9)	

Two or more	403 (50.6)	198 (48.4)	205 (52.8)	0.436
Number of vehicles at home (n)				
None	32 (4.0)	22 (5.4)	10 (2.6)	
One	261 (32.7)	144 (35.2)	117 (30.2)	
Two or more	504 (63.2)	243 (59.4)	261 (67.3)	0.009

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Table 2. Distance and transport to school

	Total sample n=797	Enrolled in the closest school n=409	Not enrolled in the closest school n=388	p-value
Distance to school (km) [median (range)]	3.2 (0.3-54.5)	1.7 (0.3-29.8)	5.7 (1.6-54.5)	<0.001
Living within walking distance to school (≤2.3 km) [n(%)]	292 (36.6)	266 (65.0)	26 (6.7)	<0.001
Living within cycling distance to school (≤4.0 km) [n(%)]	457 (57.3)	338 (82.6)	119 (30.7)	<0.001
Usual transport modes to school [n(%)] [a]				
By car (driven by others)	354 (44.4)	132 (32.3)	222 (57.2)	<0.001
By car (driving myself)	39 (4.9)	15 (3.7)	24 (6.2)	0.168
By school bus	103 (12.9)	27 (6.6)	76 (19.6)	<0.001
By public transport	54 (6.8)	10 (2.4)	44 (11.3)	<0.001
On foot	270 (33.9)	214 (52.3)	56 (14.4)	<0.001
By bike	13 (1.6)	6 (1.5)	7 (1.8)	0.824
Other	14 (1.8)	6 (1.5)	8 (2.0)	0.473

Frequency of walking to school in the previous two weeks [n(%)]	(n=792)	(n=407)	(n=385)	
Never	380 (48.0)	113 (27.8)	267 (69.4)	
Almost never	70 (8.8)	37 (9.1)	33 (8.6)	
Sometimes	82 (10.4)	51 (12.5)	31 (8.1)	
Almost every day	102 (12.9)	75 (18.4)	27 (7.0)	
Every day	158 (19.9)	131 (32.2)	27 (7.0)	<0.001
Active transport to school [n(%)]				
Active transport	224 (28.1)	190 (46.5)	34 (8.8)	
Combination of active and motorised transport	141 (17.7)	54 (13.2)	87 (22.4)	
Motorised transport	432 (54.2)	165 (40.3)	267 (68.8)	<0.001

[a]Transport mode used "most of the time" or "all of the time".

820 **Table 3.** School choice decision-making and reasons for school choice

	Total sample n=797		Enrolled in closest school n=409		Not enrolled in closest school n=388		p-value
	mean±SD	% Agree	mean±SD	% Agree	mean±SD	% Agree	
Decision making							
Who decided what secondary school you would attend?							
I did.		332 (41.7)		147 (35.9)		185 (47.7)	
My parent(s)/ guardian(s) did.		138 (17.3)		88 (21.5)		50 (12.9)	
My parent(s)/ guardian(s) and I did together.		320 (40.2)		172 (42.1)		148 (38.1)	
Somebody else		7 (0.9)		2 (0.5)		5 (1.3)	0.001
Reasons for school choice							
Closest school to home	3.0 ± 1.5	331 (41.5)	3.8 ± 1.3	276 (67.5)	2.1 ± 1.2	55 (14.2)	<0.001

Siblings went or go to this school[a]	2.4 ± 1.6	247 (31.1)	2.6 ± 1.6	145 (35.6)	2.2 ± 1.5	102 (26.4)	<0.001
Parents or other family members went to this school	2.3 ± 1.5	192 (24.1)	2.5 ± 1.5	116 (28.4)	2.1 ± 1.4	76 (19.6)	<0.001
Friends were going to this school	3.3 ± 1.4	427 (53.6)	3.4 ± 1.4	227 (55.5)	3.1 ± 1.4	200 (51.5)	0.033
Facilities at this school	3.2 ± 1.2	358 (44.9)	3.1 ± 1.2	153 (34.7)	3.4 ± 1.2	205 (52.8)	<0.001
Sports programmes at this school	3.2 ± 1.3	344 (43.2)	3.0 ± 1.3	157 (38.4)	3.3 ± 1.3	187 (48.2)	0.001
Cultural programmes at this school	2.9 ± 1.3	244 (30.6)	2.8 ± 1.3	122 (29.8)	2.9 ± 1.3	122 (31.4)	0.379
Positive comments from parents of this school	3.3 ± 1.2	372 (46.7)	3.2 ± 1.2	172 (42.1)	3.4 ± 1.2	200 (51.5)	0.003
Positive comments from students of this school	3.3 ± 1.2	389 (48.8)	3.3 ± 1.2	189 (46.2)	3.4 ± 1.2	200 (21.5)	0.051

Preferred a single-sex school[b]	2.8 ± 1.2	120 (24.8)	2.8 ± 1.2	44 (24.4)	2.8 ± 1.2	76 (25.1)	0.747
Preferred a co-educational school[c]	4.0 ± 1.1	230 (73.2)	4.0 ± 1.2	167 (72.9)	4.1 ± 1.2	63 (74.1)	0.476
Negative comments from parents at closest school	1.9 ± 1.1	61 (7.7)	1.8 ± 1.0	18 (4.4)	2.1 ± 1.2	43 (11.1)	<0.001
Negative comments from students at closest school	2.0 ± 1.1	66 (8.3)	1.8 ± 1.0	18 (4.4)	2.2 ± 1.2	48 (12.4)	<0.001
Other reasons	2.7 ± 0.9	46 (5.8)	2.7 ± 0.9	26 (6.4)	2.7 ± 1.0	20 (5.2)	0.633

821 Categorical variables were coded as "agree", "neutral", "disagree" and "I do not know".

822 Responses “I don’t know” were excluded from the analysis for continuous variables.

823

824 [a]Data analysed only for adolescents who had at least one sibling

825 [b]Data analysed only for adolescents who attended single-sex school only

826 [c]Data analysed only for adolescents who attended co-educational school only

Table 4. Multivariate correlates of the initial enrolment in the closest school

	Coefficient	Std. Error	P-value	OR	95% CI Lower	95% CI Upper
Age	0.04	0.08	0.634	1.04	0.89	1.20
Gender (ref. female)	0.41	0.25	0.872	1.04	0.63	1.71
Ethnicity (ref. other)						
New Zealand European	-0.05	0.30	0.868	0.95	0.53	1.71
Māori	-0.10	-0.40	0.793	0.90	0.41	2.00
Neighbourhood deprivation score	-0.07	0.04	0.079	0.93	0.87	1.01
Co-educational status of the school (ref. single-sex school)						
Co-educational school	**1.51**	**0.28**	**<0.001**	**4.51**	**2.60**	**7.80**
One or more siblings attending the same school (ref. other siblings attending)	-0.22	0.24	0.356	0.80	0.50	1.28
School chosen because of proximity to home	**0.83**	**0.08**	**<0.001**	**2.29**	**1.97**	**2.66**
School chosen because siblings went or go to this school	-0.06	0.07	0.433	0.94	0.82	1.10

School chosen because of parents or other family members went to this school	0.10	0.08	0.201	1.10	0.95	1.28
School chosen because friends were going to this school	0.08	0.08	0.329	1.08	0.93	1.26
School chosen because of negative comments from parents at closest school	0.06	0.19	0.752	1.06	0.73	1.53
School chosen because of negative comments from students at closest school	**-0.39**	**0.19**	**0.038**	**0.68**	**0.47**	**0.98**
Distance to school	**-0.16**	**0.02**	**<0.001**	**0.86**	**0.82**	**0.90**

(Reference: Not enrolled in the closest school)