

*SOCIOLOGICAL APPLICATIONS OF
POSITIVE MENTAL HEALTH*



Christopher Justin Jacobi

Department of Sociology

This dissertation is submitted for the degree of Doctor of Philosophy

Trinity Term 2021/22

Word count: 79,935



**Nuffield
College**
UNIVERSITY OF OXFORD

This thesis is dedicated to my loving parents,

Cornelia & Reinhard

Jacobi.

“It appears that the eudaimon life is lived in accordance with virtue (aretē). Such a life is lived with seriousness (spoudē), but not by means of amusement (paidia).”

— Aristotle, Nicomachean Ethics, x. 7.7-9. Translated by Professor Mary Lefkowitz.

DECLARATION

This doctoral thesis is the result of my own work and has not been previously submitted, in part or whole, to any university or institution for any degree, diploma, or other qualification.

In compliance with the Examination Regulations of the University of Oxford and of the Department of Sociology, this thesis does not exceed 100,000 words (including figures and tables).

Signed: _____

Date: _____

Christopher Justin Jacobi (BA, MSc)

Oxford

ABSTRACT

This thesis tests the conceptual relevance and empirical usefulness of the positive mental health (PMH) framework for quantitative sociological research. The PMH approach postulates mental health to be inherently multidimensional and to consist of the tripartite domains of hedonic (affective, emotional, and cognitive), psychological (eudaimonic) and social well-being. It stipulates that the presence of PMH does not merely mirror the absence of mental disorders and illnesses (dual continua model), and it proposes that eudaimonic well-being, in particular, can be meaningfully distinguished from other forms of mental health. Even though versions of the PMH approach have gained considerable popularity in academia and public policy, they are often still limited by a lack of longitudinal evidence and a shortage of advanced statistical modelling that would demonstrate their broader importance. In response, this thesis employs state-of-the-art PMH indicators, primarily the Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS), on high-quality nationally representative data and strategically contrasts the finding of PMH scales with more established NMH ones over a broad array of sociological conditions and outcomes.

The first empirical chapter tests the empirical prevalence, predictors and consequences of the dual continua model and sheds light on the psychometric and sociological differences between the SWEMWBS, the GHQ and life satisfaction and uses allostatic load measures as a physiological benchmark. The subsequent two empirical chapters analyse how neighbourhoods, as an important meso-level consideration, and how religiosity, as an eminent individual-level factor, distinctly affect PMH while jointly controlling for NMH, both cross-sectionally and over ten years (with four measurement occasions of the SWEMWBS). Finally, the fourth paper establishes the link between

PMH and mortality risk over a 21-year span while controlling for the influences of other mental health and psychological measures.

Throughout the thesis, an extensive set of statistical techniques such as event history, fixed and random effects, and structural equation modelling are employed. While the thesis finds somewhat of an expected overlap between the PMH scales and the competing mental health measures, the dual continua model of mental health is supported, and striking differences emerge in reference to the SWEMWBS' sub-dimensions of feeling optimistic and feeling usefulness. Each chapter also portrays meaningful differences in the relationships of the mental health variables with life course conditions. The thesis demonstrates that sociological researchers must deliberately choose the right psychological scale or sub-dimension with care and that, in certain applications, differentiating between negative and positive mental health according to the dual continua model of mental health can provide new insights.

ACKNOWLEDGEMENTS

I would like to express my great appreciation to Professor Christiaan Monden for his excellent and unwavering support of my research endeavours throughout many challenges. His advice has greatly helped me learn to become a professional researcher and it has played a pivotal role when translating “interesting ideas” into actual research questions and scientific outputs. While it can be relatively straightforward to generate impressive graphics or complicated regression models when one has gained enough computer programming experience, it is my experience that the interpretation and theory-building aspects sometimes require the most care and deliberation.

I am also grateful to Professor Francesco Billari who in the early stages of the thesis influenced my decision to take an at least somewhat longitudinal and demographic focus, as well as having set up a connection with the Population Studies Center at the University of Pennsylvania, where I had the chance to stay for an extended research visit. Accordingly, I would like to thank Professor Jason Schnittker for having graciously hosted me to investigate multidimensional mental health on an American data set. Francesco, now Dean of Faculty at Bocconi University in Italy, also invited me to another research visit at the Dondena Center for Research on Social Dynamics and Public Policy and facilitated my research collaboration with Professor Nicoletta Balbo.

People tend to flourish when they experience proper support, and I have certainly profited from the excellent research and funding support network that is the Economic and Social Research Council (ESRC). I am hence extremely thankful for the ESRC's financial investment into my "1 + 3" (MSc + DPhil) studentship. I am also obliged to the European Consortium for Sociological Research (ECSR) and the Max Planck Institute for Demographic Research (MPIDR) for further research training funds.

The University of Oxford has been my home for several years, and I am indebted to the academic opportunities that the Department of Sociology, Nuffield College and Oriel College offered me during this period.

I am especially grateful to my wife Lilit Jacobi for having endured and supported me when I was spending countless days in front of Stata outputs. I further express my thankfulness to Brandon Vaidyanathan, Kelsey O'Connor, Laura Fleischer, and many other friends and colleagues for their invaluable input.

CONTENTS

1 THESIS INTRODUCTION	1
1.1 A VERY BRIEF HISTORY OF HAPPINESS AND CONCOMITANT CONCEPTS	2
1.2 THE POPULARITY OF POSITIVE MENTAL HEALTH AND WELL-BEING	4
1.3 DIFFICULTIES IN DEFINING HAPPINESS	8
1.4 A POSITIVE REVOLUTION? DEFINING POSITIVE MENTAL HEALTH.....	10
<i>1.4.1 Hedonic happiness and mental health</i>	<i>21</i>
<i>1.4.2 Eudaimonic happiness and mental health</i>	<i>23</i>
<i>1.4.3 Three modes of flourishing</i>	<i>27</i>
<i>1.4.4 The (Short) Warwick-Edinburgh Mental Well-Being Scale.....</i>	<i>31</i>
<i>1.4.5 Psychological needs</i>	<i>37</i>
1.5 POSITIVE EMOTIONS	37
1.6 THE LIFE COURSE.....	39
1.7 CRITICISMS OF POSITIVE MENTAL HEALTH RESEARCH	41
1.8 A SOCIOLOGY OF PMH AND SOCIOLOGICAL APPLICATIONS OF WELL-BEING	44
1.9 OVERVIEW OF THE THESIS	47
1.10 A NOTE ON STATISTICS AND METHODOLOGY	52
<i>1.10.1 Data analysis.....</i>	<i>52</i>

1.10.2 Representativeness and missing data.....	53
1.11 REFERENCES.....	56
2 THE SHORT WARWICK-EDINBURGH MENTAL WELL-BEING SCALE IN THE UK'S UNDERSTANDING SOCIETY	75
2.1 INTRODUCTION.....	77
2.2 METHODOLOGY.....	82
2.2.1 Data.....	82
2.2.2 Statistical modelling.....	83
2.2.3 Sample selection.....	83
2.2.4 Variables	84
2.3 RESULTS AND ANALYSES	86
2.3.1 <i>Who is flourishing? How strongly is the SWEMWBS associated with demographic and sociological conditions?</i>	<i>89</i>
2.3.2 <i>The dual continua model.....</i>	<i>95</i>
<i>How does the SWEMWBS compare psychometrically with other mental health scales in Understanding Society?</i>	<i>114</i>
2.3.3 <i>How are the domains of the SWEMWBS relating to each other and with sociological and demographic conditions? What are the details and psychometric properties of these domains?</i>	<i>131</i>

2.3.4 <i>What are the associations of PMH with objective health in terms of allostatic load measures?</i>	149
2.4 DISCUSSION.....	156
2.4.1 <i>Limitations and future avenues</i>	160
2.5 CONCLUSION	162
2.6 REFERENCES.....	164
3 POSITIVE MENTAL HEALTH AND NEIGHBOURHOOD CONDITIONS IN ENGLAND.....	176
3.1 INTRODUCTION.....	178
3.2 LITERATURE AND THEORY.....	180
3.3 METHODOLOGY.....	184
3.3.1 <i>Participants and data</i>	184
3.3.2 <i>Variables</i>	185
3.3.3 <i>Statistical approach</i>	187
3.4 RESULTS.....	193
3.4.1 <i>Longitudinal analyses</i>	210
3.5 DISCUSSION.....	217
3.5.1 <i>Limitations and further research</i>	221
3.6 CONCLUSION	223

3.7 REFERENCES.....	225
4 POSITIVE MENTAL HEALTH AND RELIGIOSITY IN THE UNITED KINGDOM	233
4.1 INTRODUCTION.....	235
4.2 LITERATURE AND THEORY.....	236
METHODOLOGY	240
<i>4.2.1 Data.....</i>	<i>240</i>
<i>4.2.2 Sampling and missing data</i>	<i>240</i>
<i>4.2.3 Variables</i>	<i>241</i>
<i>4.2.4 Modelling strategy</i>	<i>242</i>
4.3 RESULTS.....	245
4.4 DISCUSSION AND CONCLUSION	268
<i>4.4.1 Limitations and future research.....</i>	<i>272</i>
4.5 CONCLUSION	274
4.6 REFERENCES.....	275
5 POSITIVE MENTAL HEALTH AND MORTALITY IN THE USA	284
5.1 INTRODUCTION.....	286
5.2 LITERATURE AND THEORY.....	286
5.3 METHODOLOGY.....	291

5.3.1 Variables	291
5.3.2 Analytical approach	294
5.4 RESULTS	296
5.4.1 A finer differentiation of PMH	315
5.5 DISCUSSION	317
5.5.1 Limitations and further research	322
5.6 CONCLUSION	323
5.7 REFERENCES	325
6 THESIS DISCUSSION	333
6.1 SUMMARY OF FINDINGS	334
6.2 LIMITATIONS AND FURTHER RESEARCH	341
6.3 CONCLUDING REMARKS	346
6.4 REFERENCES	351

LIST OF TABLES

TABLE 1 LIST OF ABBREVIATIONS AND ACRONYMS.....	XXIV
TABLE 2 FOUNDATIONAL CONCEPTIONS OF POSITIVE MENTAL HEALTH	13
TABLE 3 MODERN EMPIRICAL MEASURES RELATING TO POSITIVE MENTAL HEALTH.....	17
TABLE 4 CLASSIFICATIONS OF THE SWEMWBS DOMAINS FROM A PHILOSOPHICAL AND PSYCHOLOGICAL PERSPECTIVE	33
TABLE 5 SAMPLE SELECTION AND MISSINGNESS STATISTICS IN (UKHLS WAVE 1).....	87
TABLE 6 DESCRIPTIVE STATISTICS OF THE COVARIATES: N = 35,957 (UKHLS WAVE 1) .	88
TABLE 7 SURVEY WEIGHTED BIVARIATE STATISTICS OF THE SWEMWBS WITH SOCIOLOGICAL AND DEMOGRAPHIC VARIABLES OF INTEREST IN THE UKHLS WAVE 1.	91
TABLE 8 SURVEY WEIGHTED BIVARIATE STATISTICS OF THE SWEMWBS WITH OWN SOCIAL CLASS AND FATHER’S SOCIAL CLASS IN THE UKHLS WAVE 1.....	94
TABLE 9 EMPIRICAL STATUS OF THE DUAL CONTINUA MODEL AND OFF-DIAGONAL GROUPS IN THE UKHLS WAVE 1.	97
TABLE 10 CROSS-TABULATION OF PMH AND NMH (CUT-OFF SCORING) TO EMPIRICALLY TEST THE DUAL CONTINUA MODEL.	98
TABLE 11 CROSS-TABULATION OF PMH AND NMH IN TERMS OF TERTILES TO EMPIRICALLY TEST THE DUAL CONTINUA MODEL.	99
TABLE 12 CROSS-TABULATION OF THE OPTIMISM DOMAIN (PMH) WITH NMH (CUT-OFF SCORING).	102

TABLE 13 CROSS-TABULATION OF THE DUAL CONTINUA MODEL WITH DESCRIPTIVE STATISTICS (UKHLS WAVE 1).	103
TABLE 14 DESCRIPTIVE STATISTICS FOR THE SAMPLE OF RESPONDENTS THAT WERE MATCHED WITH THE BIG5 PERSONALITY FACTOR INFORMATION (UKHLS WAVES 1 AND 3).....	106
TABLE 15 BIVARIATE ASSOCIATIONS OF THE DUAL CONTINUA MODEL CATEGORIES FROM WAVE 1 WITH THE BIG 5 PERSONALITY FACTORS IN WAVE 3 OF THE UKHLS.	107
TABLE 16 SURVEY-WEIGHTED CROSS-TABULATION OF THE DUAL CONTINUA CATEGORIES AT BASELINE IN WAVE 1 WITH THE PROPENSITY OF SMOKING BEHAVIOUR AT WAVE 10 IN THE UKHLS.	110
TABLE 17 SURVEY WEIGHTED CROSS-TABULATION OF THE DUAL CONTINUA CATEGORIES AT BASELINE (WAVE 1) WITH NEGATIVE MENTAL HEALTH AT (WAVE 10) IN THE UKHLS.	111
TABLE 18 STATISTICAL COMPARISON OF MATCHED AND UNMATCHED SURVEY RESPONDENTS FROM WAVE 1 – 10 (UKHLS WAVES 1 AND 10).....	112
TABLE 19 PEARSON’S CORRELATIONS OF THE MENTAL HEALTH SCALES (UKHLS WAVE 1)	116
TABLE 20 LIST OF SWEMWBS AND GHQ DOMAINS AND THEIR VARIABLE NAMES.....	117
TABLE 21 EXPLORATORY FACTOR ANALYSIS LOADING WITH PROMAX ROTATION OF THE GHQ AND SWEMWBS (UKHLS WAVE 1).	119
TABLE 22 SURVEY-WEIGHTED CONFIRMATORY FACTOR ANALYSES OF PMH AND NMH (UKHLS WAVE 1). N = 40,995	123

TABLE 23 LONGITUDINAL CORRELATIONS BETWEEN THE MAIN MENTAL HEALTH VARIABLES (UKHLS WAVES 1 TO 10). N = 14,236	125
TABLE 24 AVERAGE LONGITUDINAL PATTERN ON THE SWEMWBS AND OTHER MEAN HEALTH SCALES OVER TIME (UKHLS WAVE 1, 4, 7, AND 10).....	126
TABLE 25 CUMULATIVE DENSITY FUNCTION OF LIFE SATISFACTION AND DOMINANCE CHECKS BY AGE GROUPS (UKHLS WAVE 1).....	128
TABLE 26 POLYCHORIC CORRELATIONS OF THE SWEMWBS DOMAINS (UKHLS WAVE 1)	134
TABLE 27 SURVEY-WEIGHTED AVERAGE SCORES OF THE DOMAINS OF THE SWEMWBS WITH IMPORTANT SOCIOLOGICAL AND DEMOGRAPHIC VARIABLES (UKHLS WAVE 1). N = 38,859	135
TABLE 28 SURVEY-WEIGHTED CROSS-TABULATION OF THE SWEMWBS OPTIMISM DOMAIN WITH IMPORTANT SOCIOLOGICAL AND DEMOGRAPHIC VARIABLES (UKHLS WAVE 1). N = 38,859.....	136
TABLE 29 SURVEY-WEIGHTED CROSS-TABULATION OF THE SWEMWBS DOMAIN OF OPTIMISM WITH SOCIAL CLASS AND FATHER’S SOCIAL CLASS (UKHLS WAVE 1)...	137
TABLE 30 MULTIDIMENSIONAL SCALING OF THE SUBDOMAINS OF THE SWEMWBS ACROSS TWO DIMENSIONS (UKHLS WAVE 1).	140
TABLE 31 TABLE OF IRT (GRT) RESULTS OF THE SUBDOMAINS OF THE SWEMBS (UKHLS WAVE 1).....	145

TABLE 32 DESCRIPTIVE STATISTICS OF THE ALLOSTATIC LOAD MEASURE FROM THE NURSE INTERVIEW DATA IN WAVE 2 AND CONTROL VARIABLES (UKHLS WAVE 1 AND 2). N = 9,485.....	152
TABLE 33 REGRESSION RESULTS (MODEL 1 AND MODEL 2) OF ALLOSTATIC LOAD ON PMH (UKHLS WAVES 1 AND 2). N = 9,485	153
TABLE 34 REGRESSION RESULTS (MODEL 1 AND MODEL 2) OF ALLOSTATIC LOAD ON PMH WHILE CONTROLLING FOR NEGATIVE MENTAL HEALTH (UKHLS WAVES 1 AND 2). N = 9,485	154
TABLE 35 SUMMARY OF THE LONGITUDINAL SAMPLE (UKHLS WAVES 1 TO 10)	193
TABLE 36 DESCRIPTIVE STATISTICS OF CONTINUOUS VARIABLES INCLUDING THE SWEMWBS AND ITS DOMAINS, THE IMD AND ITS DOMAINS, AND THE PERCEIVED/SOCIAL NEIGHBOURHOOD FACTORS (UKHLS WAVE 1). N = 42,927....	195
TABLE 37 DESCRIPTIVE STATISTICS OF CATEGORICAL CONTROL VARIABLES (UKHLS WAVE 1).....	196
TABLE 38 AVERAGE LEVELS OF THE SWEMWBS BY IMD RANKS (DECILES) IN ENGLAND (UKHLS WAVE 1).....	197
TABLE 39 MODELS 1A TO 1H: LINEAR MULTILEVEL REGRESSIONS OF THE SWEMWBS ON THE IMD (UKHLS WAVE 1)	198
TABLE 40 MODELS 2A-2I: LINEAR MULTILEVEL REGRESSIONS OF THE SWEMWBS ON PERCEIVED/SOCIAL NEIGHBOURHOOD ITEMS (UKHLS WAVE 1)	201

TABLE 41 MODELS 3A TO 3G: LINEAR MULTILEVEL REGRESSIONS OF THE DOMAINS OF THE SWEMWBS ON THE IMD AND THE PERCEIVED/SOCIAL NEIGHBOURHOOD SCALE (UKHLS WAVE 1).....	202
TABLE 42 MODELS 4A TO 4H: LINEAR MULTILEVEL REGRESSIONS OF THE SWEMWBS ON THE IMD WHILE ACCOUNTING FOR NEGATIVE MENTAL HEALTH IN RELATION TO THE DUAL CONTINUA MODEL (UKHLS WAVE 1).....	204
TABLE 43 MODELS 5A TO 5I: LINEAR MULTILEVEL REGRESSIONS OF THE SWEMWBS ON PERCEIVED/SOCIAL NEIGHBOURHOOD FACTORS WHILE ACCOUNTING FOR NEGATIVE MENTAL HEALTH IN RELATION TO THE DUAL CONTINUA MODEL (UKHLS WAVE 1).	205
TABLE 44 MODELS 6A AND 6B: LINEAR MULTILEVEL REGRESSIONS OF THE SWEMWBS ON THE IMD AND PERCEIVED/SOCIAL NEIGHBOURHOOD SCALE WITH NMH (UKHLS WAVE 1).	208
TABLE 45 FIML REGRESSION OF THE SWEMWBS AND EACH OF ITS DOMAINS ON THE IMD AND NEIGHBOURHOOD COHESION AS A ROBUSTNESS CHECK TO THE PREVIOUS MODELS (UKHLS WAVE 1).....	209
TABLE 46 LONGITUDINAL SAMPLE CHARACTERISTICS AND LEVELS OF MISSINGNESS OVER 10 WAVES AND NEIGHBOURHOOD TRANSITIONS (UKHLS WAVES 1-10).....	212
TABLE 47 TRANSITIONS PROBABILITIES FOR LSOA RESIDENCY MOVEMENTS BY IMD DECILE RANK (UKHLS WAVES 1-10).....	213
TABLE 48 MODELS 7A TO 7H: LINEAR RANDOM EFFECTS PANEL DATA REGRESSIONS OF THE SWEMWBS AND ITS DOMAINS ON THE IMD AND NEIGHBOURHOOD COHESION	

WHILE ACCOUNTING FOR NEGATIVE MENTAL HEALTH IN RELATION TO THE DUAL CONTINUA MODEL (UKHLS WAVES 1-10).	214
TABLE 49 DESCRIPTIVE STATISTICS OF CATEGORICAL VARIABLES INCLUDING RELIGIOSITY IN TERMS OF ATTENDANCE AND RELIGIOSITY IN TERMS OF IMPORTANCE (UKHLS WAVE 1)	245
TABLE 50 DESCRIPTIVE STATISTICS OF CONTINUOUS VARIABLES INCLUDING THE SWEMWBS AND ITS DOMAINS (UKHLS WAVE 1)	246
TABLE 51 MODELS 1A TO 1C: SURVEY-WEIGHTED OLS REGRESSION OF THE SWEMWBS ON RELIGIOUS ATTENDANCE (UKHLS WAVE 1).....	250
TABLE 52 SURVEY-WEIGHTED OLS REGRESSION OF THE SWEMWBS ON RELIGIOUS IMPORTANCE (UKHLS WAVE 1)	251
TABLE 53 MODELS 3A TO 3G: SURVEY-WEIGHTED OLS REGRESSIONS OF SWEMWBS DOMAINS ON RELIGIOSITY (ATTENDANCE) (UKHLS WAVE 1).	253
TABLE 54 MODELS 4A TO 4G: SURVEY-WEIGHTED OLS REGRESSIONS OF SWEMWBS DOMAINS ON RELIGIOSITY (IMPORTANCE) (UKHLS WAVE 1)	254
TABLE 55 MODELS 5A TO 5E: SIMULTANEOUS-QUANTILE REGRESSIONS OF THE SWEMWBS ON RELIGIOSITY (ATTENDANCE) (UKHLS WAVE 1).....	255
TABLE 56 MODELS 6A TO 6E: SIMULTANEOUS QUANTILE REGRESSIONS OF THE SWEMWBS ON RELIGIOSITY (IMPORTANCE) (UKHLS WAVE 1).	256
TABLE 57 MODELS 7A TO 7B: OLS REGRESSIONS OF THE GHQ ON BOTH TYPES OF RELIGIOSITY (UKHLS WAVE 1).	257
TABLE 58 LONGITUDINAL SAMPLE (UKHLS WAVES 1 TO 10).	260

TABLE 59 LONGITUDINAL TRENDS ON THE DOMAINS OF THE SWEMWB (UKHLS WAVES 1 TO 10).....	260
TABLE 60 LONGITUDINAL TRANSITION PROBABILITIES (UKHLS WAVES 1 TO 10).....	261
TABLE 61 MODELS 8A TO 8C: FIXED EFFECTS REGRESSIONS OF THE SWEMWBS AND GHQ ON WITHIN-PERSON CHANGES IN RELIGIOUS ATTENDANCE (UKHLS WAVES 1-10).	263
TABLE 62 MODELS 9A TO 9C: FIXED EFFECTS REGRESSIONS OF THE SWEMWBS AND GHQ ON WITHIN-PERSON CHANGES IN RELIGIOUS IMPORTANCE (UKHLS WAVES 1-10)	264
TABLE 63 MODELS 10A TO 10G: FIXED EFFECTS REGRESSIONS OF THE SWEMWBS AND ITS DOMAINS ON WITHIN-PERSON CHANGES IN RELIGIOUS ATTENDANCE (UKHLS WAVES 1-10).....	265
TABLE 64 MODELS 11A TO 11G: FIXED EFFECTS REGRESSIONS OF THE SWEMWBS AND ITS DOMAINS ON WITHIN-PERSON CHANGES IN RELIGIOUS IMPORTANCE (UKHLS WAVES 1-10).....	266
TABLE 65 DESCRIPTIVE STATISTICS OF CATEGORICAL VARIABLES AT BASELINE LEVELS INCLUDING THE PMH MEASURE (MIDUS 1995/96).....	297
TABLE 66 DESCRIPTIVE STATISTICS OF CONTINUOUS VARIABLES AT BASELINE LEVELS (MIDUS 1995/96)	298
TABLE 67 CORRELATION MATRIX OF THE MAIN PSYCHOLOGICAL AND MENTAL HEALTH VARIABLES (MIDUS 1995/96).....	301

TABLE 68 MODELS 1A TO 1I: REPLICATION MODELS: NESTED LOGISTIC REGRESSIONS OF MORTALITY RISK OVER A 21-YEAR PERIOD (MIDUS 1995/96 AND MORTALITY INFORMATION)	305
TABLE 69 MODELS 2A TO 2I: REPLICATION MODELS OF MORTALITY RISK WITH NESTED COX-PROPORTIONAL HAZARDS SURVIVAL MODELS AS EXTENSIONS (MIDUS 1995/96 AND MORTALITY INFORMATION)	307
TABLE 70 MODELS 3A TO 3I REPLICATION MODELS OF MORTALITY RISK WITH NESTED COX-PROPORTIONAL HAZARDS SURVIVAL MODELS AS EXTENSIONS AND NMH (MIDUS 1995/96 AND MORTALITY INFORMATION)	308
TABLE 71 MODELS 4A TO 4I COX PROPORTIONAL HAZARDS MODELS OF MORTALITY RISKS BY THE MORE DETAILED PMH MEASURES BASED (MIDUS 1995/96 AND MORTALITY INFORMATION)	310
TABLE 72 MODELS 5A TO 5E: COX PROPORTIONAL HAZARDS MODEL OF MORTALITY RISK BY THE DETAILED PMH STATUS WITH ADDITIONAL CONTROL VARIABLES (MIDUS 1995/96 AND MORTALITY INFORMATION)	311
TABLE 73 MODELS 6A TO 6D: COX PROPORTIONAL HAZARDS MODELS OF MORTALITY RISK BY THE MORE DETAILED PMH MEASURE WITH INTERACTION EFFECT FOR GENDER, EDUCATION, MOTHER’S EDUCATION, AND NMH (MIDUS 1995/96 AND MORTALITY RISK)	312

LIST OF FIGURES

FIGURE 1 GOOGLE NGRAM SEARCH FOR THE TERM "EUDAIMONIC".	6
FIGURE 2 CHART OF THE ANNUAL FREQUENCY OF PUBLICATIONS OF THE (S)WEMWBS	20
FIGURE 3 VISUALISATION OF A GOOGLE SCHOLAR WEB SEARCH FOR THE TERM EUDAIMONIA	24
FIGURE 4 HISTOGRAM AND OVERLAYED NORMAL DENSITY FUNCTION OF THE SWEMWBS FOR MEN AND WOMEN (UKHLS WAVE 1)	35
FIGURE 5 STACKED LIKERT-SCALE DISTRIBUTIONS OF SWEMWBS DOMAINS (UKHLS WAVE 1)	36
FIGURE 6 DIAGRAM OF COMMUNITY WELL-BEING (VANDERWEELE 2019)	46
FIGURE 7 DENSITY PLOTS OF THE FOUR MAIN MENTAL HEALTH VARIABLES (SWEMWBS, GHQ, LIFE SATISFACTION AND SF12-MCS (UKHLS WAVE 1))	115
FIGURE 8 PROFILE FACTOR LOADING PLOT OF THE SWEMWBS DOMAINS AND GHQ DOMAINS (UKHLS WAVE 1)	118
FIGURE 9 SCATTERPLOT OF THE SWEMWBS AND GHQ (BINNED) (UKHLS WAVE 1)	120
FIGURE 10 CUMULATIVE DISTRIBUTION FUNCTION AND DOMINANCE CHECKS OF LIFE SATISFACTION BY AGE GROUPS (UKHLS WAVE 1)	129
FIGURE 11 MULTIDIMENSIONAL SCALING (SPEARMAN) OF THE SUBDOMAINS OF THE SWEMWBS (UKHLS WAVE 1)	141
FIGURE 12 MULTIDIMENSIONAL SCALING (POLYCHORIC) OF THE SUBDOMAINS OF THE SWEMWBS (UKHLS WAVE 1)	141

FIGURE 13 TEST INFORMATION FUNCTION OF AN IRT MODEL OF THE SWEMWBS (UKHLS WAVE 1).....	144
FIGURE 14 ITEM-CHARACTERISTIC CURVES OF GRADED RESPONSE IRT MODELS OF THE SWEMWBS SUBSCALES (UKHLS WAVE 1)	146
FIGURE 15 CATEGORY CHARACTERISTIC CURVE AT THE HIGHEST LEVEL (FIFTH) OF A GRADED RESPONSE IRT MODEL OF THE SWEMWBS SUBSCALES (UKHLS WAVE 1)	147
FIGURE 16 HISTOGRAMS OF THE ALLOSTATIC LOAD SCALE AND 5 COMPONENTS (UKHLS WAVES 1 AND 2) N= 9,485.	151
FIGURE 17 GRAPHS OF SWEMWBS DOMAIN BY RELIGIOUS ATTENDANCE (UKHLS WAVE 1).	248
FIGURE 18 GRAPHS OF SWEMWBS DOMAINS BY RELIGIOUS IMPORTANCE (UKHLS WAVE 1).	248
FIGURE 19 BOX PLOTS OF THE PSYCHOLOGICAL OR MENTAL HEALTH VARIABLES: STANDARDISED (MIDUS 1995/96)	300
FIGURE 20 STACKED BAR CHARTS OF PMH CATEGORIES (LANGUISHING, MODERATE PMH, AND FLOURISHING) BY NMH (MIDUS 1995/96)	303
FIGURE 21 CUMULATIVE HAZARD ESTIMATES OF MORTALITY RISK BY PMH STATUS (NOT FLOURISHING VS FLOURISHING) (MIDUS 1995/96 AND MORTALITY INFORMATION)	306

FIGURE 22 KAPLAN-MEIER SURVIVAL ESTIMATES OF LONGEVITY BY PMH STATUS (FLOURISHING VS NOT FLOURISHING) (MIDUS 1995/96 AND MORTALITY INFORMATION)	306
FIGURE 23 KAPLAN-MEIER SURVIVAL ESTIMATES BY THE MORE DETAILED PMH STATUS (LANGUISHING, MODERATE PMH, FLOURISHING) (MIDUS 1995/96 AND MORTALITY INFORMATION)	309
FIGURE 24 SUPPLEMENTARY MATERIAL: LEVEL EFFECT OF THE PSYCHOLOGICAL OR MENTAL HEALTH VARIABLES AS BASED ON COX PROPORTIONAL HAZARDS SURVIVAL MODELS OF MORTALITY RISK (MIDUS 1995/96 AND MORTALITY INFORMATION) .	309
FIGURE 25 PREDICTED PROBABILITY OF MORTALITY RISK WITH THE INTERACTION EFFECT OF MODEL 6A: DETAILED PMH AND GENDER (MIDUS 1995/96 AND MORTALITY INFORMATION)	313
FIGURE 26 PREDICTED PROBABILITY OF MORTALITY RISK WITH THE INTERACTION EFFECT OF MODEL 6A: DETAILED PMH AND EDUCATION (MIDUS 1995/96 AND MORTALITY INFORMATION)	314

LIST OF ABBREVIATIONS AND ACRONYMS

Table 1 List of abbreviations and acronyms

Abbreviation/ Acronym	Meaning
<i>Concepts</i>	
AWB	Affective well-being
Big5	Five-factor model of personality
CWB	Cognitive well-being
DS	Domain satisfaction
EWB	Eudaimonic well-being
HWB	Hedonic well-being
LE	Life evaluation (Cantril ladder)
LS	Life satisfaction
NA	Negative affect
NMH	Negative mental health
PA	Positive affect
PMH	Positive mental health
PWB	Psychological well-being
QoL	Quality-of-Life (Quality of life)
SWB	Subjective well-being
<i>Methods</i>	
CFA	Confirmatory factor analysis
EFA	Exploratory factor analysis
DRM	Day reconstruction method
ESM	Experience sampling method
IRT	Item response theory
MDS	Multi-dimensional scaling
SEM	Structural equation modelling
SUR	Seemingly unrelated regressions
SQR	Simultaneous quantile regression
<i>Scales or Data</i>	
GHQ	General Health Questionnaire
MHC-SF	Mental Health Continuum-Short Form
MIDUS	Midlife in the United States (Survey) (1995-2020)
LSOA	Lower Layer Super Output Areas
PANAS	Positive and Negative Affect Scale
SF-12	Short Form Health Survey
SWEMBWS	Short Warwick-Edinburgh Mental Well-Being Scale (7 items)
UKHLS	UK Household Longitudinal Study (Understanding Society: 2009-2019)
WEMWBS	Warwick-Edinburgh Mental Well-Being Scale (14 items)

1 THESIS INTRODUCTION

1.1 A very brief history of happiness and concomitant concepts

This thesis concerns itself with the sociological relevance of the psychological concept of positive mental health and evaluates the usefulness of empirical measures of positive mental health.

Philosophical debates around the search for happiness and about the meaning of life are, of course, grounded in a long-standing history: Ancient Greek philosophers like Aristotle have differentiated between hedonia – broadly understood as enjoyment and pleasure - and eudaimonia - a life lived according to virtue (Ameriks and Clarke 2000). Religious traditions from around the world have been contemplating happiness for centuries and millennia: In the Catholic church, Saint Thomas Aquinas reiterated and emphasised the philosophical distinction between enjoyment and happiness but argued that true happiness (beatitude) is only found in the knowledge of God and thus reserved for the afterlife (Aquinas 2006).

Moving forward several centuries, John Stuart Mill's and Jeremy Bentham's modern utilitarianism calculated the sum of pleasures and pains and opened the quantification of happiness (Mill and Bentham 1987). Modern philosophical work has focused on the normative foundations of virtue and character for understanding a well-lived life (Comim 2005; Frey 2019). In recent decades, psychologists have emphasised the devastating effects of mental illnesses like depression on physical health, relationships, and work (Coryell et al. 1993; Rovner et al. 1991).

Economists like Amartya Sen made great contributions to their field by pinpointing capabilities and freedoms as important life conditions, against a singular focus on the gross domestic product, in welfare economics and further highlighted the need to study objective living conditions that are deemed essential to happiness and well-being (Sen 1993a). Nobel Laureate Angus Deaton (2018) demonstrates the devastating rise of

“deaths of despair” in the US among blue-collar and predominantly young White men. Similarly, Emile Durkheim (2005[1897]) reported differences in suicide rates between Catholic and Protestant regions and thereby established sociology as an empirical scientific discipline. Both scholars touch upon the theme of happiness and mental health and at least indirectly find that the loss of the belief in a better future can have detrimental consequences. Deaton’s colleague, Nobel Laureate Daniel Kahneman, shaped behavioural economics and developed tools such as the Day-Reconstruction-Method that are used to study hedonic and emotional well-being (Kahneman et al. 2004a). In 2019, New Zealand officially switched from a GDP growth-focused public budget to a well-being budget.¹

While one could spend a lifetime reading all these excellent and diverse scholarly materials, and while it would be beyond the realm of a sociological thesis to summarise all approaches in depth, it is notable that even up to this date, there has been no final agreement or definition of term happiness. It remains to be seen – and arguably unlikely - whether agreement on a complete definition of mental health and happiness will ever be found, at least not one that is valid in a cross-cultural sense for all people.

Nonetheless, the research field is certainly flourishing when evaluated in the sense of the number of publications and the size of funds granted by charities like the Templeton World Charity Foundation, which has recently invested 60 million US dollars in research on human flourishing in a single funding round² or the \$43.4 million Global Flourishing Study of 240,000 participants from 22 countries that was launched in

¹ <https://www.treasury.govt.nz/sites/default/files/2019-05/b19-wellbeing-budget.pdf>

² <https://www.templetonworldcharity.org/humanflourishing>

November 2021³, or the growth in the number of academic institutes like the Harvard Flourishing Program⁴ or Oxford Well-Being Center⁵.

1.2 The popularity of positive mental health and well-being

Before defining the scope and details of positive mental health for sociological applications in detail, one can simply start by noting how important PMH concepts and empirical measures have already become in policy and academia: it is hard to overstate that mental health has become a buzzword among policymakers in the last ten years. The UK has introduced several initiatives to study and improve the mental health of its citizens and hosted the first “Global Ministerial Mental Health Summit” in October 2018.⁶ Former Prime Minister Theresa May even appointed the world’s first Minister for Loneliness.⁷ In 2008, the former President of the French Republic, Nicolas Sarkozy, launched a high-profile commission on the “Measurement of Economic Performance and Social Progress”, which was chaired by world-renown academics like Josef Stiglitz, Amartya Sen and Jean-Paul Fitoussi.⁸ International institutions like the Organisation for Economic Co-operation and Development (OECD) are leading a movement to go beyond the GDP for measuring social progress, and their statistical teams work on multidimensional indicators of quality of life and especially mental health.⁹ In November 2018, the OECD hosted the 6th “World Forum on The Future of Well-

³ https://hfh.fas.harvard.edu/files/pik/files/globalflourishingstudy_report.pdf?mc_cid=a2603520c6&mc_eid=26968f0d0b

⁴ <https://hfh.fas.harvard.edu>

⁵ <https://wellbeing.hmc.ox.ac.uk/home#/>

⁶ <https://www.gov.uk/government/news/worlds-first-global-ministerial-mental-health-summit-to-be-held-in-london>

⁷ <https://www.gov.uk/government/news/pm-launches-governments-first-loneliness-strategy>

⁸ <https://ec.europa.eu/eurostat/documents/118025/118123/Fitoussi+Commission+report>

⁹ <http://www.oecdbetterlifeindex.org>

Being” in South Korea.¹⁰ This political relevance might stem from the extreme human suffering and high financial costs that are caused by mental illnesses: According to the World Health Organisation (WHO), depressive disorders alone are forecasted to be the “leading cause of disease burden globally”.¹¹

The growth rate of the popularity of PMH has been even more staggering. Today, the idea and notion of PMH have gained notable popularity in academia, especially in economics (Bruni 2010; Crespo and Mesurado 2015; Frey and Stutzer 2018b; Kahneman, Diener and Schwarz 1999; Kahneman et al. 2004b; Layard et al. 2014), education (Gillham et al. 2013; Rorty 2005; Wright and Pascoe 2015), health research (Binder and Buenstorf 2018; Diener et al. 2017; Hill, Edmonds and Hampson 2017; Maccagnan et al. 2019; Martín-María et al. 2017; Ryff 2014; Ryff 2017; Vázquez et al. 2009), psychology (Peterson and Seligman 2004; Seligman 2008a; Seligman 2011; Seligman 2012a; Seligman et al. 2011a; Seligman and Csikszentmihalyi 2014), sociology (Hooghe and Vanhoutte 2011; Vanhoutte 2015; Vanhoutte 2013; Vanhoutte 2014), medicine (e.g. the NHS’ mental health assessment tools¹²) and even in genetic research (Baselmans and Bartels 2018b; Baselmans et al. 2019). One of the defining dimensions of PMH is eudaimonia, and its exponential growth is visualised in Figure 1.

¹⁰ <https://www.oecd.org/statistics/6wf.htm>

¹¹ http://apps.who.int/gb/ebwha/pdf_files/eb130/b130_9-en.pdf

¹² <http://www.healthscotland.scot/health-topics/mental-health-and-wellbeing/wemwbs>

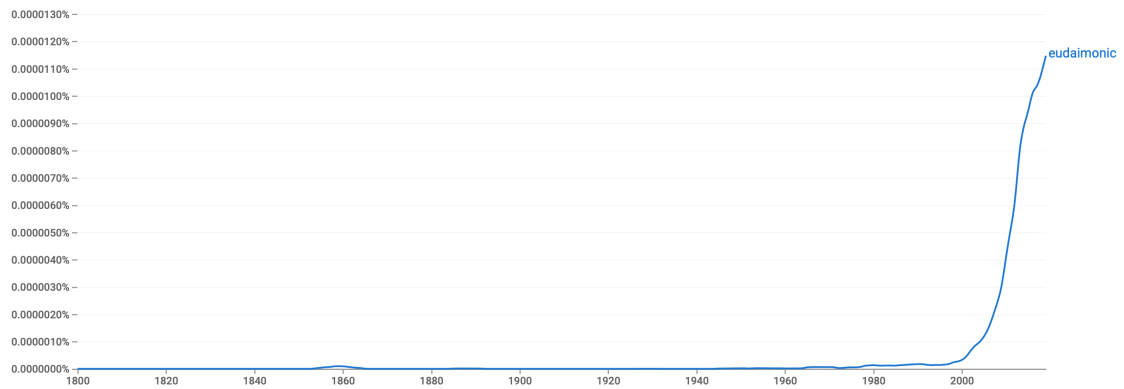


Figure 1 Google Ngram search for the term "eudaimonic".¹³

The *positive* turn has not just occurred with regard to mental health, but *positive* psychologists like Angela Duckworth have maybe had some of the longest-lasting and deepest impacts in the field of education. Her signature theory of grit as “perseverance and passion for long-term goals” or similar notions like a growth mindset are commonly taught in schools worldwide (Duckworth 2016). To some extent, one might say that the current culture has witnessed a shift in which optimism, potential and other psychological terms have become deeply ingrained, whereas before, hard work or discipline would have been attributed to family obligations, social expectations of one’s community or traditional values (Hunter 2008). While there has sometimes been a temptation to repackaging obvious words of wisdom or self-evident but shallow truths as new intellectual insights or to be overly enthusiastic when selling various types of self-help or parenting books that are partly grounded in this literature, positive psychology arose out of modern quantitative social sciences techniques such as experiments or large-scale survey data; maybe more so than most other major concepts that are in use in psychology or the social sciences.

¹³ Based on scanned texts and books by Google with data for the years 1800 to 2019. Data was retrieved on the 2nd October 2021.

Demographers and sociologists have seemingly been slower in adopting a PMH framework, possibly because sociologists especially seem to have a structural and professional penchant for the negative: Social inequality, racial discrimination, power dynamics, variability in mortality rates and so on. Although this thesis can only make a limited contribution, it is motivated to empirically establish which types of knowledge and insights sociology can gain by a focus on positive concepts and conditions.

Sociologists certainly have much to offer to the field of PMH, for instance, by exploring the extent to which different social classes understand and relate to concepts of self-realisation or self-actualisation.

Despite not having shifted to positive sociology overall, individual concepts of PMH, such as the one of autonomy, are still occasionally used, for instance, in demography under the notion of The Second Demographic Transition that places emphasis on the decline of prescriptive social norms and the importance of individual self-realisation (Lesthaeghe 2014). Life satisfaction and subjective well-being scales are also well-established in sociology, but they are often treated as exchangeable proxies of mental health in a broad sense rather than being employed based on a careful depiction of psychological and sociological processes. Even though one should not expect or even hope that sociologists cater for every nuance of every psychological trend, this thesis proposes that it is at least worthwhile to investigate whether the PMH framework can be relevant for demographic and sociological analysis.

Given that many of the most prominent social surveys like the Canadian General Social Survey, the English Longitudinal Study of Ageing, the European Social Survey, EU-

SILC,¹⁴ the Health Survey for England, Understanding Society, MIDUS, the National Health Interview Survey in the USA,¹⁵ the Survey of Health, Ageing and Retirement in Europe (SHARE) and the Scottish Health Survey have already invested in PMH variables, the opportunity cost of studying these indicators is minimal, and the findings will be relevant to the substantial number of researchers that are prone to utilise these kinds of data sets. Furthermore, the literature on happiness and well-being, which includes the field of positive psychology, is very broad, and a sociological perspective might hence help to clarify or at least test some of the open questions.

One major problem in the field of happiness research and positive mental health has been the dominance of cross-sectional analyses. PMH will be especially relevant for sociological analyses if it can be used for explanatory mechanisms, for instance, social status reproduction over time or relative advantage accumulation over the life course. In the UK, the Warwick-Edinburgh Mental Well-Being Scale, a highly acclaimed PMH indicator, has been available in Understanding Society since the first wave more than ten years ago, but it is only now that truly longitudinal analyses have become possible with the release of the fourth measurement occasion in wave ten.

1.3 Difficulties in defining happiness

The introductory paragraphs have already raised several linguistic and conceptual issues. Are happiness and positive mental health the same thing? Even when only considering the most recent literature, one will witness apparently indiscriminate uses of terms like happiness, mental health, mental illness, positive mental health, negative

¹⁴ Eudaimonia scale: “To what extent do you feel the things in your life are worthwhile? (scored from 0 “not at all worthwhile” to 10 “completely worthwhile”)

¹⁵ “My life has a clear sense of purpose”, “most days I feel a sense of accomplishment”, “in most ways my life is close to ideal”, and “so far I have gotten the important things in life that I want” (scored from 1 “strongly disagree” to 5 “strongly agree”).

mental health, well-being, emotional well-being, subjective well-being, social well-being, life satisfaction, quality-of-life, psychological functioning, and many other derivations as well as an abundance of corresponding psychological scales. One obvious reason for this multiplicity of terms is that academic disciplines each have valid but differential interests in this field and that they utilise different linguistic and scholarly terms for what one might tentatively summarise as *well-being* in the broadest sense.

A lack of a clear definition poses immediate challenges for a research project in that one might not be sure if the topic that one is studying and writing about is properly understood and specified. This could be problematic in the sense there are many high-quality published papers on “mental health” that have used scales of depression like the GHQ-12 (see, for instance, Hauck and Rice 2004; Pevalin and Ermisch 2004; Thomas, Benzeval and Stansfeld 2005) - which is a measure of psychopathology and mental illness. Similarly, to build incremental knowledge, one would assume that it is important to know how subdimensions of a construct relate to the overall construct or theme and how the subdimensions themselves relate to each other: As Aristotle and Aquinas pinpointed, hedonia, which nowadays might be operated as Diener’s subjective well-being scale (SWB) or positive affect (PANAS), might be negatively correlated with eudaimonic measures. If one simply used terms interchangeably or without much clarity, it would be more difficult to build accumulative knowledge over time.

There have been so many papers on the big theme of happiness and well-being that it might now be desirable to move forward with care and specificity. To draw a comparison, sociologists typically stress that social class, social status, income, and education are separate (but correlated) constructs (Goldthorpe 2004). Nonetheless, this is not to say that when the focus is just to control for socio-economic factors in general or, by comparison, just to control for happiness or well-being in a broad sense, for

instance in a regression model, it might be appropriate and parsimonious to pick only one measure as a proxy for the overall construct. In many real-world research situations, datasets might only offer one or two mental illness variables in any case.

While some of these conceptual and empirical challenges have motivated the thesis, the focus is placed on the notion of *positive* mental health that many psychologists understand to be the state-of-the-art of the research field and for which many new empirical scales have recently been collected in large-scale social surveys.

1.4 A positive revolution? Defining Positive Mental Health

From the vantage point of many academics, the entire field of psychology was revolutionized in 1998 when the President of the American Psychological Association, Martin Seligman, called a “new science of human strengths” into being.¹⁶ In his Presidential Address, Professor Seligman argued that the field of psychology has been overly focused on studying negative psychological characteristics and that the time has come to shift towards studying the factors and mechanisms that make it possible for human beings to flourish. Seligman proposed that it is not sufficient to cure mental illnesses but that psychology should foster flourishing in all its dimensions.

PMH is typically defined as consisting of the **tripartite dimensions** of hedonia (including affective, emotional and cognitive psychological states or life evaluations), psychological (eudaimonic), and social well-being (see Huta 2015; Huta 2016a; Huta 2016b; Huta 2018a; Huta and Waterman 2014; Keyes 2002; Keyes, Shmotkin and Ryff 2002; Keyes 2005; Keyes 2007; Keyes 2012; Lamers 2012; Ryff 2014; Ryff 2018; Vittersø 2016). What hedonia, eudaimonia and social well-being have in common is

¹⁶ <https://www.apa.org/about/governance/president/address>

that they have been consistently named to tap into the positive dimension of mental health. The main idea behind combining these three dimensions is to capture the full range of mental *well-being* (as opposed to negative mental health) under one theoretical concept. While there is a rationale for analysing each dimension separately, the promise of this higher-level theory is greater explanatory power than what the lower-level dimensions can offer. For instance, it appears reasonable to assume that not every person will score equally highly on all dimensions of PMH and that some dimensions are unrelated or even competing against each other, hence necessitating the inclusion of multiple PMH dimensions. Nonetheless, the PMH approach does not presuppose fixed relationships between the stated tripartite dimensions and allows for a large amount of analytical flexibility. Alternatively, a more succinct definition of PMH that is used by the creators of the WEMWBS is *feeling good and functioning well* (Stewart-Brown 2015a), which demonstrates the union of subjective states of satisfaction and happiness with the combined presence of positive psychological states like self-realisation.

One could argue that a more precise theoretical specification would be preferable, but given the initial stages of this framework, it might be unrealistic or even disadvantageous to bind oneself to more exact assumptions. Indeed, the concept of NMH or simply mental illness has also been vaguely defined for many decades and is subject to frequent revisions too, as seen in the evolution of the Diagnostic and Statistical Manual of Mental Disorders (DSM) (Schnittker 2017). Whereas the core concepts of NMH are anxiety disorders and depressive symptomology, the PMH approach encapsulates cognitive-, emotional-, and eudaimonic mental health. Whether or not this differentiation between NMH and PMH holds up to scrutiny in empirical reality will be tested in this thesis.

Similarly, a key tenet of the PMH approach that most positive psychologists seem to agree upon is that PMH is not merely mirroring the absence of any mental illnesses but that it entails the presence, at elevated levels, of added forms of well-being. This is referred to by Keyes (2002) as the **dual continua** model of mental health: The first dimension of mental illness connotes the NMH continuum and the second one of well-being connotes the PMH one. This differentiation logically implies that it is possible to experience four distinct states of overall mental health, as shown in the list below:

1. high NMH and high PMH (*struggling*) → off-diagonal
2. high NMH and low PMH (*floundering*) → the least desirable state
3. low NMH and high PMH (*flourishing*) → the most desirable state
4. low NMH and low PMH (*languishing*) → off-diagonal

Under the dual continua model, people are considered to be in a state of flourishing when they are simultaneously free from mental illnesses such as depression and also report high levels of well-being (e.g., mastery, purpose, connectedness to others). There is extensive literature on the ambitions, development and history of PMH and its constituent dimensions (see Land, Michalos and Sirgy 2011; Sirgy 2012), the most relevant aspects of which are elaborated upon in this section. The following second chapter tests the empirical reality, relevance, and appropriateness of the dual continua model, especially the off-diagonal positions of languishing and struggling that the dual continua model highlights, via nationally representative household data of the United Kingdom.

Marie Jahoda (1958) first outlined the importance of understanding mental health as a multidimensional construct, consisting of six positive dimensions that became known as “ideal mental health”. This conception of mental health is still strongly reflected in the recent psychological theories on self-determination and flourishing, which are explored

later in this chapter. In 2003, George Vaillant, a psychiatrist, also provided a list of six current approaches towards mental health that largely resemble but modernise the original theorisation. Jahoda's and Vaillant's concepts of mental health are listed in Table 2.

Table 2 Foundational conceptions of positive mental health

Jahoda 1958

Positive attitudes towards the self
 Self-actualisation of one's potential
 Resistance to stress
 Personal autonomy
 Accurate perception of reality
 Environmental mastery

Ryff 1989

Self-acceptance
 Mastery of environment
 Good relations with others
 Personal development
 Autonomy
 Purpose of life

Keyes 1998

Social contribution
 Social inclusion
 Social actualisation
 Social recognition
 Social coherence

Vaillant 2003

Above normal
 Positive psychology
 Maturity
 Social-emotional intelligence
 Subjective well-being
 Resilience

Both scholars express that mental health is not just concerned with psychopathology and negative mental states, but that PMH includes the **active presence** of positive factors such as relationships with other people, well-being, resilience, and **above-average** psychological functioning. The notion of “resilience” could certainly be one that has an intuitive appeal and demonstrates that high PMH (i.e., being resilient) can buffer the detrimental effects of NMH. For instance, resilient people do not give up in the face of difficulty, find creative solutions to unknown problems and have the strength to resist in the face of the temptation of challenging environments (Sweetman et al. 2011). Another way in which resilience is a core part of the PMH approach is that it links with the environmental mastery component. As a non-negligible side implication of the focus on the positive, Jahoda and Vaillant, among many others, extended and opened up the relevance of the term mental health away from clinical sub-populations to the general population. Sociologists might find greater appeal in positive mental health as a tool to study individuals’ state of mind and being than in analysing clinical cut-off points of symptomatic scales.

However, despite the focus on the positive, PMH is not inherently in conflict with the analysis of actual mental illnesses (NMH). It would, for instance, be worthwhile to investigate whether clinically depressed people benefit especially strongly from PMH (interventions) or whether PMH protects from the onset of mental illnesses over time (buffering). There is also a biological dimension to resilience and positive mental health, namely that it is associated with better stress response and even faster recovery rates after surgery (Beasley, Thompson and Davidson 2003; Ozbay et al. 2007), implying that PMH dimensions are not merely subjective feelings but that they have objective consequences.

From an applied perspective, the distinct dimensions of PMH that differentiate it from NMH or single-item well-being measures are summarised in Table 2.

These two aspects are the ones of **psychological well-being** (Ryff 1989) and **social well-being** (Keyes, 2002). Cognitive, emotional, or hedonic mental health is the remaining third aspect of the tripartite definition of PMH and represents by far the most used happiness measures such as the one of life-satisfaction. The novel attributes of PMH, however, lie in the psychological and social dimensions. The differentiation between hedonia and eudaimonia is subject to intense and ongoing debate and will be touched upon later in this chapter.

One of the key strategies and contributions of this thesis is the fact that it **jointly accounts for and controls** negative *and* positive mental health (at the same time). The vast majority of demographic, sociological, and epidemiological studies relating to mental health only focus on either NMH or PMH, but it is rare to see both dimensions included together in the same regression models and theoretical frameworks. Indeed, even when a study is interested in both NMH and PMH, this commonly means that separate sets of regressions with each as separate outcome (or predictor) variables are conducted (Aksoy et al. 2021).

The joint accounting of both the negative and positive mental health concepts is necessary because they are inherently correlated and empirically often “tap into” an underlying latent mental health field. Across or even within many publications, differing indicators like the GHQ, SWB or life satisfaction are basically used interchangeably or as proxies of mental health in a general sense. This approach is justified when the focus lies on other predictor variables or when mental health is a simple control variable in a large regression model, but it is severely limited when one intends to gain detailed, testable, and comparable findings on the nature of positive

mental health (Lee, Kubzansky and VanderWeele 2021). Therefore, it is necessary to control for NMH to isolate the uniquely positive aspect of PMH. If one only included a PMH scale, one would partly capture the negative mental health dimension as well. The joint accounting requirement is also important when looking at the sub-dimensions of the scales, for instance, when separating the effects of optimism from social connectedness. Furthermore, the joint account approach will make it possible to consider the interaction effects between NMH and PMH and to speak to philosophical debates about meaning in life (eudaimonia) when one is struggling with illness or mental illness like depression (NMH).

More details will be provided later, but the comparison of multiple mental health or well-being scales causes several complexities. These ordinal scales are common and have varying levels of cardinality and scoring systems – some starting at zero, some at one, some offering three broad categories, while others have ten or more choices (Tay, Jebb and Scotney). Statistically speaking, it is important to standardise these scales for comparability within a study, but also for the comparability of the size of the associations with other studies.

The theoretical appeal of PMH has been matched by the invention of many new mental health scales, as presented in Table 3. While Ed Diener's (1984) subjective well-being scale targeted the emotional and cognitive dimension of mental health, more recent scales have shifted towards broader PMH, especially the Harvard Flourishing Measure and the WEMWBS. There has also been a renewed interest in eudaimonic measures that were initially highlighted by Carol Ryff (1989) under the concept of psychological well-being: These include Ed Diener's (2010), Felicia Huppert's (2012), Tyler Vanderweele's (2016) and Mohsen Joshanloo's (2018) dedicated flourishing scales that are predominantly of a eudaimonic nature.

Table 3 Modern empirical measures relating to positive mental health

Diener, E	1984	Subjective Well-Being
Ryff, C	1989	Psychological Well-Being
Rand Corp.	1992	Short-Form Health Survey (SF-12)
Keyes, C	2002	Social Well-Being
Hyde, M.	2003	CASP Scale
Keyes, C	2005	Mental Health Continuum Short Form (MHC-SF)
Tennant, R	2007	Warwick-Edinburgh Mental Well-Being Scale (WEMWBS)
Diener, E	2010	Flourishing Scale
Seligman, M	2011	PERMA-Profiler
Huppert, F	2012	Flourishing Scale (alternative)
Su, R	2014	Comprehensive Inventory of Thriving (CIT)
VanderWeele, T	2017	(Harvard) Flourishing Index
Moshanloo, J	2018	Eudaimonic Well-Being Scale

CASP: Control, Autonomy, Self-realisation, and Pleasure.

PERMA: Positive and negative emotions, engagement, relationships, meaning, accomplishments.

Comparing the availability of the various mental health scales at an OECD-wide level, it appears that SWB and life-satisfaction data is available in almost every country, while survey data on eudaimonia is more limited (often limited to only a single question or items that are measured at irregular time intervals) – albeit with an improving data outlook (OECD 2013; OECD 2017; OECD 2018).

While this list of items demonstrates an impressive amount of research activity, it is also evidence of a lack of a clearly defined set of standards. Even though one can identify common themes among these items, there are also huge discrepancies between them. Does a PMH scale need to entail a measure of meaning in life? Does a PMH scale need to entail social well-being? If so, how strongly should it be weighted? For instance, Vanderweele’s Harvard Flourishing Index has seen a steep rise in use and includes and equally weights a large array of sub-dimensions that relate to well-being, namely:

1. happiness: *“Overall, how satisfied are you with life as a whole these days?”* and life satisfaction *“In general, how happy or unhappy do you usually feel?”*

2. mental health *“In general, how would you rate your physical health?”* and physical health *“How would you rate your overall mental health?”*
3. meaning *“Overall, to what extent do you feel the things you do in your life are worthwhile?”* and purpose *“I understand my purpose in life.”*
4. character *“I always act to promote good in all circumstances, even in difficult and challenging situations”* and virtue *“I am always able to give up some happiness now for greater happiness later.”*
5. close social relationships *“I am content with my friendships and relationships”,* and *“My relationships are as satisfying as I would want them to be.”*
6. financial *“How often do you worry about being able to meet normal monthly living expenses?”* and material stability *“How often do you worry about safety, food, or housing?”*

For each of the six domains, the two items are scored from 0 (worst possible) to 10 (best possible), resulting in an overall range of the Flourishing Index from 0 to 120.

Typically, the psychometric properties of such scales are sound; for this scale, the alpha score is around .89 (VanderWeele 2017). The scale demonstrates that PMH and flourishing or well-being in the broadest sense are inherently multidimensional constructs. Interestingly, depending on the research interest, researchers have the option to include the financial and material well-being dimensions for a “secure flourishing measure” or exclude it if it is not directly relevant¹⁷. Another interesting note of the scale is that it can be condensed to just six instead of twelve items when needed in short surveys, but for robust modelling, it is desirable to have two items for each sub-scale¹⁸.

¹⁷ <https://hfh.fas.harvard.edu/measuring-flourishing>

¹⁸ This statement is based on personal exchanges with members of the Human Flourishing Program

A sceptical reader may wonder whether the second item for close social relationships (“*my relationships are as satisfying as I would want them to be*”) is well-worded as it postulates an inherent ceiling effect that is a slight contradiction to the intuition of PMH to measure the full range of top-level functioning as well as in assuming some sense of stagnation or low expectations towards social relationships when there might always be room for improvement, but this potential shortcoming has often been made, even in well-established scales like domain life satisfaction.

It is further noteworthy that most PMH scales tend to include aspects of hedonic mental health and subjective well-being even though the notion of PMH is typically presented as an extension and improvement over these separate dimensions: *Most PMH scales are not pure PMH scales but include all aspects of mental health*. It might be self-evident in any case, but sociologists who are interested in psychological concepts and scales would be well-advised to look into the details of the measures and evaluate the exact wording of the items that constitute it rather than taking its actual content for granted by the title of the scale. Out of the presented scales, only Ryff’s psychological functioning scale could be seen as purely eudaimonic and will be discussed in more detail shortly.

Even though the increasing availability of many competing mental health scales allows for many social scientific explorations, one might say that the field has now reached a point at which the marginal rate of return to new scales could be limited. As listed above, a multitude of scales exists for all aspects of mental health, both negative and positive, and applied researchers often have the choice of many alternatives. Three of the empirical chapters of this thesis focus on the SWEMWBS that is collected in the world’s largest household panel survey, Understanding Society (The UK Household Longitudinal Survey), which includes four mental health scales in total as well as rotating modules on psychological traits and domain-specific mental health. Hence, a

pressing and, indeed, difficult question lies in the validation and differentiation of the many available options for mental health researchers. A reason why this has not yet happened to a substantial extent for UK data may be the fact that rich longitudinal PMH data only became available in 2017 with the release of wave seven (i.e., the third measurement point of the SWEMWBS) and in 2020 with the fourth wave of the SWEMWBS. There are now around 100 publications annually that are based on the WEMWBS or SWEMWBS across surveys with a strongly increasing positive trend (Figure 2), with most of those studies in public health and epidemiology.

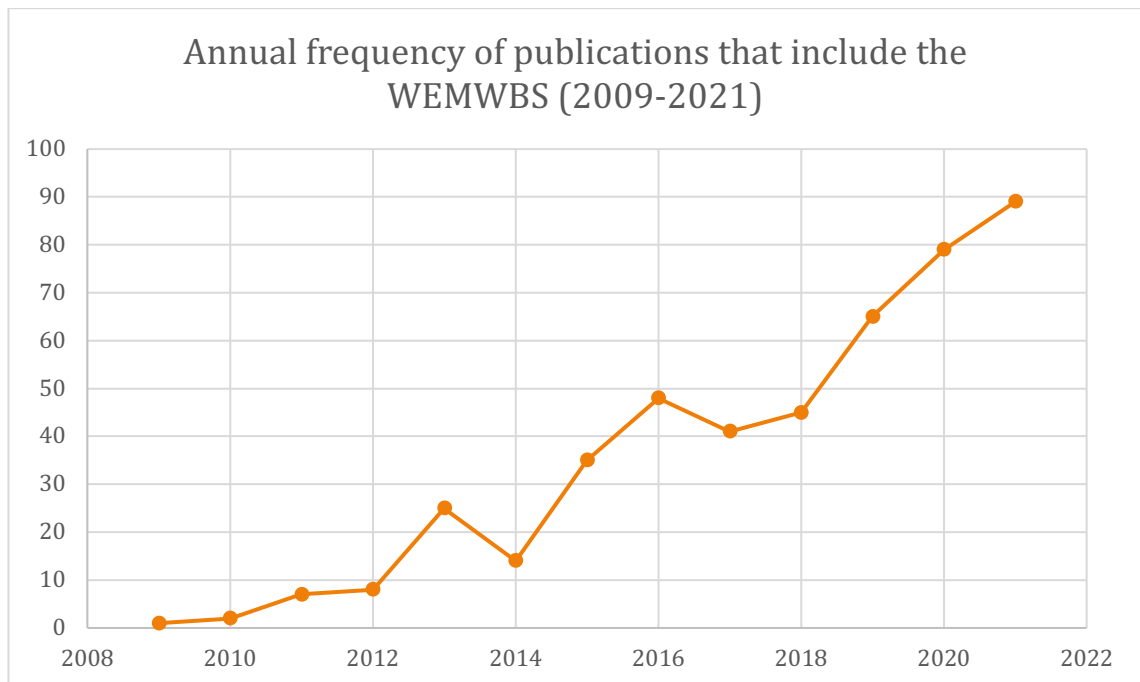


Figure 2 Chart of the annual frequency of publications of the (S)WEMWBS

The following sections go into greater depth about the psychological elements of PMH, starting with an overview of the competing notions of hedonic and eudaimonic mental health. While this distinction has been very prominent in the philosophical discussions of mental health and in the justifications for approaching mental health from different angles, it is not necessarily presupposed that those distinctions are absolutely reliable.

Increasingly, scholars have been calling for theoretical models of well-being that have a more formal specification and that integrate the following distinctions in a more closely defined manner (Alexandrova and Fabian, 2022). One large recent research project that studied the distinctiveness of hedonia and eudaimonia across a broad set of 31 different items and several studies seems to suggest that eudaimonic and hedonic items differ significantly in terms of “global or situational orientations/motives, global behaviours, and situational experiences for the momentary time span”, but less for “global experiences, or situational experiences for a one-week time span” such as the ones that part of the mental health scales in large social surveys (Huta, 2020).

1.4.1 Hedonic happiness and mental health

Within positive psychology and the PMH approach, hedonia is a term that refers to that area of happiness that relates to the maximisation of pleasures and enjoyment on the one hand, and to the minimisation of pain on the other hand. Hedonia consists of two subdomains, namely, an affective and a cognitive dimension (Diener 1984). The affective components can be subdivided into positive and negative affect, while the cognitive components include global or domain-specific dimensions of life satisfaction. Hedonic happiness is outcome-oriented and indicates whether an individual is feeling certain positive emotions (Ryff, Boylan and Kirsch 2021). The reference period when asking survey questions on hedonic happiness is usually the present moment or the last few days, presumably because there would otherwise be a large amount of recall bias as people struggle to remember their exact emotions over a large time horizon. Hedonia can also be effectively measured via Day-Reconstruction-Methods (DRM) in which respondents continuously report their feelings in 10-minute intervals, a method which is often used in time-use surveys (Diener and Tay 2014; Dockray et al. 2010).

Hedonia has, by far, been the dominant philosophical and historical conception of well-being and happiness measurement. Prominent scholars include Jeremy Bentham and his calculus of welfare arithmetics which state that good governance maximises population-average levels of happiness (Mill and Bentham 1987). Life satisfaction and subjective well-being also mostly fall into the hedonic form of well-being, although they might also integrate other relevant aspects of mental health. The purely subjective nature of hedonia could be one of its attractive features: When asked about their emotional states, survey respondents are completely free to take into consideration any factor that they wish. This is to say that the researcher does not impose a certain benchmark or comparison point. Equally, however, this problematises between-people comparisons, and it may even be the case that people's reporting functions of their emotional states change as they become older. Hedonia carries no value-judgement on the source and appropriateness of one's happiness, so it is hypothetically possible that people find happiness in criminal, detrimental, and superficial activities such as drug consumption.

The so-called *hedonic treadmill* (or hedonic adaptation) is one of the especially useful theoretical insights that have been generated from hedonic well-being indicators. Under this notion, studies have found that many people return to a set-level of happiness after short-lived fluctuations that were caused by major life events and changes (Kahneman, Diener and Schwarz 1999). From a life course perspective, this suggests that well-being indicators would be of little usefulness, although the finding that happiness is rather stable is certainly very significant in itself. A related phenomenon is the *Easterlin paradox* that reported that happiness does not increase as countries and people become richer, but that, at the same time, richer people and richer nations are happier than poorer ones (Easterlin et al. 2010). Easterlin and others suggest that comparisons of the relative position on the income ladder that do not change when everyone's incomes rise

are one of the main factors for solving this puzzle. Both examples show how the field of happiness research was able to produce counter-intuitive findings that generated a huge amount of research outputs.

Another interesting application of hedonic indicators is seen in Nobel Prize-winning economist Daniel Kahneman's work on cognitive biases. Kahneman classifies two distinct patterns of brain functioning (Kahneman 2011), System 1 and System 2. While System 1 is the fast and intuitive thinking process, System 2 represents the slow and rational one. According to Kahneman, System 1 is the dominant thought process in most situations, but it is prone to fall victim to anchoring, availability, substitution, loss aversion, framing and sunk-cost heuristics. To some extent, System 1 and System 2 resemble the differentiation between hedonia (immediate happiness) and eudaimonia (long-term, deliberative happiness).

1.4.2 Eudaimonic happiness and mental health

PMH would argue that eudaimonia is the most innovative and defining aspect of the PMH school of thought (Ryff, Boylan and Kirsch). Originally coined by Aristotle, eudaimonia expresses a state of "being with the Gods" that can only be achieved at the end of a virtuous life (Heintzelman 2018).¹⁹

Figure 3 is a visualisation of Google Scholar search results for terms starting with "eudaimon*" (e.g. eudaimonia or eudaimonic). The network map illustrates how eudaimonia is often discussed as a psychological concept of human happiness and health, invented by Aristotle, that is contrasted with hedonic measure.

¹⁹ Historically speaking, Aristotle did not formally invent the term eudaimonia.

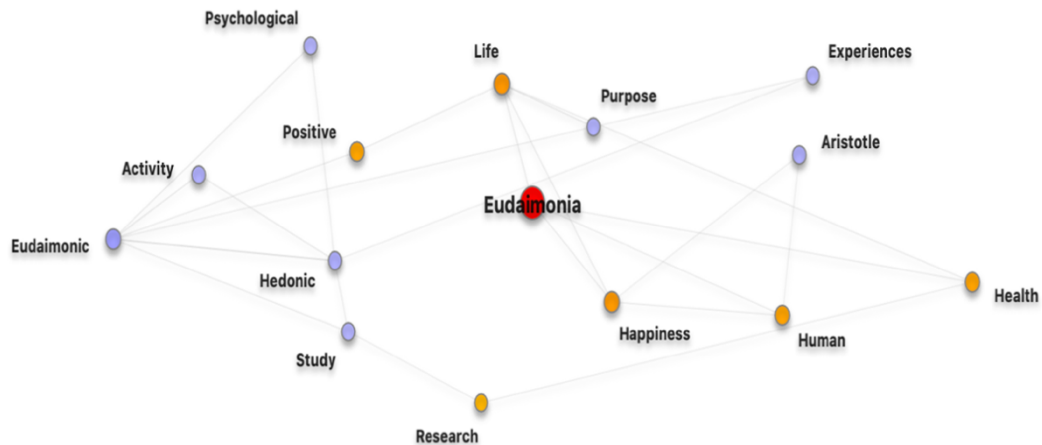


Figure 3 Visualisation of a Google Scholar web search for the term eudaimonia²⁰

In contrast to hedonic pleasures, eudaimonia is a term that is used to describe a life of great meaning and purpose, a virtuous life, and, in its original meaning, a life that is lived with intimate knowledge of the Gods. The original Greek meaning of eudaimonia is “favoured by divinity, having good fortune, a good allotment from the Gods”.²¹ What might be important to note is that eudaimonia, in this original sense, was not a subjective feeling but that a eudaimonic life would correspond to objectively desirable circumstances. These opposing philosophical foci on the qualities of happiness hence differentiate the eudaimonic and hedonic approaches.

According to the ancient philosophers, it was not possible to achieve eudaimonia on a consistent level but only momentarily. Reassuringly to academics, Aristotle thought that intellectual life is the one that most closely resembles a life filled with eudaimonia. Interestingly, the ancient origins of the term eudaimonia comprise a demographic life

²⁰ Data collected on 2.110.2021. Visualisation created with DEVONagent Pro.
<https://www.devontechnologies.com/apps/devonagent>

²¹ *Etymology*: *Eu*= good, well + *Daimōn*= a divinity, from root *dai*- =distribute, allot

course perspective (choices and conditions that accumulate to an end state at the end of life) and highlight that eudaimonia is not a narrow psychological state but one that is multidimensional:

“The contemplative life (theōretikē) is superior to ordinary human existence, provided that it has a complete life-span. No aspect of eudaimonia can be incomplete. But such a life would be better than what is humanly possible. For no human can live like that, unless something that is divine survives within him.”

– Aristotle, Nicomachean Ethics, x. 7.7-9. Translated by Professor Mary Lefkowitz.

In a noteworthy shift over the last two to three decades, psychologists have revisited early scholars like Jahoda and created survey items and psychological scales that interpret eudaimonia as a form of **psychological functioning** (Ryff and Singer 1998; Ryff and Keyes 1995). Incorporating psychological theories on self-actualisation and Maslow’s hierarchy of needs (Maslow and Lewis 1987), one key assumption of psychological eudaimonia is a) that it represents a “high” form of well-being and b) that it is a form of resilience (Begley 2013; Fredrickson 1998; Fredrickson 2013; Nickerson 2018). Given the large scope of these topics, they will only be addressed in the relevant empirical chapters.

The modern understanding of eudaimonia comes from a psychological functioning perspective of maximising one’s potential, using one’s strengths to the best abilities and living a fulfilled and meaningful life. Contrasted with hedonia, eudaimonia is concerned with the dignity, the content, and the virtues of human activities and life choices.

As briefly mentioned before, Ryff (1989) established a six-factor model of psychological well-being that could be described as the defining modern empirical conceptualisation of eudaimonia and crucial for PMH. The six dimensions are²²:

1. Self-acceptance (*Possesses a positive attitude toward the self; acknowledges and accepts multiple aspects of self, including good and bad qualities; feels positive about past life*)
2. Positive relations with others (*Has warm, satisfying, trusting relationships with others; is concerned about the welfare of other others; capable of strong empathy, affection, and intimacy; understands give and take of human relationships*)
3. Autonomy (*Is self-determining and independent; able to resist social pressures to think and act in certain ways; regulates social pressures to think and act in certain ways; regulates behaviour from within; evaluates self by personal standards*)
4. Environmental mastery (*Has a sense of mastery and competence in managing the environment; controls complex array of external activities; makes effective use of surrounding opportunities; able to choose or create contexts suitable to personal needs and values*)
5. Purpose in life (*Has goals in life and a sense of directedness; feels there is meaning to present and past life; holds beliefs that give life purpose; has aims and objectives for living*)
6. Personal growth (*Has a feeling of continued development; sees self as growing and expanding; is open to new experiences; has sense of realizing*)

²² The text in parentheses illustrates high scores on the dimensions; taken from Lee et al (2021)

his or her potential; sees improvement in self and behaviour over time; is changing in ways that reflect more self-knowledge and effectiveness)

The extent to which the ancient philosophical foundation of eudaimonia has survived in these six concepts is debatable, but Ryff's psychological well-being is one of the most widely accepted ones in the relevant literature.

Many prominent economists have also indirectly paid attention to eudaimonia, especially from the lens of welfare economics: Acclaimed scholar Amartya Sen developed the *capability approach*, which focuses on the capabilities of individuals to achieve a good life (Sen 1993b). At the time of publication, this was a landslide shift in economics - away from purely utilitarian principles. The capability approach also largely exceeds simple hedonic well-being measures because it places value on the objective reality of living conditions and as it makes normative judgements about social justice. Finally, the capability approach has been used in the development of the United Nations Human Development Index (HDI) and is one of the most frequently made justifications for using alternative measures to the GDP. Even though the economist's stance on eudaimonia has been very fruitful, this thesis will concentrate on the sociological usefulness of the philosophical-psychological side of PMH.

1.4.3 Three modes of flourishing

Combining hedonic and eudaimonic dimensions, the modern term psychological use of the term flourishing builds on **self-actualisation** theory (Maslow 1943). It was first conceptualised for social psychological and sociological use as the dual continua model of mental health (Keyes 2002), secondly as the spectrum of mental health model (Huppert, Baylis and Keverne 2005), and thirdly as the PERMA model (Seligman 2012b).

Compared to Ryff's original conceptualisation of psychological well-being in its eudaimonic form, Keyes also includes a social well-being dimension which is subdivided into the five dimensions of social coherence, social actualisation, social integration, social contribution and social acceptance. The Mental Health Continuum Short Form measure was invented by Corey Keyes to measure the complete range of PMH and captures:

1. Subjective well-being (based on life satisfaction and positive and negative affect questions)
2. Psychological well-being (Ryff)
3. Social well-being (Keyes)

According to Keyes, who studied the well-being of middle-aged Americans with MIDUS data that includes the MHC-SF, only 20 per cent of Americans are flourishing at any one moment in time, 60 per cent of people are neither languishing nor flourishing, and 12 per cent of people are languishing. To some extent, the three different levels of well-being are not competing as rivals on the same level, but one might also think of subjective well-being or affective pleasure as operating on the cognitive level, psychological well-being as operating on the level of values and orientations, and social well-being as operating on a macro level (see Lomas et al., 2022 for a recent overview of the field).

The second primary theoretical account of flourishing is Felicia Huppert's (2009) **spectrum of mental health**, which includes the three core components of

1. Positive emotions
2. Engagement
3. Meaning

as well as six extra components of optimism, resilience, vitality, positive relations with others, competence, and emotional stability. Huppert's conceptualisation has been used for studying differences in flourishing at the population level, most notably in two waves of the European Social Survey (Harrison et al. 2016; Huppert and So 2013). Interestingly, the conceptualisation was designed by taking the opposite of mental illness symptoms from the DSM (Huppert and So 2013). One might criticise that PMH is not simply the mirror image of NMH according to the dual continua model (i.e., not one spectrum), but the ESS data have been well-received with numerous high-quality studies. Findings demonstrate significant differences between happiness and life satisfaction on the one hand and the ten PMH items on the other (Ruggeri et al. 2020). Similarly, objective evidence for the validity of the multidimensional approach to PMH and for the need to differentiate between the sub-dimensions is seen in the fact that average countries' scores in the sub-dimensions are not uniformly ranked.

The third model of flourishing is Seligman's (2011b) PERMA model consisting of

1. Positive emotions
2. Engagement
3. Relationships
4. Meaning
5. Accomplishments

PERMA's unique aspect is the incorporation of accomplishments, a factor which is likely to play a significant role when people assess their levels of well-being.

Nonetheless, since the other scales do not include satisfaction with accomplishments, it will not be explored in this thesis.

On this note, it is important to point out that measurement scales of latent constructs such as mental health do not necessarily have to combine every single element that is potentially relevant. The priority should be a sound theoretical foundation and empirical validation of the discriminative power of the scale. It is certainly possible to investigate whether accomplishments predict differences in PMH, but there is not necessarily a need to conjoin them as this could dilute the PMH indicator. For comparison, indicators of social class and social status, such as the National Statistics Socio-economic classification (NS-SEC), do not integrate measures of cultural consumption even though these two aspects are highly correlated.

These three models of flourishing share a standard set of attributes (meaning, positive relationships with others, and engagement), and there is a significant conceptual overlap between them. Keyes's framework is arguably the most comprehensive one, as it integrates all dimensions into a single scale, while Seligman's PERMA model gives equal importance to each dimension.

The following two sections expand upon the two most relevant psychological theories (self-determination theory and positive emotions) that have played a part in the development of the PMH framework. The contribution of these two sets of theories is important because they explain the unique features of PMH that are not directly constituent of NMH. Explaining intrinsic motivation and self-actualisation of individual actors at the micro-level can be helpful in linking macro-micro-macro transitions (Coleman 1986). In essence, social conditions (macro-level) such as neighbourhood deprivation may affect individual psychological states (micro-level), which in turn explains varying levels of PMH between neighbourhoods or socio-economic groups (macro-level). Although differences in mental health between population groups are in themselves important from an epidemiological and public health perspective, the

analytical possibilities that a micro-level foundation of PMH enables are productive from a sociological perspective.

1.4.4 The (Short) Warwick-Edinburgh Mental Well-Being Scale

The Warwick Edinburgh Mental Well-Being Scale (WEMWBS), or its shorter version (SWEMWBS), represent the UK's most used and acclaimed dedicated PMH scale. This thesis focused on the 7-item SWEMWBS as it is available in Understanding Society and as it contains a larger relative share of psychological functioning items than the full 14-item scale that included more affective and feelings-oriented items, hence being most aligned with the focus of the thesis. Its detailed empirical properties will be discussed in the first empirical chapter and compared with competing mental health scales, so here I will mention its philosophical foundation in both *hedonia* and *eudaimonia*, as well as in the integration of modern concepts of psychological functioning with subjective well-being. Closely following the *dual continua* approach, positive mental health in the SWEMWBS is explicitly operationalised as *more than* the absence of mental illness (Tennant et al. 2007b); this is seen in the fact that all of the seven items are strictly positively worded. The seven items are scored on five-point frequency Likert-type scales from “none of the time”, “rarely”, “some of the time”, “often”, and “all of the time” in response to respondents' experiences in the last two weeks (Table 5).

The SWEMWBS was released in 2007, and it was, to a large part, designed for clinical use to evaluate patients' complete mental health for use in population health studies.

The origins of the SWEMWBS lie in the Affectometer 2 that was used in New Zealand (Kammann and Flett 1983). The SWEMWBS' original focus on the two main domains of positive affect (hedonic) and psychological functioning (eudaimonic) might nowadays be differentiated in more detail in the PMH literature (Watson 2018). This is especially noteworthy for the item “I've been feeling optimistic” as optimism is

commonly understood as a eudaimonic factor and not as an affective state in the PMH literature (Gillham 2000). Applying the full PMH classification in Table 4, the third column presents the thesis author's adapted classification of the SWMEMWB items in relation to the core aspects of PMH that were discussed previously. It is evident that apart from the item of feeling relaxed, the SWEMWBS represents many eudaimonic dimensions of PMH, ranging from autonomy, competence, to meaning as well as the important PMH dimensions of optimism and social connectedness.

Table 4 Classifications of the SWEMWBS domains from a philosophical and psychological perspective²³

SWEMWBS Item	Original classification	Adapted PMH classification²⁴
I've been feeling optimistic about the future	Positive functioning	Optimism (eudaimonia)
I've been feeling useful	Positive functioning	Meaning (eudaimonia)
I've been feeling relaxed	Positive affect	Affective (hedonia)
I've been dealing with problems well	Positive functioning	Competence
I've been thinking clearly	Positive affect	Competence
I've been feeling close to other people	Positive interpersonal relationships	Social (social/eudaimonia)
I've been able to make up my own mind about things	Positive functioning	Autonomy (hedonia/eudaimonia)

The SWEMWS hence provides the advantage of being well-validated in a psychometric and large-scale population research sense as well as having a clear philosophical and psychological foundation that differs from other negative mental health scales. Because of its widespread use, the SWEMWBS has been found to respond to changes, and population parameters for significant changes have been established at one-point levels on the 35-point scale (Warwick Medical School, 2022²⁵). In Understanding Society wave 1, the mean of the SWEMWBS is 25.2, with a standard deviation of 4.5 points.

²³ Questions were asked about “experiences in the last 2 weeks.

²⁴ Thesis author’s interpretation

²⁵ The reference is available at <https://warwick.ac.uk/fac/sci/med/research/platform/wemwbs/using/howto/> [accessed on 12.07.2022]]

The histogram of the SWEMWBS, shown separately for men and women in Figure 4, illustrates the continuous nature of the scale. The distributions resemble normal distributions, but there are also noticeable divergences as seen in the peaked distribution around the relatively high scores of 27 to 29. With a kurtosis of around 3.9, one could classify this as a leptokurtic distribution. On average, men and women have an apparently similar distribution on the SWEMWBS. There is also a small peak at scores of 21, likely caused by respondents who select the middle response option across all seven items.

The distributions of the SWEMWBS sub-domains in wave one of Understanding Society are depicted in Figure 5. While scores in the worst two response categories are relatively rare, interesting differences emerge between the top scores of the sub-domains: 32% of respondents are able to make up their own minds all of the time, while only 8% of respondents can say the same for feeling optimistic. Over 80% of respondents express feeling all of the seven items at least some of the time, thus drawing a relatively positive depiction of well-being in the UK population, albeit with avenues of improvement. A deeper statistical analysis of the SWEMWBS will be conducted in the next chapter, but this short introduction has shown that empirical measures with a direct foundation in PMH already exist in mainstream sociological surveys and that at face value they seem to provide at least as usable results as more common mental illness measures.

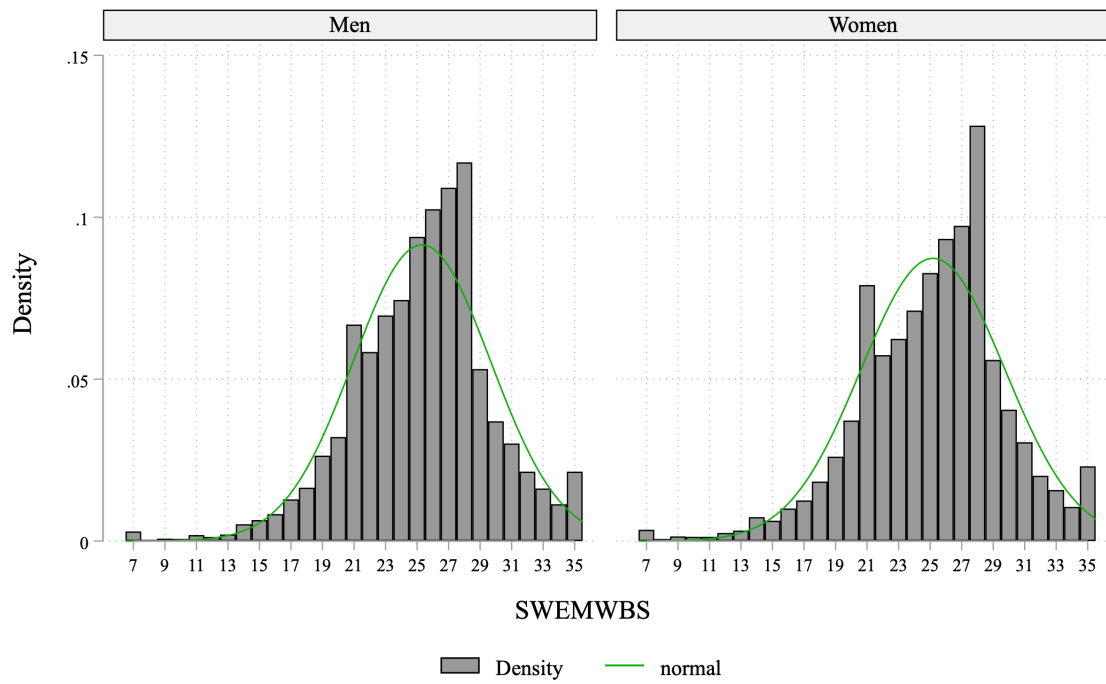


Figure 4 Histogram and overlaid normal density function of the SWEMWBS for men and women (UKHLS wave 1)

Note: The SWEMWBS is scored from 7-35, with a higher score representing higher PMH. Data: UKHLS wave 1. $N = 37,850$.

Sociological Applications of Positive Mental Health

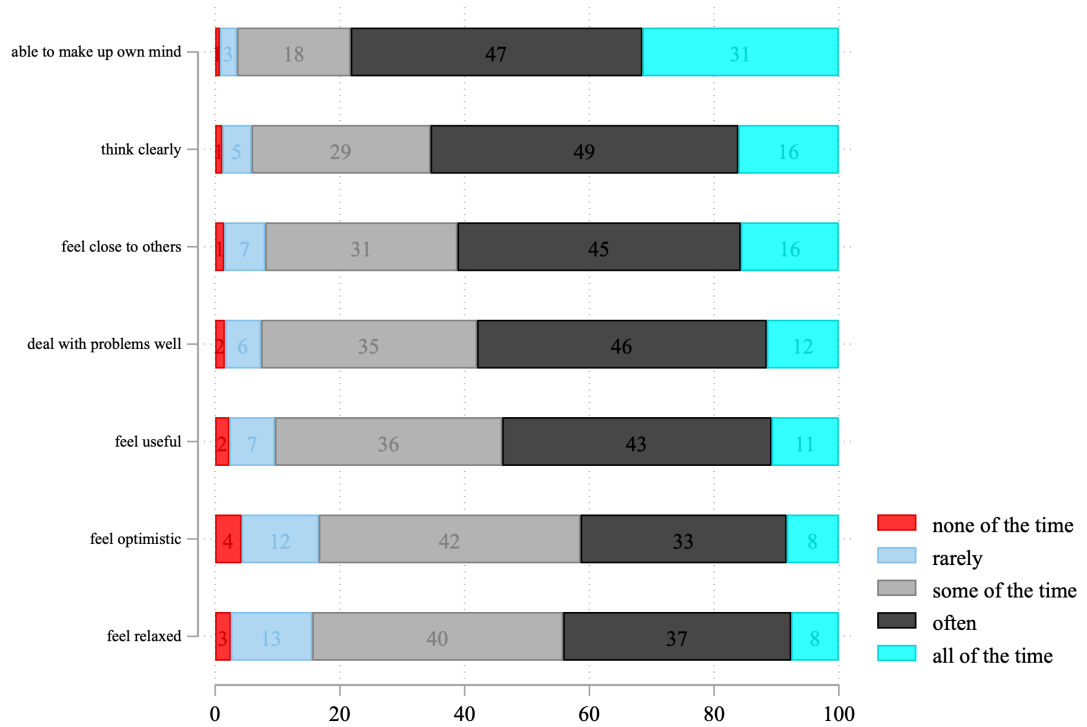


Figure 5 Stacked Likert-scale distributions of SWEMWBS domains (UKHLS wave 1)

Note: Stacked horizontal bar chart of the seven SWEMWBS domains, which are scored from 1-5, with a higher score representing higher PMH. The graph is sorted by the proportion of responses of “all of the time”. Data: UKHLS wave 1. N = 37,850

1.4.5 Psychological needs

In general, self-determination theory is concerned with the intrinsic motivation of people and how this motivation is translated into action that, in turn, shapes people's identities and their views of themselves. Self-determination theory was mainly developed by Deci and Ryan (2002; 2004; 2000). The origins of self-determination theory lie in Maslow's (1943) and Rogers' (1954) accounts of psychological needs and are understood to be universally relevant. Furthermore, self-determination theory concerns itself with the underlying psychological needs that are useful in informing a scientific understanding of PMH.

Just like in the case of psychological well-being, autonomy is seen as a strong element of intrinsic motivation. People who are free to make their own choices and who are not strongly influenced by external circumstances enjoy high autonomy.²⁶ The second dimension of self-determination theory is competence, namely that people need to find an optimum level of challenge in which they are neither too bored because the task is too simple nor overwhelmed because the gap between the existing and required skills may be too large. The third dimension of self-determination theory is relatedness with others: Ryan and Deci (2002) argue that human beings require the comfort of human relations to feel safe and secure and to realise themselves fully. Related to self-determination is the one of self-actualisation, which connotes the desire of humans to act and shape their life that is coherent with their intrinsic psychological needs.

1.5 Positive emotions

Increasingly much psychological research is being carried out on the multidimensionality of different emotional states, with a shift from studying negative to

²⁶ Autonomy does not mean that people should live in total isolation or independence.

positive emotions. Negative emotions include states such as depression or anxiety. Positive emotional states are feelings of awe (Keltner and Haidt 2003), compassion (Goetz, Keltner and Simon-Thomas 2010), interest (Silvia 2008), love (Gonzaga and Haselton 2008; Gonzaga et al. 2008), pride (Tracy and Robins 2007a; Tracy and Robins 2007b) and savouring (Bryant and Veroff 2017) among others.

The key scholar in the field, Barbara Fredrickson, introduced the **broaden and build** theory of positive emotional functioning, in which she outlines how positive experiences and emotions enrich and expand human capabilities. People who regularly experience positive emotions can build psychological resources, and these resources are a crucial factor in fostering flourishing. Relatedly, positive emotions have the potential of undoing negative events and memories in one's life so that stressful or difficult tasks do not have a lasting negative effect on a person's psychological development (Fredrickson 2002). Fredrickson thus also addresses the notion of flourishing and refers to it as optimal human functioning (Fredrickson and Losada 2005).

Nonetheless, it is neither absolutely clear that all negative emotions are necessarily bad (Susskind et al. 2008) nor that all positive emotions increase broaden-and-build psychological functioning (Gable and Harmon-Jones 2008; Gable and Harmon-Jones 2010). As one might expect, different sets of emotions have different causes and different behavioural consequences. Some of the earlier studies have found that feelings of amusement are not associated with increased likelihood of helping others (Bartlett and DeSteno 2006), for instance.

A particular form of the experience of positive emotions is reached in moments of "flow". Flow describes experiences of total immersion in an activity that is simultaneously challenging but not exceeding the current skillset (Csikszentmihalyi 2002). Although flow may be more linked to hedonic than to eudaimonic mental health,

it still forcefully displays that the PMH framework entails unique factors that are distinct from NMH; this is in line with the dual continua model and theories of psychological functioning.

1.6 The life course

This thesis partly takes a demographic and longitudinal direction because this makes it feasible to answer some of the most interesting questions about the relevance of a PMH framework for social scientific research:

“well-being connotes that healthy and positive physiological and behavioral functioning at one point in time is associated with such functioning at other points in time. To have well-being, the integrated developmental system must be maintained over time ... Moreover, if well-being at one point in time was not related to well-being at subsequent times in life, then the concept of well-being could not be used to understand development. The well-being concept would be irrelevant for understanding the life span”

(Lerner, Bornstein and Smith 2003)

If the PMH framework is fruitful, then one could theorise that it should affect significant changes over time and that it should also be affected by changing life conditions. Methodologically, it is also clear that cross-sectional evidence of self-rated mental health indicators can only be of limited evidence (Rindfleisch et al. 2008). Cross-sectional research is beneficial for the first part of analysis or for detailed descriptions and estimating population statistics, but it should be supported by longitudinal evaluations as well. The author of the thesis concurs that longitudinal analyses of mental health, guided by a life course lens, should be a priority whenever there is sufficient data (Lee, Kubzansky and VanderWeele 2021). Very recent research also confirms that sociological and economic life conditions such as income, education,

employment, family conflict, health, childcare, and crime do indeed have lasting impacts on well-being when measured through life-satisfaction indicators (Clark et al. 2019). Finally, sociologists can make a valuable contribution by going beyond psychometric evaluations to explore the social, demographics and cultural predictors of well-being.

One of the most interesting life course finding in this regard is the one of a U-shaped pattern of happiness over people's lifetime (Blanchflower and Oswald 2008):

Blanchflower and Oswald found that the two contrasting age groups of adolescents and young adults vs old people and even very old people have high levels of well-being and that happiness tends to severely drop for middle-aged persons; a finding which the authors replicated in many countries and for many cohorts to rule out confounding cultural or generational effects. The fact that supporting evidence for this striking midlife crisis of happiness was even found in great apes indicates a powerful biological element in the life course trajectory of happiness (Weiss et al. 2012). In fact, one might argue that the enormous stability of this U-shaped pattern of happiness is one of the most stable demographic findings in general. New evidence suggests that the U-shaped patterns cannot be fully replicated when only considering eudaimonic indicators (Ryff, Boylan and Kirsch 2021).

As mentioned previously, hedonic treadmill and set-point theories also have an inherent longitudinal dimension, even if they are evidence of stability rather than change.

Psychological theories such as the one of broaden-and-build are inherently designed from a life-span perspective. Within this life-span view, psychological theories predict or explain how the human mind develops in relation to external stimuli and internal processes and how it maintains a consistent level of functioning. This is to say that the micro-foundation of psychological functioning (life-span) neatly connects with the

demographic and sociological life-course perspective. This linkage has hardly been articulated in detail in the existing literature. It illustrates one of the ways in which the PMH approach could also be of theoretical rather than just empirical relevance for sociological research.

However, despite employing many life course techniques such as survival analyses, the focus lies on sociological applications and not on pure demographic exercises like cohort analyses or differentiating between age-period-cohort effects or life tables.

1.7 Criticisms of positive mental health research

Particularly because of its highly subjective nature, the field of happiness research attracts severe criticism. Many scholars are sceptical about the possibility of comparing mental health states between people. Professor James Hunter, a pre-eminent cultural sociologist, argues forcefully that

the prima facie case against happiness as a scientifically useful concept is very strong: people find subjective well-being in as many different sources as one can imagine. What could be more variable? Middle-aged introspective academics, Nepalese Sherpas, horny American teenagers, religiously observant Jews, Kalahari bushmen, Tibetan monks, members of a biker gang, construction workers, ISIS fighters, and so on, all find happiness in different ways. What is the happiness they share in common? Except for the word itself, what common currency of utilitarian exchange could permit us to resolve conflict and pursue justice? (Hunter and Nedelisky 2018)

This is a valid criticism of the field of happiness research in that happiness researchers have sometimes been too one-sided in their advocacy of well-being measures. The excerpt hints at the importance of cross-cultural differences in understanding happiness, a finding that is well-understood (Uchida, Norasakkunkit and Kitayama 2004). What one could say in response, however, is that the PMH approach is more suited to deal

with the concerns of subjectivity than analyses that are solely based on a single life-satisfaction or hedonic scale. By considering multiple dimensions at the same time, it might be possible to identify situations in which people are “delusionally” happy but not actually functioning well from a psychological (eudaimonic) standpoint. The entire premise of the PMH approach is to go beyond “shallow” happiness and to expand towards the higher qualities of life that might, at times, even be at odds with purely emotional happiness. A rich PMH allows us to incorporate country-specific measures of happiness like the Japanese *Ikigai* (Uchida, Norasakkunkit and Kitayama 2004).

Another criticism of the general happiness approach is that up to 50 per cent of people’s happiness is a result of their genetic endowment, while only 40 per cent is due to personal decisions and 10 per cent to external factors (Lyubomirsky 2008). Social scientists thus should not claim that mental health is only a sociological topic when most of its variance is genetically determined. Nonetheless, it is still worthwhile to investigate those aspects of mental health that are subject to social influences, and it is also possible that the genetic endowment and social environment interact. Indeed, even in highly biological and demographic settings such as the one of fertility (e.g. the age at first birth), gene-environment interactions have been found (Tropf et al. 2015). Once again, one might also argue that eudaimonic happiness as a higher-order form of hedonic happiness could be more susceptible to psychological and sociological influences.

Empirical criticism of mental health research has recently come from methodological and econometric research that has indicated that happiness scales with only a few response options are exposed to severe reporting-function flaws (Bond and Lang 2014; Bond and Lang 2018). By applying modest changes to the distributional assumption of these scales, many of the established findings in the happiness literature could not be

replicated and were sometimes even reversed. This challenge highlights that the subjective and self-reported nature of happiness scales continues to pose challenges, although one could argue, in defence, that most other commonly used scales, such as political attitudes ones, would be affected in very similar ways. Econometric research is ongoing, but opposing new findings based on mathematical modelling and empirical replications suggest that most of Bond and Land's claims do not hold up and that they can be explained by heterogeneity in predictor variables, among other factors (Kaiser and Vendrik 2020).

PMH scales tend to consist of multiple sub-scales like the tripartite domains of eudaimonic, hedonic, and social well-being, so there is a chance that some of the reporting-function biases are mitigated or even cancelled out if they are non-uniformly distributed in any case. It is unlikely that the larger range of PMH scales (e.g., from 7 to 35 in the WEMWBS compared to 1 to 7 in a life satisfaction scale) will automatically be less affected by reporting biases than the more succinct ones. Nonetheless, there is increasing appreciation in the well-being literature that it might be desirable to employ techniques such as quantile regression to go beyond central tendency measures (Tay, Jebb and Scotney).

As the thesis is taking the notion of PMH somewhat literally, the recommendation to focus on the top levels of the distribution rather than average scores resonates well and especially to jointly account for NMH and PMH as theorised under the dual continua model. There has been evidence that regression analyses of well-being scales remained robust when using the median rather than mean (without parametric assumptions), for instance, via ordered logit models (Chen et al. 2019). The question of the statistical reliability of mental health scales will continue to be crucial for the field. One advantage of studying subjective measures in so much detail is that they allow us to learn the

underlying statistical techniques in even greater detail than one might have otherwise needed to. Polychoric correlations and polychoric factor scores might be better analytical methods for some well-being items than Pearson's or other linear techniques that are common as they account for the categorical or nominal nature of the measurement scales.

The distinction between eudaimonia and hedonia is contested in the well-being research arena. When the notion of PMH first gained popularity, some scholars argued that the multitude of marginally different concepts risks causing more confusion and contradiction than clarities (Kashdan, Biswas-Diener and King 2008). Indeed, based on genome-wide association study of UK biobank data of 72,146 participants, there was only limited evidence for a differential genetic make-up of the two concepts (Baselmans and Bartels 2018a): While the authors did identify two distinct loci for eudaimonia and six distinct loci for hedonia, there was a very large overlap in terms of phenotypes and traits. Nonetheless, the majority of scholars seem to agree that eudaimonia and hedonia connote different philosophical and psychological concepts (Huta 2018b).

This thesis strives to take a value-neutral position on the ongoing debate about the advantages and disadvantages of a multidimensional mental health agenda. Even though it engages with the core tenets of PMH, it does not automatically subscribe to the usefulness of these elements. Instead, it simply proposes that it is worthwhile to engage with the notion of PMH from a critical perspective and to move beyond philosophical debates by analysing high-quality data that has now become available.

1.8 A sociology of PMH and sociological applications of well-being

Before moving on to the outline of the thesis in the next section, it is helpful to take a step backwards from the plenitude of psychological terms that have been introduced in

this chapter to conceptualise and contextualise PMH in relation to sociology. Objective aspects of well-being are well-understood and studied in sociology, both on an individual and community level: Education, health, and the role of factors such as volunteering for social cohesion (Wiertz 2015) are common themes of individual-objective well-being, while on the community or county level sociologists are interested in evaluating the objective effects of economic policies on health (Stuckler et al. 2017) or institutional activism (Pettinicchio 2012). A recent theoretical contribution clarified the linkage between objective and subjective well-being on the one hand and individual and community well-being on the hand, as seen in Figure 6 (VanderWeele 2019). Accordingly, this thesis focuses on the lower right quadrant of subjective-individual well-being – specifically the notion of PMH -, but it targets the objective and sociological dimensions like education as crucial predictors and explanatory variables. The thesis is not advocating that sociologists should predominantly focus on subjective and individual conditions relating to mental health but that a full understanding of both individual and community well-being might be informed by it.

The three main substantive research chapters of the thesis, firstly on the associations of neighbourhood deprivation with PMH, secondly on the associations of religiosity with PMH and thirdly on the effect of PMH on mortality, were chosen as they represent some of the most foundational applications of sociological research. Whereas neighbourhood analyses draw a macro lens on the social context of deprivation within the socio-geographic environment, religiosity simultaneously represents a micro-level personal but also collective experience. By studying mortality outcomes, it is possible to assess the objective importance of PMH which is important when one is dealing with multiple subjective indicators in the other chapters.

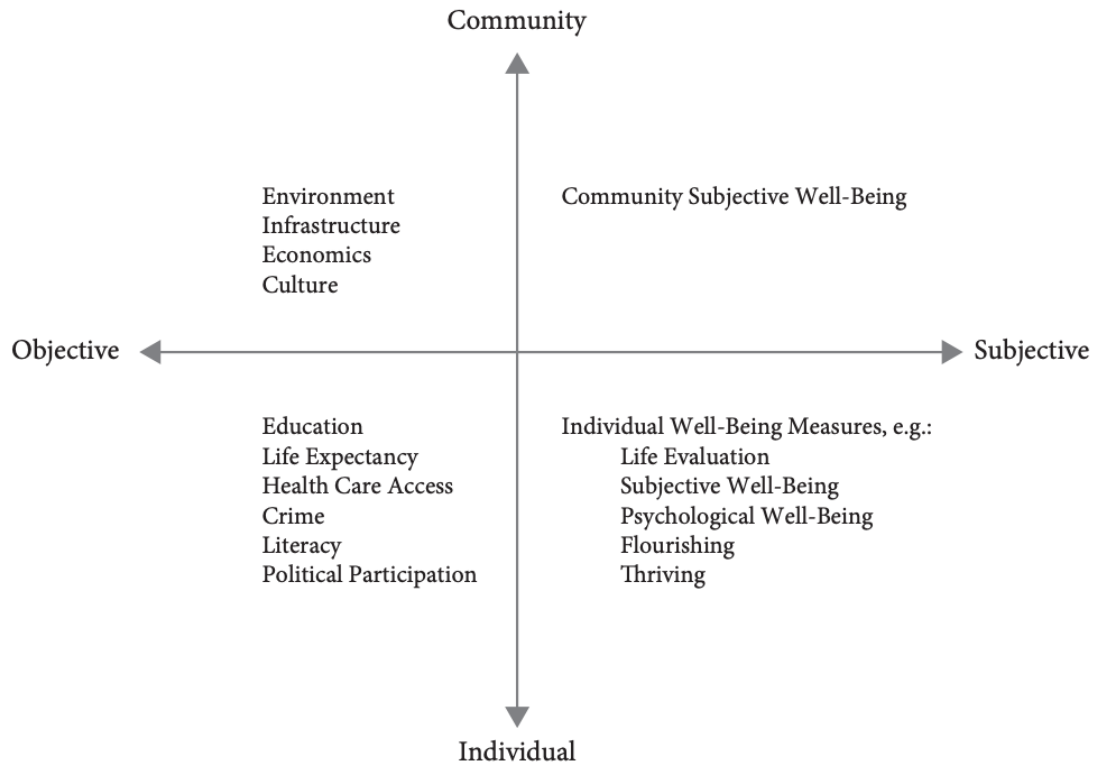


Figure 6 Diagram of community well-being (VanderWeele 2019)

1.9 Overview of the thesis

Having presented the core theoretical considerations, this dissertation seeks to answer the guiding research question: What are the empirical usefulness and conceptual relevance of PMH indicators, primarily the Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS), for sociological research? This overall research question can be divided into smaller parts.

Firstly, it asks whether PMH indicators show differential or identical patterns compared to competing NMH or single-item mental health ones and especially whether PMH still has a distinct effect when controlling for negative mental health. This research question relates to Keyes' (2002) dual continua model, which is foundational to the PMH framework. Simultaneously, the thesis assesses whether PMH is best treated as a multidimensional concept in sociological applications. Moreover, the thesis tests whether the subdomains of PMH robustly measure the same latent concept and whether there are domains of PMH that are particularly useful for sociological analyses.

Secondly, this thesis tests whether elevated levels of PMH buffer NMH or boost the protective effect of the absence of NMH. The PMH framework implies that these sorts of effects should be prominent, and unlike NMH scales, the dedicated PMH indicators are said to be less affected by ceiling or threshold effects. This aspect of the research endeavour captures the broader relevance of PMH, both longitudinally and in terms of policy implications, as they pertain to the evolution of health.

Thirdly, the thesis consistently explores the demographic and sociological relevance of PMH, which is dependent on the two previous research questions. Mortality risk, religiosity, and neighbourhood effects are some of the most prominent topics in the social sciences, and this is one of the first times that highly acclaimed PMH indicators are comprehensively incorporated into sociological studies with longitudinal data.

Regarding the structure of the thesis, the first three empirical chapters focus on the SWEMWBS in the United Kingdom and build on Understanding Society data, the UK's longitudinal household panel survey.²⁷ Understanding Society is the world's largest panel survey and provides unparalleled depth of detail about its participants, including allostatic load and neighbourhood information and an extensive set of survey items that can be used as control variables.²⁸ Four mental health variables are included in Understanding Society, namely the General Health Questionnaire (GHQ), life satisfaction questions, the 12-item Short Form Survey Mental Component Summary (SF-12 MCS), and the SWEMWBS.²⁹ The first three indicators are collected at every wave (i.e. every year), while the SWEMWBS is collected every three waves (wave one, wave four, wave seven, and so forth). Advanced longitudinal analyses require several measurement points, the latest of which was released in 2020, so this thesis is a well-timed assessment of the SWEMWBS. By comparing the effects of important life course conditions on PMH (SWEMWBS) with established measures of NMH (GHQ-12) and one-item life satisfaction, this thesis can ascertain whether the PMH approach truly offers unique insights.³⁰

The first empirical chapter has a twofold ambition: Firstly, it tests whether the theoretical model of the dual continua of mental health holds up in empirical reality.

The chapter finds that dual continua categories in terms of flourishing and floundering,

²⁷ In the future, it might be possible to also conduct a survival analysis of mortality risk on the WEMWBS with Understanding Society data, but presently the follow-up period is too short, and the linkage with national registers is not as robust as is the case with the MIDUS.

²⁸ <https://www.understandingsociety.ac.uk/participants/faq>

²⁹ Understanding Society includes the Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS). The SWEMWBS is a shorter 7-item version of the WEMWBS, but both names are used interchangeably in this thesis.

³⁰ The dimensionality of the GHQ and other mental health scales is subject to debate. The GHQ is designed to measure psychopathology (e.g., symptoms of anxiety or depression). The SF-12 MCS is a scale to measure health functioning. Life satisfaction is an overall cognitive evaluation of one's life.

but also the off-diagonal groups of struggling and languishing, are very strongly associated with demographic variables such as age and sociological aspects such as educational attainment and social class and that there are important differentiations between these groups. Comparing the SWEMWBS with other mental health scales, it is found that correlations are only moderate and that there are meaningful differences between NMH as measured through the GHQ and PMH as measured through the SWEMWBS, even when jointly accounting for NMH when analysing the effects of PMH.

Second, the chapter uses psychometric techniques to establish the baselines and longitudinal measurement properties of the SWEMWBS, and it evaluates whether the seven sub-indicators of the SWEMWBS measure a distinct latent concept compared to the sub-indicators of the other two mental health scales. A major insight that is presented refers to the multidimensional nature of PMH and the fact that the domains of the SWEMWBS are sometimes distinctly associated with other variables. “Feeling optimistic” and “feeling useful” prove to be partially distinct from the other indicators and seem to reflect a more eudaimonic dimension of PMH.

Furthermore, objective physiological data in terms of allostatic load measurements are used to test whether the psychometric differences between the scales are reflected in the hard facts of biological reality. If the PMH approach is to differ from the negative one, then one should expect to see differences on an objective physiological level too. Moreover, as a measure of the wear and tear of the body, it is substantively informative to explore the association of long-term stress with PMH. This facet of objective physical health hence directly connects the first two studies. Together, this is the first time that the SWEMWBS is measured against allostatic load data, and it is also the first time that the SWEMWBS is evaluated longitudinally. Because of these strengths, the

second chapter contributes major new insights into the qualities of this promising PMH scale. In terms of methods, this chapter uses exploratory factor analyses, confirmatory factor analyses, multidimensional scaling and regression techniques both cross-sectionally but also longitudinally from wave 1 to waves 2, 3, and mostly wave 10.

Moving to a sociological application of PMH, in the second empirical chapter (chapter 3), the scope of analysis is expanded to neighbourhood conditions. The crucial sociological question of whether neighbourhoods affect or at least interact with the health and mental health of inhabitants is not new, but the state of the research field is unclear with regard to the effect of neighbourhoods on PMH. Special access data from the UK Data Archive³¹ on the geographic location, measured via Lower Super Layer Output Areas (LSOAs), of the survey participants living in England and official statistics on the objective neighbourhood deprivation levels of these areas (Index of Multiple Deprivation) were gathered, and a longitudinal file of neighbourhood residence for each individual for each of the ten waves was coded, leading to a panel data set of nearly 500,000 person-period observations. In the first part, multilevel analyses of individuals nested within neighbourhoods were calculated to explore whether objective neighbourhood deprivation and subjective neighbourhood feelings, such as neighbourhood belonging and cohesion, correspond to differences in PMH. Simultaneously, the other mental health variables are used to see whether neighbourhoods have a differential effect on the different dimensions of mental health. It is hypothesised that because social well-being forms an important part of PMH, it should be independently and more strongly associated with neighbourhood belonging than the competing mental health scales. Frequently stated problems in the

³¹ <https://ukdataservice.ac.uk>

neighbourhood effects literature are the ones of causality and the difficulty of the identification of genuinely contextual, as opposed to compositional, neighbourhood effects. As a means of corroborating the multilevel cross-sectional findings from the first part of the analysis, longitudinal random and fixed effects analyses of neighbourhood transitions are employed.

The question of whether religiosity is associated with higher levels of PMH is explored in the third empirical chapter. Even though it is a stylised fact that religiosity is associated with better mental health, it is hypothesised that life satisfaction and NMH are less strongly related to religiosity than PMH. The argument is that both PMH and religiosity inherently concern themselves with topics such as meaningfulness, gratitude, and hope. Using seemingly-unrelated regressions, the study compares the relative strength of the association of religiosity with the four competing mental health scales. Innovatively, this chapter also looks at the association of religiosity with the sub-indicators of the WEMWBS instead of just the overall summary scale and presents previously unknown levels of detail. Using simultaneous quantile regressions, it is tested whether religiosity affects low or elevated levels of well-being (at the 15th, 50th and 85th quantiles). As mentioned before, a core proposition of the PMH agenda is that it can capture the highest levels of well-being, which are not just a mirror image of the absence of NMH, so this chapter represents one of the first serious attempts of putting this claim to the test. Finally, this chapter makes use of the longitudinal sample of Understanding Society in fixed effects regression design to test whether changes in religiosity correspond to changes in PMH.

The fourth empirical chapter, now in the USA, replicates and significantly extends one of the seminal studies in the field, namely that PMH, as measured through a flourishing-languishing indicator, is associated with lower mortality risk (Keyes and Simoes

2012b). Compared to their original study, which was based on a logistic regression of only ten years of MIDUS data, the present study extends the follow-up period to more than 20 years and employs vastly more advanced survival analysis techniques.

Importantly, this chapter also sheds light on the characteristics of PMH that cause a beneficial effect on longevity by distinguishing boosting from buffering level effects. Furthermore, the entire array of competing mental health scales is analysed in this study, which makes it possible to test whether PMH has a unique effect on mortality or whether all the mental health scales share an underlying association with what - can be considered to be - the final and most objective health outcome. This chapter, therefore, confirms the demographic life-course significance of PMH and proves the long-term relevance of PMH on the most objective health outcome.

The fifth chapter summarises the research findings and elaborates on the broader relevance of the work that has been presented.

1.10 A note on statistics and methodology

1.10.1 Data analysis

The author uses modern quantitative methods for the presentation, interpretation and visualisation of the statistical results (Gelman, Pasarica and Dodhia 2002). Throughout the thesis, the main results are presented in tables, and 95% confidence intervals and/or significance levels at the $p < 0.05$ level are presented. Descriptive statistics are usually presented in tables as this is the most parsimonious way of providing a large amount of detailed information. One advantage of analysing mental health scales is that they are continuous, so that it is not necessary to deal with inherent nonlinearity through logistic regressions and related techniques (Mize, Doan and Long 2019). Still, predicted probabilities and average marginal effects are occasionally presented in the results

sections (Williams 2012). Visualisations in graphs (with 95% confidence intervals) further aid the interpretation of the distribution of the scales.

Different disciplines have different views about the proper statistical methods, with economics focusing on the identification of causal effects (Angrist and Pischke 2008), demography and sociology focusing on elaborate statistical descriptions over time (Goldthorpe 2016), and psychology focusing on measurement models (Bollen and Long 1993). The author believes that all these approaches offer certain advantages and thus employs techniques that span the entire breadth of quantitative methodology. However, given the early stage of PMH research, the main interest does not lie in isolating perfectly causal effects of explanatory variables on PMH; this is an avenue for future research when the main patterns, relevance, and trends of PMH have been established. Nonetheless, the longitudinal analyses and the creative use of objective data in this thesis certainly go further in determining robust evidence than many other studies have done in the past.

The mental health scales were often standardised when they were used in the same models for greater comparability but given the validated cut-off scoring of the GHQ for the presence of psychological distress and illness, a binary indicator, has also been used to facilitate the joint accounting of PMH and NMH at the same time as well as to create the groupings according to the dual continua model.

1.10.2 Representativeness and missing data

One of the main strengths of the UKHLS is its extremely large size sample size of 40,000 households and the oversampling of ethnic minorities at wave one as well as the inclusion of further participants from the BHPS in wave two and so-called boosters to keep up the representativeness over time, especially of harder to reach populations (Benzeval et al., 2020; Boreham et al., 2012). Unlike a large share of psychological

studies that are typically based on small sample sizes and convenience samples, a strength of this thesis is the fact that the psychological concept of PMH is analysed via the highest-quality and representative UK population level. This allows inference to ethnic minorities and age groups on the one hand but also the identification of subgroups, for instance, with regards to the dual continua model, on the other hand.

Missing data, however, are a serious potential problem when carrying out analyses on many mental health variables (Fox-Wasylyshyn and El-Masri, 2005; Davillas et al., 2005). People with poor mental health might be harder to incentivize to participate in the survey, might drop out of the survey at faster rates than other participants, and poor mental health might come with other factors such as lower education, physical illness, transient housing or even just minority ethnicity status (Graaf et al, 2000). When estimating the levels of PMH, missing data might bias the results upwards for descriptive purposes and downwards when analysing the relationship between predictor variables and mental health.

Thanks to the high quality of Understanding Society and the registry information in MIDUS, it is found that missingness does not affect PMH measures significantly more than they do affect other measures like the GHQ. In the second empirical chapter, full information maximum likelihood (FIML) estimators are chosen in the cross-sectional regression of neighbourhood effects on mental health as a robustness check (Enders and Bandalos 2001).

For the longitudinal analyses, the full sample information of UKHLS has been used, i.e., via appending all ten waves for unbalanced panels, thus keeping as many transitions in the data as possible and aiming to avoid selection on a biased sample of complete cases at baseline that would be affected by attrition (Lynn and Borkowska, 2018). Given

the issue of attrition, and the risk that respondents with lower mental health are more likely to leave the sample, this choice seems appropriate.

Probability weights (cross-sectional) have been used in some of the empirical chapters to improve the representativeness of the survey samples to the general population (Lynn and Kaminska 2010). The survey weights account for non-response at baseline and, importantly, self-completion survey response, which is a large source of missingness across mental health variables at wave 1 of the UKHLS. All three chapters that use the SWEMWBS both have cross-sectional and longitudinal parts (each of them would require a different survey weighting strategy with varying consequences for the sample sizes). The explicit choice has been made to let the sample sizes vary across analyses so that only the absolute necessary number of respondents are dropped rather than to limit all analyses to the same reduced sample in which all variables were not missing, which would have led to a severely reduced and biased sample.

Nonetheless, the issue of representativeness is certainly a constant concern and will become even more important as more longitudinal survey data become available and as attrition increases over time.

Further details on the specific statistical models are offered in the empirical chapters.

1.11 References

- Aksoy, Ozan, David Bann, Meg E Fluharty, and Alita Nandi. 2021. "Religiosity and mental wellbeing among members of majority and minority religions: findings from Understanding Society, The UK Household Longitudinal Study." *American Journal of Epidemiology*.
- Ameriks, Karl, and Desmond M Clarke. 2000. *Aristotle: Nicomachean Ethics*: Cambridge University Press.
- Angrist, Joshua D, and Jörn-Steffen Pischke. 2008. *Mostly harmless econometrics: An empiricist's companion*: Princeton university press.
- Aquinas, Thomas. 2006. *Summa Theologiae: Volume 38, Injustice: 2a2ae. 63-79*: Cambridge University Press.
- Alexendarova, A. and Fabian, M. (2022) *The Science of Well-Being*. Research review. John Templeton Foundation. Available at: https://www.templeton.org/wp-content/uploads/2022/02/Science_of_Wellbeing_JTF_1.pdf
- Bartlett, Monica Y, and David DeSteno. 2006. "Gratitude and prosocial behavior: Helping when it costs you." *Psychological science* 17(4):319-25.
- Baselmans, B. M. L., and M. Bartels. 2018a. "A genetic perspective on the relationship between eudaimonic -and hedonic well-being." *Sci Rep* 8(1):14610.
- Baselmans, BML, and M Bartels. 2018b. "A genetic perspective on the relationship between eudaimonic -and hedonic well-being." *Sci Rep* 8(1):14610.

- Baselmans, BML, R Jansen, HF Ip, J van Dongen, A Abdellaoui, MP van de Weijer, Y Bao, M Smart, M Kumari, G Willemsen, JJ Hottenga, consortium BIOS, Science Genetic Association Consortium Social, DI Boomsma, EJC de Geus, MG Nivard, and M Bartels. 2019. "Multivariate genome-wide analyses of the well-being spectrum." *Nat Genet*.
- Boreham, R., Boldysevaite, D., & Killpack, C. (2012). UKHLS: Wave 1 technical report. *London: NatCen*.
- Beasley, Margaret, Ted Thompson, and John Davidson. 2003. "Resilience in response to life stress: the effects of coping style and cognitive hardiness." *Personality and Individual Differences* 34(1):77-95.
- Begley, Nick. 2013. "Psychological adoption and adaptation of eudaimonia."
- Binder, Martin, and Guido Buenstorf. 2018. "Smile or die: Can subjective well-being increase survival in the face of substantive health impairments." *Economics & Human Biology* 31:209-27.
- Blanchflower, David G, and Andrew J Oswald. 2008. "Is well-being U-shaped over the life cycle?" *Social Science & Medicine* 66(8):1733-49.
- Bollen, Kenneth A, and J Scott Long. 1993. *Testing structural equation models*: Sage.
- Bond, Timothy N, and Kevin Lang. 2014. "The sad truth about happiness scales." National Bureau of Economic Research.
- . 2018. "The Sad Truth About Happiness Scales: Empirical Results." National Bureau of Economic Research.

- Bruni, Luigino. 2010. "The happiness of sociality. Economics and eudaimonia: A necessary encounter." *Rationality and Society* 22(4):383-406.
- Bryant, Fred B, and Joseph Veroff. 2017. *Savoring: A new model of positive experience*: Psychology Press.
- Chen, Le-Yu, Ekaterina Oparina, Nattavudh Powdthavee, and Sorawoot Srisuma. 2019. "Have Econometric Analyses of Happiness Data Been Futile? A Simple Truth About Happiness Scales."
- Clark, Andrew E, Sarah Flèche, Richard Layard, Nattavudh Powdthavee, and George Ward. 2019. *The origins of happiness: the science of well-being over the life course*: Princeton University Press.
- Coleman, James S. 1986. "Social theory, social research, and a theory of action." *American Journal of Sociology* 91(6):1309-35.
- Comim, Flavio. 2005. "Capabilities and happiness: Potential synergies." *Review of social economy* 63(2):161-76.
- Coryell, William, William Scheftner, Martin Keller, Jean Endicott, Jack Maser, and Gerald L Klerman. 1993. "The enduring psychosocial consequences of mania and depression." *The American journal of psychiatry*.
- Crespo, Ricardo F, and Belén Mesurado. 2015. "Happiness economics, eudaimonia and positive psychology: From happiness economics to flourishing economics." *Journal of Happiness Studies* 16(4):931-46.
- Csikszentmihalyi, Mihaly. 2002. *Flow: The Psychology of Happiness: The Classic Work on How to Achieve Happiness*: Rider.

- Davillas, A., de Oliveira, V., & Jones, A. (2022). Is inconsistent reporting of self-assessed health persistent and systematic? Evidence from the UKHLS.
- Deaton, Angus. 2018. "Deaths of despair." *Lancet*, 392(10157):26.
- Deci, Edward L, and Richard M Ryan. 2002. "Overview of self-determination theory: An organismic dialectical perspective." *Handbook of self-determination research*:3-33.
- . 2004. *Handbook of self-determination research*: University Rochester Press.
- Diener, E, SD Pressman, J Hunter, and D Delgado-Gaitanaris. 2017. "If, Why, and When Subjective Well-Being Influences Health, and Future Needed Research." *Applied Psychology* 68(2):133-67.
- Diener, Ed. 1984. "Subjective well-being." *Psychological Bulletin* 95(3):542-75.
- Diener, Ed, and Louis Tay. 2014. "Review of the day reconstruction method (DRM)." *Social Indicators Research* 116(1):255-67.
- Dockray, Samantha, Nina Grant, Arthur A Stone, Daniel Kahneman, Jane Wardle, and Andrew Steptoe. 2010. "A comparison of affect ratings obtained with ecological momentary assessment and the day reconstruction method." *Social Indicators Research* 99(2):269-83.
- Duckworth, Angela. 2016. *Grit: The power of passion and perseverance*: Scribner New York, NY.
- Easterlin, Richard A, Laura Angelescu McVey, Malgorzata Switek, Onnicha Sawangfa, and Jacqueline Smith Zweig. 2010. "The happiness–income paradox revisited." *Proceedings of the National Academy of Sciences* 107(52):22463-68.

- Enders, Craig K, and Deborah L Bandalos. 2001. "The relative performance of full information maximum likelihood estimation for missing data in structural equation models." *Structural equation modeling* 8(3):430-57.
- Fredrickson, Barbara L. 1998. "What good are positive emotions." *Review of general psychology* 2(3):300-19.
- . 2002. "Positive emotions." *Handbook of positive psychology*:120-34.
- . 2013. "Positive emotions broaden and build." Pp. 1-53 in *Advances in experimental social psychology* 47: Elsevier.
- Fredrickson, Barbara L, and Marcial F Losada. 2005. "Positive affect and the complex dynamics of human flourishing." *American Psychologist* 60(7):678.
- Frey, Bruno S, and Alois Stutzer. 2018. "Economics of Happiness."
- Frey, Jennifer A. 2019. "Happiness as the constitutive principle of action in Thomas Aquinas." *Philosophical Explorations* 22(2):208-21.
- Fox-Wasylyshyn, S. M., & El-Masri, M. M. (2005). Handling missing data in self-report measures. *Research in nursing & health*, 28(6), 488-495.
- Gable, Philip A, and Eddie Harmon-Jones. 2008. "Approach-motivated positive affect reduces breadth of attention." *Psychological Science* 19(5):476-82.
- Gable, Philip, and Eddie Harmon-Jones. 2010. "The motivational dimensional model of affect: Implications for breadth of attention, memory, and cognitive categorisation." *Cognition and emotion* 24(2):322-37.
- Gelman, Andrew, Cristian Pasarica, and Rahul Dodhia. 2002. "Let's practice what we preach: turning tables into graphs." *The American Statistician* 56(2):121-30.

Gillham, Jane. 2000. "The science of optimism and hope: Research essays in honor of Martin EP Seligman."

Gillham, Jane E, Rachel M Abenavoli, Steven M Brunwasser, Mark Linkins, Karen J Reivich, and Martin EP Seligman. 2013. "Resilience education." in *Oxford Handbook of Happiness*.

Goetz, Jennifer L, Dacher Keltner, and Emiliania Simon-Thomas. 2010. "Compassion: an evolutionary analysis and empirical review." *Psychological Bulletin* 136(3):351.

Goldthorpe, John H. 2004. "The economic basis of social class." *LSE STICERD Research Paper No. CASE080*.

—. 2016. *Sociology as a population science*: Cambridge University Press.

Gonzaga, Gian C, and Martie G Haselton. 2008. "The evolution of love and long-term bonds." *Social relationships: Cognitive, affective, and motivational processes*:39-54.

Gonzaga, Gian C, Martie G Haselton, Julie Smurda, Mari sian Davies, and Joshua C Poore. 2008. "Love, desire, and the suppression of thoughts of romantic alternatives." *Evolution and Human Behavior* 29(2):119-26.

Graaf, R. D., Bijl, R. V., Smit, F., Ravelli, A., & Vollebergh, W. A. (2000). Psychiatric and sociodemographic predictors of attrition in a longitudinal study The Netherlands Mental Health Survey and Incidence Study (NEMESIS). *American Journal of Epidemiology*, 152(11), 1039-1047.

- Harrison, EK, Annie Quick, Saamah Abdallah, K Ruggeri, G Garcia Garzon, Á Maguire, FA Huppert, R Saini, and N Zwiener. 2016. "Looking into the wellbeing Kaleidoscope: results from the European social survey."
- Hauck, Katharina, and Nigel Rice. 2004. "A longitudinal analysis of mental health mobility in Britain." *Health economics* 13(10):981-1001.
- Heintzelman, SJ. 2018. "Eudaimonia in the contemporary science of subjective well-being: Psychological well-being, self-determination, and meaning in life." *Handbook of well-being. Salt Lake City, UT: DEF. Retrieved from www.nobascholar.com.*
- Hill, Patrick L, Grant W Edmonds, and Sarah E Hampson. 2017. "A purposeful lifestyle is a healthful lifestyle: Linking sense of purpose to self-rated health through multiple health behaviors." *Journal of health psychology*:1359105317708251.
- Hooghe, Marc, and Bram Vanhoutte. 2011. "Subjective Well-Being and Social Capital in Belgian Communities. The Impact of Community Characteristics on Subjective Well-Being Indicators in Belgium." *Social Indicators Research* 100(1):17-36.
- Hunter, James Davison. 2008. *The death of character: Moral education in an age without good or evil*: Basic Books.
- Hunter, James Davison, and Paul Nedelisky. 2018. *Science and the Good: The Tragic Quest for the Foundations of Morality*: Foundational Questions in Scie.
- Huppert, F. A., and T. T. C. So. 2013. "Flourishing Across Europe: Application of a New Conceptual Framework for Defining Well-Being." *Social Indicators Research* 110(3):837-61.

- Huppert, Felicia A. 2009. "Psychological well-being: Evidence regarding its causes and consequences." *Applied Psychology: Health and Well-Being* 1(2):137-64.
- Huppert, Felicia A, Nick Baylis, and Barry Keverne. 2005. *The science of well-being*: Oxford University Press, USA.
- Huta, Veronika. 2015. "The Complementary Roles of Eudaimonia and Hedonia and How They Can Be Pursued in Practice." Pp. 159-82 in *Positive Psychology in Practice*. Hoboken, NJ, USA: John Wiley & Sons, Inc.
- . 2016a. "Eudaimonic and Hedonic Orientations: Theoretical Considerations and Research Findings." Pp. 215-31 in *Handbook of Eudaimonic Well-Being: International Handbooks of Quality-of-Life*. Cham: Springer International Publishing.
- . 2016b. "An overview of hedonic and eudaimonic well-being concepts." *Handbook of media use and well-being: International perspectives on theory and research on positive media effects*:14-33.
- . 2018a. "Eudaimonia versus Hedonia: What Is the Difference? And Is It Real." *International Journal of Existential Psychology and Psychotherapy* 7(2):8.
- . 2018b. "Eudaimonia versus Hedonia: What Is the Difference? And Is It Real?" *International Journal of Existential Psychology and Psychotherapy* 7(2):8.
- . 2020. How distinct are eudaimonia and hedonia? It depends on how they are measured. *Journal of Well-Being Assessment*, 4(3), 511-537.
- Huta, Veronika, and Alan S. Waterman. 2014. "Eudaimonia and Its Distinction from Hedonia: Developing a Classification and Terminology for Understanding

Conceptual and Operational Definitions." *Journal of Happiness Studies* 15(6):1425-56.

Kahneman, Daniel. 2011. *Thinking, fast and slow*: Macmillan.

Kahneman, Daniel, Edward Diener, and Norbert Schwarz. 1999. *Well-being: Foundations of hedonic psychology*: Russell Sage Foundation.

Kahneman, Daniel, Alan B Krueger, David A Schkade, Norbert Schwarz, and Arthur A Stone. 2004a. "A survey method for characterizing daily life experience: The day reconstruction method." *Science* 306(5702):1776-80.

Kahneman, Daniel, Alan B Krueger, David Schkade, Norbert Schwarz, and Arthur Stone. 2004b. "Toward national well-being accounts." *American Economic Review* 94(2):429-34.

Kaiser, Casper, and Maarten Vendrik. 2020. "How threatening are transformations of happiness scales to subjective wellbeing research?".

Kammann, Richard, and Ross Flett. 1983. "Affectometer 2: A scale to measure current level of general happiness." *Australian journal of psychology* 35(2):259-65.

Kashdan, TB, R Biswas-Diener, and L King. 2008. "Reconsidering happiness: The costs of distinguishing between hedonics and eudaimonia." *The Journal of Positive*

Keltner, Dacher, and Jonathan Haidt. 2003. "Approaching awe, a moral, spiritual, and aesthetic emotion." *Cognition and emotion* 17(2):297-314.

Keyes, CL, and EJ Simoes. 2012. "To flourish or not: positive mental health and all-cause mortality." *Am J Public Health* 102(11):2164-72.

- Keyes, Corey L. M. 2002. "The Mental Health Continuum: From Languishing to Flourishing in Life." *Journal of Health and Social Behavior* 43(2):207.
- Keyes, Corey L. M., Dov Shmotkin, and Carol D. Ryff. 2002. "Optimizing well-being: The empirical encounter of two traditions." *Journal of Personality and Social Psychology* 82(6):1007-22.
- Keyes, Corey LM. 2005. "Mental illness and/or mental health? Investigating axioms of the complete state model of health." *Journal of consulting and clinical psychology* 73(3):539.
- . 2007. "Promoting and protecting mental health as flourishing: A complementary strategy for improving national mental health." *American Psychologist* 62(2):95.
- . 2012. *Mental well-being: International contributions to the study of positive mental health*: Springer Science & Business Media.
- Lamers, Sanne Maria Antoinette. 2012. "Positive mental health: Measurement, relevance and implications."
- Land, Kenneth C, Alex C Michalos, and M Joseph Sirgy. 2011. "Handbook of social indicators and quality of life research."
- Layard, Richard, Andrew E Clark, Francesca Cornaglia, Nattavudh Powdthavee, and James Vernoit. 2014. "What predicts a successful life? A life-course model of well-being." *The Economic Journal* 124(580):F720-F38.
- Lee, Matthew T, Laura D Kubzansky, and Tyler J VanderWeele. 2021. *Measuring Well-Being: Interdisciplinary Perspectives From the Social Sciences and the Humanities*: Oxford University Press.

- Lerner, Richard M, Marc H Bornstein, and C Smith. 2003. "Child well-being: From elements to integrations." MH Bornstein, L. Davidson, CM Keyes, K. Moore, & the Center for Child Well-Being (Eds.), *Well-being: Positive development across the life course*:501-23.
- Lesthaeghe, Ron. 2014. "The second demographic transition: A concise overview of its development." *Proceedings of the National Academy of Sciences* 111(51):18112-15.
- Lynn, Peter, and Olena Kaminska. 2010. "Weighting strategy for Understanding Society." *Understanding Society at the Institute for Social and Economic Research*.
- Lynn, Peter., & Borkowska, Magda. (2018). *Some indicators of sample representativeness and attrition bias for BHPS and understanding society*. Colchester, UK: Institute for Social and Economic Research, University of Essex.
- Lyubomirsky, Sonja. 2008. *The how of happiness: A scientific approach to getting the life you want*: Penguin.
- Maccagnan, Anna, Sam Wren-Lewis, Helen Brown, and Tim Taylor. 2019. "Wellbeing and Society: Towards Quantification of the Co-benefits of Wellbeing." *Social Indicators Research* 141(1):217-43.
- Martín-María, Natalia, Marta Miret, Francisco Félix Caballero, Laura Alejandra Rico-Uribe, Andrew Steptoe, Somnath Chatterji, and José Luis Ayuso-Mateos. 2017. "The impact of subjective well-being on mortality: a meta-analysis of

longitudinal studies in the general population." *Psychosomatic medicine* 79(5):565-75.

Maslow, Abraham H. 1943. "A theory of human motivation." *Psychological review* 50(4):370.

Maslow, Abraham, and KJ Lewis. 1987. "Maslow's hierarchy of needs." *Salenger Incorporated* 14(17):987-90.

Mill, John Stuart, and Jeremy Bentham. 1987. *Utilitarianism and other essays*: Penguin UK.

Mize, Trenton, Long Doan, and J. Scott Long. 2019. "Comparing Predictions and Marginal Effects." *Sociological Methodology*.

Nickerson, Carol A. 2018. "There Is No Empirical Evidence for Critical Positivity Ratios: Comment on Fredrickson (2013)." *Journal of Humanistic Psychology* 58(3):284-312.

OECD. 2013. *OECD Guidelines on Measuring Subjective Well-being*: OECD.

—. 2017. *How's Life? 2017*: OECD.

—. 2018. *Health at a Glance: Europe 2018*: OECD.

Ozbay, Fatih, Douglas C Johnson, Eleni Dimoulas, CA Morgan III, Dennis Charney, and Steven Southwick. 2007. "Social support and resilience to stress: from neurobiology to clinical practice." *Psychiatry (Edgmont)* 4(5):35.

Peterson, Christopher, and Martin EP Seligman. 2004. *Character strengths and virtues: A handbook and classification*: Oxford University Press.

- Pettinicchio, David. 2012. "Institutional activism: reconsidering the insider/outsider dichotomy." *Sociology Compass* 6(6):499-510.
- Pevalin, David J, and John Ermisch. 2004. "Cohabiting unions, repartnering and mental health." *Psychological Medicine* 34(8):1553-59.
- Rindfleisch, Aric, Alan J Malter, Shankar Ganesan, and Christine Moorman. 2008. "Cross-sectional versus longitudinal survey research: Concepts, findings, and guidelines." *Journal of marketing research* 45(3):261-79.
- Rogers, Carl R, and Rosalind F Dymond. 1954. "Psychotherapy and personality change."
- Rorty, Amélie. 2005. *Philosophers on education: New historical perspectives*: Routledge.
- Rovner, Barry W, Pearl S German, Larry J Brant, Rebecca Clark, Lynda Burton, and Marshal F Folstein. 1991. "Depression and mortality." *Jama* 265(8):993-96.
- Ruggeri, Kai, Eduardo Garcia-Garzon, Áine Maguire, Sandra Matz, and Felicia A Huppert. 2020. "Well-being is more than happiness and life satisfaction: a multidimensional analysis of 21 countries." *Health and Quality of Life Outcomes* 18(1):1-16.
- Ryan, Richard M, and Edward L Deci. 2000. "Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being." *American Psychologist* 55(1):68.

- Ryff, Carol D. 1989. "Happiness is everything, or is it? Explorations on the meaning of psychological well-being." *Journal of Personality and Social Psychology* 57(6):1069.
- Ryff, Carol D, Jennifer Morozink Boylan, and Julie A Kirsch. "Advancing the Science of Well-Being: A Dissenting View on Measurement Recommendations." Pp. 521-35 in *Measuring Well-Being*: Oxford University Press.
- . 2021. "Eudaimonic and hedonic well-being: an integrative perspective with linkages to sociodemographic factors and health." Pp. 92-135 in *Measuring Well-Being*: Oxford University Press.
- Ryff, Carol D, and Burton Singer. 1998. "The contours of positive human health." *Psychological Inquiry* 9(1):1-28.
- Ryff, Carol D., and Corey Lee M. Keyes. 1995. "The structure of psychological well-being revisited." *Journal of Personality and Social Psychology* 69(4):719-27.
- Ryff, CD. 2014. "Psychological well-being revisited: advances in the science and practice of eudaimonia." *Psychother Psychosom* 83(1):10-28.
- . 2017. "Eudaimonic well-being, inequality, and health: Recent findings and future directions." *Int Rev Econ* 64(2):159-78.
- . 2018. "Well-being with soul: Science in pursuit of human potential." *Perspectives on Psychological Science*.
- Schnittker, Jason. 2017. *The Diagnostic System*: Columbia University Press.
- Seligman, Martin E. P. 2008. "Positive Health." *Applied Psychology* 57(s1):3-18.
- . 2011. "Authentic Happiness."

- . 2012a. *Flourish: A Visionary New Understanding of Happiness and Well-Being*: Atria Books.
- Seligman, Martin E. P., Marie J. C. Forgeard, Eranda Jayawickreme, and Margaret L. Kern. 2011a. "Doing the Right Thing: Measuring Well-Being for Public Policy." *International Journal of Wellbeing* 1.
- . 2011b. "Doing the Right Thing: Measuring Well-Being for Public Policy." *International Journal of Wellbeing* 1(1).
- Seligman, Martin EP. 2012b. *Flourish: A visionary new understanding of happiness and well-being*: Simon and Schuster.
- Seligman, Martin EP, and Mihaly Csikszentmihalyi. 2014. "Positive psychology: An introduction." Pp. 279-98 in *Flow and the foundations of positive psychology*: Springer.
- Sen, Amartya. 1993a. "Capability and well-being." *The quality of life* 30:270-93.
- . 1993b. "Capability and well-being⁷³." *The quality of life* 30.
- Silvia, Paul J. 2008. "Interest—The curious emotion." *Current Directions in Psychological Science* 17(1):57-60.
- Sirgy, M Joseph. 2012. "The psychology of quality of life: Hedonic well-being, life satisfaction, and eudaimonia." 50.
- Stewart-Brown, S. 2015. "Measuring wellbeing: What does the Warwick-Edinburgh Mental Well-being Scale have to offer integrated care?" *European Journal of Integrative Medicine* 7(4):384-88.

Stuckler, David, Aaron Reeves, Rachel Loopstra, Marina Karanikolos, and Martin

McKee. 2017. "Austerity and health: the impact in the UK and Europe."

European Journal of Public Health 27(suppl_4):18-21.

Susskind, Joshua M, Daniel H Lee, Andrée Cusi, Roman Feiman, Wojtek Grabski, and

Adam K Anderson. 2008. "Expressing fear enhances sensory acquisition."

Nature neuroscience 11(7):843.

Sweetman, David, Fred Luthans, James B Avey, and Brett C Luthans. 2011.

"Relationship between positive psychological capital and creative performance."

Canadian Journal of Administrative Sciences/Revue Canadienne des Sciences de l'Administration 28(1):4-13.

Tay, Louis, Andrew T Jebb, and Victoria S Scotney. "Assessments of Societal

Subjective Well-Being: Ten Methodological Issues for Consideration." Pp. 70-91 in *Measuring Well-Being*: Oxford University Press.

Tennant, R., L. Hiller, R. Fishwick, S. Platt, S. Joseph, S. Weich, J. Parkinson, J.

Secker, and S. Stewart-Brown. 2007. "The Warwick-Edinburgh mental well-being scale (WEMWBS): development and UK validation." *Health and Quality of Life Outcomes* 5.

Thomas, Claudia, Michaela Benzeval, and Stephen A Stansfeld. 2005. "Employment

transitions and mental health: an analysis from the British household panel survey." *Journal of Epidemiology & Community Health* 59(3):243-49.

Tracy, Jessica L, and Richard W Robins. 2007a. "Emerging insights into the nature and

function of pride." *Current Directions in Psychological Science* 16(3):147-50.

- . 2007b. "The psychological structure of pride: a tale of two facets." *Journal of Personality and Social Psychology* 92(3):506.
- Tropf, Felix C, Gert Stulp, Nicola Barban, Peter M Visscher, Jian Yang, Harold Snieder, and Melinda C Mills. 2015. "Human fertility, molecular genetics, and natural selection in modern societies." *PLoS One* 10(6):e0126821.
- Uchida, Yukiko, Vinai Norasakkunkit, and Shinobu Kitayama. 2004. "Cultural constructions of happiness: theory and empirical evidence." *Journal of Happiness Studies* 5(3):223-39.
- VanderWeele, T. J. 2017. "On the promotion of human flourishing." *Proceedings of the National Academy of Sciences of the United States of America* 114(31):8148-56.
- VanderWeele, Tyler J. 2019. "Measures of Community Well-Being: a Template." *International Journal of Community Well-Being* 2(3-4):253-75.
- Vanhoutte, B. 2015. "Hedonic and eudemonic wellbeing." ESS ERIC (2015) Measuring and reporting on Europeans' well-being: Findings from the European Social Survey.
- Vanhoutte, Bram. 2013. "The measurement of multiple dimensions of subjective well-being in later life." *The Sage Handbook of Aging, Work and Society*. Sage, Los Angeles.
- . 2014. "The multidimensional structure of subjective well-being in later life." *Journal of Population Ageing* 7(1):1-20.

Vázquez, Carmelo, Gonzalo Hervás, Juan José Rahona, and Diego Gómez. 2009.

"Psychological well-being and health. Contributions of positive psychology."

Annuary of Clinical and Health Psychology 5:15-27.

Vittersø, Joar. 2016. "Handbook of Eudaimonic Well-Being (International Handbooks of Quality-of-Life)."569.

Watson, Kelly J. 2018. "Establishing psychological wellbeing metrics for the built environment." *Building Services Engineering Research and Technology* 39(2):232-43.

Weiss, Alexander, James E King, Miho Inoue-Murayama, Tetsuro Matsuzawa, and Andrew J Oswald. 2012. "Evidence for a midlife crisis in great apes consistent with the U-shape in human well-being." *Proceedings of the National Academy of Sciences* 109(49):19949-52.

Wiertz, Dingeman. 2015. "A bridge too far? Volunteering, voluntary associations, and social cohesion." University of Oxford.

Williams, Richard. 2012. "Using the margins command to estimate and interpret adjusted predictions and marginal effects." *The Stata Journal* 12(2):308-31.

Wright, Peter R, and Robin Pascoe. 2015. "Eudaimonia and creativity: The art of human flourishing." *Cambridge Journal of Education* 45(3):295-306.

2 THE SHORT WARWICK- EDINBURGH MENTAL WELL-BEING SCALE IN THE UK'S UNDERSTANDING SOCIETY

This chapter analyses the Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS) based on Understanding Society (UKHLS) data for the United Kingdom. The SWEMWBS has been designed to be a comprehensive and innovative scale of overall positive mental health (PMH). In most existing publications, the SWEMWBS has only been used based on smaller datasets or in clinical settings, but Understanding Society allows for the analysis of PMH in the general population with the highest-quality data.

The first part of this chapter presents the distribution of the SWEMWBS and its bivariate associations with major demographic and sociological variables.

The second part tests the empirical prevalence of the dual continua approach of mental health with a focus on the diagonal and off-diagonal groups of flourishing, floundering, struggling, and languishing. The relevant predictors of these groups and the consequences of memberships in these groups over time are tested.

The third part compares the SWEMWBS with competing and more established mental health variables, especially the GHQ as a measure of negative mental health.

Longitudinal evidence is presented on trends and stability of mental health over time. Furthermore, innovative findings about the problems of measuring subjective well-being through ordinal scales are presented regarding Diener's ordinal life satisfaction measure.

The fourth part analyses the seven subdomains of the SWEMWBS in detail and tests their psychometric as well as substantive qualities against a range of comparison variables. Modern statistical techniques in terms of Item Response Theory, polychoric correlations, multidimensional scaling, and more established exploratory factor analysis are used for the descriptive statistics and psychometric analyses. It is found that the

SWEMWBS has favourable psychometric and distributional properties, but researchers could also be interested in the subdomains of optimism and meaning.

The fifth part introduces objective evidence about the relationship of PMH with physiological health through allostatic load data.

Overall, the chapter finds that the SWEMWBS is very strongly associated with socio-demographic and socio-economic conditions that are of essential concern to sociologists. The SWEMWBS has favourable psychometric properties and can be seen as a useful scale for well-being research in sociological applications with a potential explanatory power that exceeds the mere absence of mental illness. The dual continua model of mental health is reflected in empirical reality and can tell the researcher new or at least more nuanced insights. Nonetheless, NMH and PMH are still moderately highly correlated constructs, so one might surmise that the distinction between the two concepts should not be overexaggerated as the total opposite. Two subscales of the SWEMWBS, namely “feeling useful” and especially “feeling optimistic”, show promise to capture a useful amount of truly distinct PMH and could be analysed separately.

2.1 Introduction

Mental health indicators have been used in mainstream social surveys for many decades. Starting with the Social Indicators Movement in the 1970s (Land and Michalos 2018), academics and practitioners alike agreed on the importance of subjective data for understanding individual-level preferences, quality-of-life conditions, and health levels. Self-rated health is the most universally accepted and frequently validated subjective indicator. Many similar subjective health and mental health indicators are utilised by pharmaceutical companies to evaluate the effectiveness of their drug treatments. Recent research suggests that the predictive quality of self-rated health on mortality is even

increasing over time and that each of the four levels on a four-point scale shows favourable psychometric properties (Schnittker and Bacak 2014).

This chapter poses the question of whether the SWEMWBS has the potential of achieving similar robustness as existing mental health measures and whether it delivers an added value in terms of PMH that is not provided by existing scales of NMH or other aspects of mental health that are well-captured through life satisfaction. The SWEMWBS is the shortened version of the full Warwick-Edinburgh Mental Well-Being Scale. Building on the Affectometer 2 in New Zealand (Tennant, Joseph and Stewart-Brown 2007), the WEMWBS was introduced in 2007, and it has found widespread popularity in medical fields. It is purposefully designed to measure positive mental health as opposed to negative mental health. It defines PMH as *both feeling good and functioning well*, and it thus includes and combines different philosophical (hedonia and eudaimonia) and psychological aspects (positive affect and life satisfaction) of positive mental health. The authors state that there is

"one end of a continuum of mental health with the opposite end being mental illness, mental health problems or psychiatric disorders. The concept of mental well-being defined by SWEMWBS is therefore much more than the absence of mental illness. People who have been given a diagnosis of mental illness can and do experience well-being when their illness is not making them feel bad or function poorly." (Stewart-Brown et al. 2009b)

The full WEMWBS, and especially the SWEMWBS, are not directly focused on eudaimonia in its classical Aristotelian sense but on psychological functioning that reinterprets eudaimonic ideas through modern concepts of psychological *functioning* and self-realisation (Stewart-Brown et al. 2011). The first aspect of the SWEMWBS's definition of PMH, feeling well, relates to hedonia, positive affect and satisfaction. In

practice, the SWEMWBS' purpose is to measure overall (multidimensional) positive mental health, and the philosophical and psychological meanings of the subdimension are not entirely strict. The rationale behind the overall choice of items is to include “affective-emotional aspects, cognitive-evaluative dimensions and psychological functioning” (Fung 2019a). Although presumably correlated, the SWEMWBS does not include items on spirituality and purpose in life: For monitoring well-being in the general population, different groups of respondents might perceive, and not reach a consensus about, these items as they relate to well-being. This chapter will illuminate whether the pooling of different dimensions of positive mental health into one scale leads to clear results or whether one might want to separate the items depending on the specific research needs.

The inventors of the WEMWBS and SWEMWBS have presented the scale as the new “gold standard” of well-being research (Stewart-Brown 2015b; Tennant et al. 2007a). The WEMWBS has highly favourable internal consistency scores, and it has indeed been validated in many small-to-medium-scale individual studies (Bartram et al. 2011; Bass et al. 2016; Gremigni and Stewart-Brown 2011; Lloyd and Devine 2012; Maheswaran et al. 2012; Stewart-Brown et al. 2009a; Tennant et al. 2007a). Moreover, the SWEMWBS has been translated into several languages or adapted at a country level, including Brazilian (Santos et al. 2015), Chinese (Dong et al. 2016; Fung 2019b; Taggart et al. 2013), Danish (Koushede et al. 2019), Dutch (Ikink, Lamers and Bolier 2012), French (Trousselard et al. 2016), German (Lang and Bachinger 2017), Korean (Kim et al. 2014), Norwegian (Smith et al. 2017), Pakistani (Waqas et al. 2015), Spanish (Castellví et al. 2014; López et al. 2013) and Swedish (Haver et al. 2015) as well as various others. The cross-cultural validity of the WEMWBS has generally been judged to be positive, and national norms have been developed (Ng Fat et al. 2017; Stewart-Brown 2013; Taggart et al. 2013). There is emerging evidence that the

WEMWBS is less prone to social desirability than other competing scales, such as the GHQ, and that it is sensitive to changes.

While the WEMWBS consists of 14 subscales, the SWEMWBS is a reduced form of 7 subscales. Items with lower correlations to the overall scales were excluded. Based on Rasch modelling, the SWEMWBS has been tested to meet statistical requirements to capture most of what the WEMWBS measures. However, while the WEMWBS clearly relates to all aspects of PMH, the SWEMWBS' subscales relate most strongly to psychological functioning (which includes the eudaimonic perspective) – which is in line with the research strategy of this thesis. The SWEMWBS has not been as extensively tested and used as the WEMWBS, but the existing evaluations have all been favourable (Stewart-Brown et al. 2009b).

Even though in the last five years, there were more than 100 publications annually using the WEMWBS or SWEMWBS, some of the core requirements that Tennant and Stewart-Brown made in 2007 when introducing the scale are still unfulfilled (Tennant et al. 2007c). Firstly, the WEMWBS needs to be evaluated, tested, and verified in the general population as opposed to the student or clinical samples on which it was based. Secondly, the WEMWBS needs to be tested longitudinally over a large number of years. Thirdly, it needs to be investigated whether the WEMWBS can be reduced in length. Fourthly, its sensitivity to changes needs to be explored in more detail. Fifthly, its subdimensions and their relationship to the notion of positive mental health need to be understood in more detail. This chapter, as well as the thesis overall, will deliver partial answers to all these questions.

There is a crucial conceptual and theoretical point to consider for sociologists interested in mental health and positive mental health, especially: While it may be the case that the SWEMWBS meets common expectations of psychometric validity and reliability in a

given small to medium-sized settings, this does not automatically answer the question whether such a new scale proves to be useful and reliable in large-scale household panel surveys that focus on broader social and economic conditions amid a large array of different questionnaire themes and various research themes. In fact, the SWEMWBS needs to prove its case because there exists already an intensively used indicator of negative mental health, the GHQ, as well as a scale of overall life satisfaction, and the scales of physical and mental health component scores of the Short-Form 12.

While the GHQ is designed to measure negative mental health symptomology and depression, some of its subscale items are positively worded and could correlate significantly with the SWEMWBS. Life satisfaction represents the cognitive dimension of mental health on a single-item scale, while the SWEMWBS attempts to measure overall positive mental health by integrating hedonic, eudaimonic, psychological functioning and social well-being. As is the case for the subscales of the GHQ, they partly overlap with the SWEMWBS, and there is nothing preventing researchers from using the subdimensions to compute their own mental health scales as they see fit.

The greatest value of a positive mental health scale for Understanding Society would arguably lie in measuring high and top levels of *flourishing* in a way that cannot be done with the more established measures. The focus of *positive* psychology as promoted by Martin Seligman and of *positive* mental health is at least implicitly, but arguably by definition and by name, the *positive*, i.e., the higher levels, of positive mental health.

The following research questions are addressed in this empirical chapter:

1. Who is flourishing? How strongly is the SWEMWBS associated with sociological and demographic conditions?

2. Does the dual continua model of mental health hold up in empirical reality?
What are the predictors of the off-diagonal groups (struggling and languishing)?
Does belonging to these groups have different empirical consequences over time?
3. How does the SWEMWBS compare with other mental health scales in Understanding Society?
 - a. How stable are the scores on the SWEMWBS longitudinally?
 - b. Is life satisfaction as an ordinal single-item measure a good scale?
4. How are the domains of the SWEMWBS relating to each other and with sociological and demographic conditions? What are the details and psychometric properties of these domains?
5. What are the associations of PMH with objective health in terms of allostatic load measures?

2.2 Methodology

2.2.1 Data

Data of wave one is analysed cross-sectionally and data from waves one to ten of the United Kingdom Household Longitudinal Survey (Understanding Society) are analysed longitudinally. The survey annually collects data on the General Health Questionnaire (GHQ) (Goldberg and Hillier 1979), and life satisfaction (Diener et al. 1985; Diener 1984) - as was already the case with the predecessor, the British Household Panel Survey (BHPS). The new Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS) is collected every three waves (waves one, four, seven, ten, and so on). Given that Understanding Society is the world's largest household survey and given that it includes unique data such as blood measurements that were collected via nurse visits, this creates the unique opportunity of carrying out a detailed comparison of these major

mental health variables with data that is representative of the entire population. As biological and physiological data were collected by nurse visits in waves 2 and 3, the analysis of the allostatic load with the SWEMWBS and covariate responses at wave one were merged with the nurse data from roughly one year later.

2.2.2 Statistical modelling

In the following sections, the SWEMWBS, its subscales as well as other mental health variables will be compared with each other as well as stratified against various sociological and life course conditions. Descriptive statistics of the main demographic and sociological variables as well as the overall mental health scales, follow in Table 6.

All descriptive statistical values such as means, standard deviation, and confidence intervals are survey-weighted based on the cross-sectional wave one of Understanding Society.

2.2.3 Sample selection

Mainly respondent information from wave 1 of the UKHLS is used for the analyses in this study, but wave two (allostatic load), wave three (BIG5 personality factors) and wave ten (changes in mental health and smoking behaviour) are employed as well. The major strength of the UKHLS is its extremely large sample size and inclusion of minority populations, so efforts have been made to describe trends in PMH that can be seen to be representative of the United Kingdom at this cross-sectional point in time. This is a major strength of this chapter, as most research articles that used the SWEMWBS were based on convenience or small samples. To ensure representativeness, survey weights have been used, which take into account the different likelihoods of certain groups of people to have been part of the study and to have completed the self-completion component of the UKHLS through which the SWEMWBS data were gathered (Lynn et al., 2020).

The emphasis does not lie in the selection of an identical sample across all possible statistical comparisons but in the inclusion of the maximum amount of data to maximise representativeness. Missingness on the SWEMWBS was minor at less than 5% once taking into account the sampling design and weights of the survey.

2.2.4 Variables

Mental health variables

The three main mental health variables are the SWEMWBS (7 items) for PMH, the GHQ (12 items) for NMH, and life satisfaction (single item). In most of the comparisons and psychometric tests, all mental health scales and their subscales have been standardised for comparability. A positive coefficient on the SWEMWBS or its domains always corresponds to better/higher positive mental health, and a negative coefficient corresponds to lower/worse positive mental health. Whenever sensible, the GHQ has also been reverse-coded so that a higher response corresponds to lower mental illness: as a negative mental health measure, a higher score normally indicates worse mental health.

Control variables

In terms of the main covariates used in the models and graphs (Table 6), marital status has been categorised into four groups, those who are single or never married, those who are in a partnership or married or living together as if married, those who are separated or divorced, and those who are widowed. The variable for the “number of children currently living in the household” is a continuous measure from zero to nine. Racial or ethnic background is operated through a binarised indicator for “white British” against all other racial categories in the regression models. A variable for “long-standing illness” measures the presence of chronic and significant physical health conditions. For graphs, age has been categorised into age groups, but for the ordered-logistic regression

model and the marginal effects, it is used as a continuous variable. Educational attainment, social class and job status are also used as categorical indicators. The mental health variables are described in detail in the text.

The SWEMWBS asks respondents about “experience over the last 2 weeks”, the GHQ refers to how they “have been feeling recently”, and the SF-12 asks for “activities during a typical day” and “during the past 4 weeks”. While the GHQ, like the SWEMWBS, includes many positively worded items, the philosophy of the SWEMWBS might argue that they are more connoted with a negative situation, such as overcoming difficulties, and therefore not identical and that the GHQ excludes the important aspect of social well-being.

2.3 Results and Analyses

In wave one, the UKHLS provides information on 50,994 individuals who are nested in 30,035 households. The design of such a large study is, of course, complex, partly because of sampling differences in regions in the United Kingdom (see Lynn et al., 2020), partly because of various technical sampling conditions and stratifications, partly because not all individuals were asked to complete all sections of the study, and partly because not all respondents answer all of the questions that they were intended to answer (i.e., missing data). As only the 40,513 individuals who completed the self-completion section of the UKHLS provided information on their levels of mental health, survey weights have been used to account for this potential selection bias.

As shown in Table 5 in the second panel, 38,395 of the 40,513 individuals who completed the self-completion questionnaire answered all 7 items of the SWEMWBS, and they, therefore, have a non-missing SWEMWBS score. Comparing this to the established GHQ, for which there were 39,700 valid responses (panel 3), only 1,864 or around 5% more responses on the SWEMWBS were missing than on the GHQ.³² Moreover, as shown, the majority of respondents with missing information on the SWEMWBS only skipped one or two items and not the entire set of 7 items, so it would be possible to impute their full SWEMWBS by taking the adjusted average across existing scores. The creators of the SWEMWBS encouraged such a strategy, but given the small extent of missingness of the data that were used in this chapter, the UKHLS-provided full SWEMWBS score has been used with survey weights.³³

³² $39,700 - 37,836 = 1,864$ responses, as seen panel 3.

³³ The Stata command for weighting the cross-sectional data set with adjustment for self-completion in wave 1 (`a_indresp`) was: `svyset a_psu [pweight = a_indscus_xw], strata(a_strata)`. Subsequent bivariate analyses use command such as: `svy, subpop (if a_agegr10_dv!=. & a_swemwbs_dv!=.): mean a_swemwbs_dv, over(a_agegr10_dv)`

Table 5 Sample selection and missingness statistics in (UKHLS wave 1).

Number of missing responses on the SWEMWBS items	N	Percentage	Cumulative percentage
Out of all available data at wave 1			
0	38395	75.3	75.3
1	767	1.5	76.8
2	167	0.3	77.1
3	71	0.1	77.3
4	58	0.1	77.4
5	62	0.1	77.5
6	331	0.7	78.2
7	11143	21.9	100.0
Total	50994		
Respondents with self-completion data			
0	38395	94.8	94.8
1	767	1.9	96.7
2	167	0.4	97.1
3	71	0.2	97.3
4	58	0.1	97.4
5	62	0.2	97.6
6	331	0.8	98.4
7	662	1.6	100.0
Total	40513	100.0	
Respondents with self-completion data and non-missing responses on the GHQ			
0	37836	95.3	95.3
1	730	1.8	97.1
2	154	0.4	97.5
3	63	0.2	97.7
4	45	0.1	97.8
5	52	0.1	97.9
6	305	0.8	98.7
7	515	1.3	100.0
Total	39700	100.0	

Table 6 Descriptive statistics of the covariates: N = 35,957 (UKHLS wave 1)

	Mean/Prop.	n	Freq.
Gender: Female	.56	35957	
<u>Age groups</u>		35957	
25-29	.09		3152
30-34	.09		3251
35-39	.10		3728
40-44	.11		3975
45-49	.11		3793
50-54	.09		3406
55-59	.09		3107
60-64	.09		3387
65-69	.07		2656
70+	.15		5502
<u>Highest qualification</u>		35936	
No qual	.19		6794
Other qual	.12		4286
GCSE etc	.19		6853
A level etc	.16		5787
Other higher	.12		4354
Degree	.22		7862
<u>Marital status</u>		35948	
Single	.13		4531
In partnership	.69		24979
Separated	.10		3722
Widowed	.08		2716
Children in hhold	.30	35957	
<u>Economic activitiv</u>		35950	
Employed	.56		20118
Unemployed	.05		1813
Retired	.26		9318
Home/maternity	.07		2602
Student	.01		283
Long-term sick	.04		1570
other	.01		246

N=Size of the total sample. n=Number of observations.

SD=Standard deviation.

Table 6 provides descriptive statistics of the sample characteristics of the individuals with self-completion information in wave 1. The univariate distributions are not of immediate interest but only used for reference for the bivariate analyses with mental health, but one could note that the characteristics seem to capture people across all of the life conditions and in terms of age, educational status, marital status and so on.

2.3.1 Who is flourishing? How strongly is the SWEMWBS associated with demographic and sociological conditions?

In Table 7 bivariate comparisons of the SWEMWBS with important comparison variables are offered. Survey-weighted 95% confidence intervals have been calculated around the mean SWEMWBS scores for each categorical comparison group.

Addressing the contentious debate about the development of happiness over the life course, scholars such as Oswald have made a case for a universal U-shaped distribution of happiness, that is, high levels of happiness in younger ages, a steep drop for the middle-aged (“midlife crisis”) and then returning levels of happiness from the late 50s onwards. The statistics mostly confirm a U-shaped distribution of positive mental health over age, but it is especially at older ages that people are reporting the highest levels of PMH. On average, the highest level of PMH (26.3) is found among ages 65-69, and there is only a relatively small drop to about 25.8 for ages 75-84. The contrast between the highest and lowest levels of PMH by age group is quite large at almost 2 points on the SWEMWBS. Young respondents aged 25-29 report higher levels of PMH than any other age until the group of ages 55-59. The drop between the middle life course and younger ages is relatively modest, however, at less than 0.5 points.

As a caveat, one should note that the data is cross-sectional, so the differences in PMH might stem from cohort or generational effects. Nonetheless, it is quite unexpected to

see that flourishing in terms of high levels of PMH is particularly pronounced in older ages, especially as one would expect increasing physical health problems to have a negative effect on mental well-being. On the other hand, Aristotle's notion of *eudaimonia* carries aspects of wisdom and a holistic life course evaluation that might be reflected here. Mental health might also be boosted by retirement and more leisure time. The very high levels of well-being in old age might, to a small extent, be a selection or rather survival effect in that people with better mental health live longer lives (see the last empirical chapter).³⁴

Coming to sociologically important variables, what is the relationship between PMH and educational attainment? As seen in Table 7, there is a near-linear positive association between higher levels of education and higher levels of PMH. People with a degree have an average score of about 26 on the SWEMWBS, while people without any qualifications have a score of 24.5. The pathways in which education could affect PMH can be numerous, but one could hypothesise that intellectual development and curiosity, better job prospects and careers, and otherwise improved life conditions foster the potential for higher well-being and self-realisation. People with "other qualifications" score significantly better than people with no qualifications or with A-Levels; this might be due to a combination of factors such as a rewarding career in a practical/vocational job or also related to generational differences.

³⁴ Interestingly, this very pronounced boost in PMH is not apparent in the GHQ.

Table 7 Survey weighted bivariate statistics of the SWEMWBS with sociological and demographic variables of interest in the UKHLS wave 1.

Variable	Category	Mean	L95%	U95%
Gender	Men	25.3	25.2	25.4
	Women	25.1	25.0	25.2
Age groups	10-19 years old	25.2	25.0	25.4
	20-29 years old	25.0	24.9	25.1
	30-39 years old	25.0	24.8	25.1
	40-49 years old	24.8	24.6	24.9
	50-59 years old	24.9	24.8	25.1
	60-69 years old	26.1	26.0	26.2
	70 years or older	25.8	25.6	25.9
Marital status	Single	24.7	24.6	24.8
	In partnership	25.5	25.4	25.6
	Separated	24.2	24.1	24.4
	Widowed	25.2	25.0	25.5
Educational qualifications	No qual	24.6	24.4	24.7
	Other qual	25.1	24.9	25.2
	GCSE etc	24.7	24.6	24.8
	A level etc	25.2	25.1	25.3
	Other higher	25.5	25.4	25.7
	Degree	26.0	25.9	26.1
Employment status	Employed	25.4	25.4	25.5
	Unemployed	23.5	23.2	23.7
	Retired	25.9	25.8	26.0
	Home/maternity	24.5	24.3	24.7
	Student	25.5	25.3	25.7
	Long-term sick	20.7	20.4	21.0
	other	24.1	23.5	24.7
Health	Health problem	24.3	24.2	24.4
	No health problem	25.7	25.6	25.8
Negative mental health	Absence of NMH	26.2	26.1	26.2
	Presence of NMH	20.8	20.6	20.9

In a similar way to education, another dimension of social stratification is social class. Again, a higher “position” is associated with significantly higher PMH (Table 8). Respondents working for large employers and in higher management positions have an average score above 26 on the SWEMWBS, while respondents in routine jobs (the lowest class) only have a score of about 24.5. The trend is again mostly linear across categories, but one can notice that working independently (small employers and own account) seems to be slightly better for PMH than working in intermediate status jobs, even though the intermediate job is ranked higher along the social class axis. This could be the case because of the higher levels of independence and autonomy that the self-employed enjoy. Future research could investigate whether people who value independence - either in itself or for their own mental well-being - selectively chose jobs based on these characteristics and/or whether the nature of these jobs has an independent effect net of preferences and self-selection.

The mentioned education and job status differences are quite significant and indicate that social conditions are strongly related to PMH. While this finding is not entirely surprising in the light of existing research on negative mental health or life satisfaction with socio-economics status (Yu and Williams, 1999), it at least shows that PMH is, on the surface, similarly relevant to and affected by social stratification and might even have a particularly strong association or direct connection with it.

Regarding marital status, respondents who are in a partnership benefit from nearly a 1.5-point higher level of PMH than respondents who are single or separated.

Interestingly, widowed respondents do not suffer from a lower level of PMH than the married, possibly suggesting a long-lasting effect of marriage, an age effect, or that widowed respondents who are coping well in old age also have higher scores of PMH because of their independence.

A powerful sociological application of PMH might be the ways in which it is a result of upbringing and longer-term socialisation. Table 8 further shows that even parental socio-economic status (measured on the father's side when the respondent was 14 years of age) is linearly and significantly, although of course not quite as strongly as in the previous comparison, associated with the respondents' levels of PMH. If the father worked for a large employer or in higher management, on average, the survey respondent would be predicted to have higher PMH than if the father worked in a more routine job. While this will partly be an effect of socialisation and an improved chance of the respondent finding a higher-status job oneself, it does suggest that there are long-term effects of the social environment on well-being.

Sometimes critics of positive psychology have pointed out that some of the discourse and narrative regarding concepts of mental health or character education are a distinctly classed phenomena (Sayer, 2020), which might not resonate with people in unfavourable work and life conditions: When trying to cope with the daily stresses and uncertainties of low-paid work, many of these respondents might not have much interest in entertaining academic notions of the multidimensionality of mental well-being. On the other hand, negative mental health conditions are quite prevalent across social strata, and even the medical language regarding certain molecules or drugs has become widespread in everyday culture and medical narratives (Davis, 2020). It might be the case that social advantage partly works through positive mental health, for instance, that growing up in a privileged position engrains certain self-confidence and optimism that then leads to advantages of the life course.

Table 8 Survey weighted bivariate statistics of the SWEMWBS with own social class and father's social class in the UKHLS wave 1.

Variable	Category	Mean	L95%	U95%
Father's social class (NSSEC8)	Large employers & higher management	25.8	25.6	26.0
	Higher professional	25.6	25.4	25.8
	Lower management & professional	25.5	25.4	25.7
	Intermediate	25.4	25.2	25.5
	Small employers & own account	25.2	25.0	25.3
	Lower supervisory & technical	25.2	25.1	25.4
	Semi-routine	25.2	25.0	25.3
	Routine	25.0	24.9	25.2
Respondent's social class (NSSEC8)	Large employers & higher management	26.2	25.9	26.4
	Higher professional	26.0	25.8	26.1
	Lower management & professional	25.8	25.7	25.9
	Intermediate	25.2	25.0	25.3
	Small employers & own account	25.6	25.4	25.7
	Lower supervisory & technical	25.3	25.1	25.5
	Semi-routine	24.9	24.8	25.1
	Routine	24.8	24.5	25.0

2.3.2 The dual continua model

A key proposition of the PMH approach is that the presence of mental well-being is distinct from the absence of mental illness, as previously discussed in the theoretical section of the dual continua model and related concepts of positive psychology.

The standard approach in the literature when categorising positive psychological scales is to divide responses into tertiles (Keyes, 2002), i.e., the groups of lowest, mid, and highest levels. As there is a well-validated cut-off score of having three or more symptoms on the caseness scoring of the GHQ, this binary score is used to define the presence or absence of mental illness. Applying the dual continua to the empirical distributions of data, one can then define the following groups by cross-tabulating the tertiles on the SWEMWBS with the absence or presence of negative mental health:

- flourishing as being in the top tertile of the SWEMWBS and not having a mental illness.
 - 30.5% of people in the UK can be considered to be flourishing.
- floundering as being in the bottom tertile of the SWEMWBS and having a mental illness.
 - 15.0% of people in the UK can be considered to be floundering.
- Struggling as not being in the bottom tertile of the SWEMWBS but having a mental illness.
 - 3.5% of people in the UK can be considered to be struggling.
- Languishing as being in the bottom tertile of the SWEMWBS but not having a mental illness.
 - 25.3% of people in the UK can be considered to be languishing.

Because of the clustering of responses on average levels across both scales, a fifth category of moderate positive mental health was created just so that the cases which

were not captured by the four groups were not dropped from the analyses. This group captures responses across mid-tertile scores on the SWEMWBS and low scores on the GHQ and fits 25.8% of people in the UK. The distributions of the five groups are shown in Table 9. Table 10 provides the detailed cross-tabulations based on which the categorisations for the diagonal and off-diagonal groups were made. The distributions are quite similar to what Corey Keyes reported with regards to the US population and the Mental Health Continuum Short Form (2002), but with somewhat higher levels of flourishing which is likely a result of the relatively generous tertile grouping for the top-level.

Table 9 Empirical status of the dual continua model and off-diagonal groups in the UKHLS wave 1.

Dual continua	n	Percentage
Flourishing	11540	30.5
Floundering	5667	15.0
Struggling	1309	3.5
Languishing	9564	25.3
Moderate PMH	9756	25.8
Total	37836	100.0

Table 10 Cross-tabulation of PMH and NMH (cut-off scoring) to empirically test the dual continua model.

	PMH (WEMWBS)			Total
	Lower Tertile	Middle Tertile	Upper Tertile	
Absence of NMH	9,564	9,756	11,540	30,860 n
	31.0	31.6	37.4	100.0 row %
	25.3	25.8	30.5	81.6 cell %
Presence of NMH	5,667	930	379	6,976 n
	81.2	13.3	5.4	100.0 row %
	15.0	2.5	1.0	18.4 cell %
Total	15,231	10,686	11,919	37,836
	40.3	28.2	31.5	100.0
	40.3	28.2	31.5	100.0

Table 11 Cross-tabulation of PMH and NMH in terms of tertiles to empirically test the dual continua model.

NMH (GHQ)	PMH (WEMWBS)			Total
	Lower Tertile	Middle Tertile	Upper Tertile	
Lower Tertile	2,158	4,014	7,496	13,668 n
	15.8	29.4	54.8	100.0 row %
	5.7	10.6	19.8	36.1 cell %
Middle Tertile	5,216	4,896	3,739	13,851 n
	37.7	35.4	27.0	100 row %
	13.8	12.9	9.9	36.6 cell %
Upper Tertile	7,857	1,776	684	10,317 n
	76.2	17.2	6.6	100.0 row %
	20.8	4.7	1.8	27.3 cell %
Total	15,231	10,686	11,919	37,836 n
	40.3	28.2	31.5	100.0 row %
	40.3	28.2	31.5	100.0 cell %

As shown in Table 10, respondents who are classified as being without NMH (absence) have almost equal chances (between 31% to 37%) of being in each of the tertiles of the SWEMWBS, suggesting only a weak to moderate relationship between NMH and PMH. Nonetheless, 81% of those with NMH (presence) are in the lowest tertile of PMH, but still, 13% are in the mid tertile, and 5% are in the top tertile of the SWEMWBS.

On top of these summative frequencies that reflected the prevalence of the dual continua model, it is illustrative to consider even more detailed cross-tabulations of PMH and NMH by also looking at the tertiles of NMH (Table 11): Out of respondents who are in the lowest tertile of the GHQ (i.e., those with the least mental illness), only around half of these respondents are in the top tertile of the SWEMWBS. This shows that negative and positive mental health are not the complete opposite and not direct mirror images. For the remainder of respondents from the lowest tertile of NMH, 29% are in the mid-tertile of the SWEMWBS, and 16% are in the lowest tertile of the SWEMWBS, thus suggesting significant heterogeneity: The absence of psychological distress is not a full predictor of the presence of PMH.

On the other extreme, respondents who are in the tertile with the most elevated extent of psychological distress (top tertile on the GHQ/NMH), around 7%, are simultaneously in the top level of PMH. While this only applies to a small proportion of respondents overall, this represents evidence of the dual continua model overall. Not less interesting are the middle levels: Out of respondents in the middle tertile of NMH, 38% are in the lowest tertile on PMH, 35% in the middle and 27% in the top, again suggesting significant levels of variability.

One might say that in a hypothetical scenario in which having the lowest levels of NMH would perfectly predict being in the top levels of PMH, this would be evidence against

the dual continua model, but the empirical results show that this is not the case. On the other hand, as a certain shared trend and correlation between NMH and PMH also exist, one should not present these concepts as total opposites. Other empirical specifications, for instance, in terms of using quartiles instead of tertile or using standard deviations to group responses, could lead to a reduction in the variability as one would be selecting on increasingly strict criteria and focus more on extreme cases of extremely severe depression with extremely high PMH, which might be interesting but unreasonably strict, but the results would point to a similar direction.

As will be shown later in this chapter and throughout the applied empirical chapters that follow, the domain of the SWEMWBS that relate to optimism has been found to capture a uniquely powerful and distinct aspect of PMH. This finding is also in line with other research that found strong predicted effects of hope and optimism on mortality risk. Table 12 cross-tabulated the response categories of optimism with the absence and presence of NMH as a way of testing the empirical distribution of the dual continua model applied to this specific domain of PMH. Again, it is found that the presence of NMH does not fully predict levels of optimism: 20.5% of respondents with mental illness report feeling optimism often or all the time and, in turn, “only” 34.4% of respondents with mental illness report feeling optimistic none of the time or rarely. What this means is that a large section of people with mental illness is still predominantly optimistic. As expected, the absence of NMH is associated with higher levels of optimism, e.g., 47.7% are optimistic often or all of the time, but, still, 13% of people without mental illness are only rarely or never optimistic.

Speculatively, one could conceive that given the negative effects of certain sociological conditions or inequalities and inequities on mental health, which are linked with higher risks of depression and illness, interventions to increase PMH domains, such as

optimism, could potentially act as buffers. Moreover, when the concern is not just with the prevention of mental illness but with the flourishing of the population, PMH indicators would provide richer data.

Table 13 prints the associations of the groups of the dual continua model with key sociological and demographic variables. The table thus points to the predictors of these groups, especially the off-diagonal groups of struggling and languishing that would not be identified without the dual continua model. Since there is a lot of information provided in this table, the comparisons between flourishing and floundering, floundering and struggling, and struggling and languishing are especially relevant.

Table 12 Cross-tabulation of the optimism domain (PMH) with NMH (cut-off scoring).

	Optimism domains of the SWEMWBS (PMH)					Total
	None of the time	Rarely	Some of the time	Often	All of the time	
Absence of NMH	1,048	3,041	12,485	11,531	3,416	31,521 n
	3.3	9.7	39.6	36.6	10.8	100.0 row %
	61.1	62.7	79.4	90.9	91.2	81.4 col %
	2.7	7.9	32.2	29.8	8.8	81.4 cell %
Presence of NMH	666	1,810	3,238	1,159	330	7,203 n
	9.3	25.1	45.0	16.1	4.6	100.0 row %
	38.9	37.3	20.6	9.1	8.8	18.6 col %
	1.7	4.7	8.4	3.0	0.9	18.6 cell %
Total	1,714	4,851	15,723	12,690	3,746	38,724 n
	4.4	12.5	40.6	32.8	9.7	100.0 row %
	100.0	100.0	100.0	100.0	100.0	100.0 col %
	4.4	12.5	40.6	32.8	9.7	100.0 cell %

Table 13 Cross-tabulation of the dual continua model with descriptive statistics (UKHLS wave 1).

	Flourishing Mean/Prop.	Floundering Mean/Prop.	Struggling Mean/Prop.	Languishing Mean/Prop.	Moderate PMH Mean/Prop.
Gender: Female	.56	.63	.63	.54	.53
Age	46.78	44.03	44.35	44.43	45.53
<u>Highest qualification</u>					
No qualification	.13	.17	.14	.17	.12
Other qualification	.09	.11	.09	.11	.10
GCSE etc	.18	.23	.16	.24	.21
A level etc	.20	.20	.19	.20	.20
Other higher	.13	.11	.12	.11	.13
Degree	.27	.18	.29	.18	.25
<u>Marital status</u>					
Single	.20	.26	.23	.26	.22
In partnership	.67	.54	.62	.61	.66
Separated	.07	.13	.10	.09	.07
Widowed	.06	.06	.05	.05	.05
Children in hhold	.27	.32	.30	.32	.29
<u>Economic activity</u>					
Employed	.56	.46	.49	.55	.60
Unemployed	.04	.11	.09	.07	.05
Retired	.24	.14	.18	.18	.19
Home/maternity	.06	.09	.09	.08	.07
Student	.08	.06	.10	.07	.07
Long-term sick	.01	.11	.05	.03	.01
other	.01	.01	.01	.01	.01
White British	.79	.78	.69	.80	.82
Health: Long-standing illness	.72	.46	.59	.64	.68
<u>Religiosity (attendance)</u>					
never/special occ.	.58	.66	.55	.66	.63
infrequent	.17	.15	.17	.14	.16
> once a month	.08	.07	.09	.07	.07
> once a week	.17	.12	.20	.13	.13
<u>Religiosity (importance)</u>					
no difference	.38	.40	.33	.45	.43
little difference	.17	.18	.18	.19	.19
some difference	.21	.21	.22	.19	.21
great difference	.24	.20	.28	.17	.18

On the comparison of flourishing and floundering, the bivariate statistics follow relatively well-established empirical facts, for instance, that higher education is linked with lower rates of mental illness and higher rates of mental health or that women have worse mental health than men.

Somewhat surprisingly, however, is that the dual continua category of struggling shows very similar patterns as the one of flourishing on the sociological covariates, even though people who are struggling have been classified as having a mental illness. This could indicate that people with higher education who do suffer from mental illness can use their resources or experiences to still achieve high levels of PMH, for instance, via achievements or self-actualisation at work or by having a great social network and social support. Indeed, people in the struggling category have the highest levels of education (29% have a degree compared to 18% in floundering or languishing), and they also have the highest rates of religiosity. Regarding religiosity, there could also be a coping effect, in that people who suffer from mental illness seek religion as a coping or stress buffering mechanism (Voytenko et al., 2021), which was even found to be very important during the COVID-19 pandemic (Cowden et al., 2022).

Interestingly, respondents who are languishing have very similar patterns with regard to education as people who are floundering, even though these languishing respondents do not have a mental illness. Moreover, languishing respondents have the second highest level of self-rated health (0.64 for languishing compared to 0.75 in flourishing vs 0.46 in floundering), which suggests that languishing is not just another side of floundering but is substantively different on more objective indicators.

Moving on to the predictive power of the dual continua model, the differential associations of the baseline categories with the BIG5 personality traits in wave 3, health

behaviour in terms of smoking and the transitions of the dual continua groups with negative mental health over time (both over ten years, i.e., wave ten) are analysed.

As respondent information from wave one had to be matched with wave three in which the personality trait variables were measured, the sample size is now restricted to those that completed both survey wave (N = 33,313). The descriptive statistics for the focal and control variables are shown in Table 14. The distributions of the dual continua categorisation are almost identical to those at wave 1, suggesting that attrition bias is not a large concern here over the relatively short time period.

Table 14 Descriptive statistics for the sample of respondents that were matched with the BIG5 personality factor information (UKHLS waves 1 and 3).

	Mean/Prop.	n	Freq.
Focal variables			
Agreeableness	5.65	27830	
Conscientiousness	5.50	27824	
Extraversion	4.57	27830	
Neuroticism	3.55	27830	
Openness	4.54	27798	
<i>Dual continua</i>		26252	
Flourishing	.31		8096
Floundering	.15		3816
Struggling	.03		893
Languishing	.25		6492
Moderate PMH	.26		6955
SWEMWBS	25.26	26607	
Negative mental health (binary)	.18	27344	
Control variables			
Gender: Female	.56	33312	
Age	47.03	33313	
<i>Highest qualification</i>		33279	
No qual	.17		5518
Other qual	.10		3453
GCSE etc	.21		6840
A level etc	.19		6178
Other higher	.12		3859
Degree	.22		7431
<i>Marital status</i>		33290	
Single	.20		6610
In partnership	.65		21698
Separated	.09		3019
Widowed	.06		1963
Children in hhold	.31	33313	

Table 15 reveals that the BIG5 personality factors are strongly associated with the dual continua categories: Neuroticism, which has been consistently linked with negative health outcomes, has a low mean score of 2.97 for flourishing, whereas it is elevated at 4.52 for floundering. Likewise, agreeableness and conscientiousness, which are generally associated with positive conditions, are highest on flourishing. Interestingly, levels of agreeableness are lowest on languishing (5.50) and not on floundering (5.58). Furthermore, levels of openness, which are also generally positive factors, are highest in the category of struggling (4.86 compared to 4.77 for flourishing), again suggesting surprising variability that one would not have identified without the off-diagonal groups. One could hypothesise that too much of a positive trait like openness could be linked to risky behaviours that might lead to reduced flourishing and the dual presence of mental illness with flourishing (Ferguson and Biby, 2012; Chiapelli et al., 2021). While the presented results are not showing completely opposing results between the categories, they are in line with dual continua model of mental health, which had a theoretical prediction for this pattern. If one simply perceived a single continuum between illness and wellness, the off-diagonal groups would not have been identifiable.

Table 15 Bivariate associations of the dual continua model categories from wave 1 with the BIG 5 personality factors in wave 3 of the UKHLS.

	<u>Flourishing</u>		<u>Floundering</u>		<u>Struggling</u>		<u>Languishing</u>		<u>Moderate PMH</u>	
	Mean/Prop.	SD	Mean/Prop.	SD	Mean/Prop.	SD	Mean/Prop.	SD	Mean/Prop.	SD
Agreeableness	5.80	.98	5.58	1.10	5.79	1.05	5.50	1.07	5.65	.99
Conscientiousness	5.76	1.02	5.22	1.18	5.56	1.09	5.34	1.12	5.53	1.05
Extraversion	4.84	1.29	4.36	1.36	4.76	1.30	4.38	1.31	4.58	1.28
Neuroticism	2.97	1.32	4.52	1.43	3.76	1.42	3.82	1.38	3.41	1.32
Openness	4.77	1.27	4.43	1.40	4.86	1.33	4.30	1.30	4.59	1.24

Moving to a 10-year follow-up period, Table 16 presents the associations of the dual continua categories at the baseline wave one with health behaviour in terms of smoking at wave ten. While 8.9% of respondents who were flourishing at wave one were smokers at wave ten, the percentages are 19.3% of respondents who were floundering at wave one, 11.8% of those who were flourishing, and 15.3% who were languishing. Of course, this is just a crude first estimation that does not control for various conditions and risk factors that might affect the risk for smoking behaviour (see, for instance, Saari et al., 2015), but the results nonetheless point to meaningful statistical and representative differences. Just differentiating between the highest levels of well-being and lowest levels of well-being is not telling the full story, as there is a complex gradient between people who are languishing and who have increased rates of smoking despite not having a mental illness at baseline. There is, of course, a large literature base on the predictors of smoking (Minichino et al., 2013), so first analyses such as this one point to the potential of PMH across many applications.

Finally moving on to the comparison of the dual continua categories over time, Table 17 shows the transitions of the tracked respondents from the respective dual continua categories at the baseline to scores of NMH at wave ten. As seen in the row percentages, out of respondents who were flourishing at baseline, 10.3% had a mental illness at wave ten. Out of the respondents who were floundering at baseline, 41.3% had a mental illness. Striking, out of those who were struggling (i.e., 100% had a mental illness at baseline but also some level of PMH), only 23.8% met the scoring for mental illness, suggesting a very large rate of improvement. In contrast, of respondents who were languishing at baseline, 19.8% had a mental illness, suggesting that the absence of PMH is linked to severe deterioration in negative mental health as none of those respondents were previously classified as having a mental illness. This illustrates how the struggling

Chapter 2: The Short Warwick-Edinburgh Mental Well-Being Scale in the UK's Understanding Society

and languishing categories point to a divergent trend in mental health over time (Iasiello and van Agteren, 2020). Mental health professionals could target people who are languishing, even though they might not meet standard criteria for mental illness, based on findings like this (see van Agteren et al, 2021 for a systematic review of psychological interventions to improve well-being).

Table 16 Survey-weighted cross-tabulation of the dual continua categories at baseline in wave 1 with the propensity of smoking behaviour at wave 10 in the UKHLS.

Dual continua model at wave 1	Smoking at wave 10	Non-smoking at wave 10	Total
Flourishing	428	4,400	4,828
row %	8.9	91.1	100.0
Floundering	412	1,723	2,135
row %	19.3	80.7	100.0
Struggling	60	448	508
row %	11.8	88.2	100.0
Languishing	560	3,104	3,664
row %	15.3	84.7	100.0
Moderate PMH	432	3,701	4,133
row %	10.5	89.6	100.0
Total	1,892	13,376	15,268
row %	12.4	87.6	100.0

Table 17 Survey weighted cross-tabulation of the dual continua categories at baseline (wave 1) with negative mental health at (wave 10) in the UKHLS.

Dual continua model at wave 1	Absence of mental illness	Presence of mental illness	Total
Wave 10			
Flourishing			
n	4,216	484	4,700
row %	89.7	10.3	100.0
col %	34.8	18.1	31.8
Floundering			
n	1,202	846	2,048
row %	58.7	41.3	100.0
col %	9.9	31.6	13.9
Struggling			
n	368	115	483
row %	76.2	23.8	100.0
col %	3.0	4.3	3.3
Languishing			
n	2,832	699	3,531
row %	80.2	19.8	100.0
col %	23.4	26.1	23.9
Moderate PMH			
n	3,495	532	4,027
row %	86.8	13.2	100.0
col %	28.9	19.9	27.2
Total			
n	12,113	2,676	14,789
row %	81.9	18.1	100.0
col %	100.0	100.0	100.0

Table 18 Statistical comparison of matched and unmatched survey respondents from wave 1 – 10 (UKHLS waves 1 and 10).

	<u>Respondents who were in wave 1 but not in wave 10</u>			<u>Respondents who are in wave 1 and wave 10</u>		
	Mean/Prop.	n	Freq.	Mean/Prop.	n	Freq.
Focal variables at wave 1						
<u>Dual continua</u>		22426			15410	
Flourishing	.30		6667	.32		4873
Floundering	.16		3519	.14		2148
Struggling	.04		796	.03		513
Languishing	.26		5863	.24		3701
Moderate PMH	.25		5581	.27		4175
SWEMWBS	25.02	22810		25.40	15585	
Negative mental health (binary)	.20	23802		.17	15898	
Focal variables at wave 10						
Smoker				.87	18385	
<u>Dual continua</u>					17540	
Flourishing				.27		4774
Floundering				.15		2685
Struggling				.03		504
Languishing				.24		4155
Moderate PMH				.31		5422
SWEMWBS				24.61	17644	
Negative mental health (binary)				.18	17637	
Gender: Female	.53	32326		.57	18666	
Age	45.06	32328		46.64	18666	
<u>Highest qualification</u>		32253			18649	
No qual	.21		6648	.13		2421
Other qual	.11		3428	.10		1797
GCSE etc	.21		6815	.20		3711
A level etc	.19		6139	.19		3452
Other higher	.10		3201	.13		2336
Degree	.19		6022	.26		4932
<u>Marital status</u>		32307			18654	
Single	.27		8680	.18		3313
In partnership	.58		18852	.69		12789
Separated	.08		2600	.09		1720
Widowed	.07		2175	.04		832
Children in hhold	.29	32328		.31	18666	

Table 18 presents information on the distributions of sample members and elucidates whether sample members who were still in the UKHLS at wave ten were systematically different from those that were no longer part of it. As such, the middle columns represent the distributions of respondents who were only in wave one, but not in wave ten, while the right column shows the statistics for those who were in both waves. There is slight evidence that the sample of respondents which was in both waves had higher levels of flourishing (32% vs 30%), lower levels of mental illness (17% vs 20%) and higher levels of education (26% with a degree vs 19% with a degree) and more likely to be in a partnership (69% vs 58%). This pattern suggests potential selection bias of original sample members who remained in the UKHLS with higher socio-economic and mental health at baseline (in support of Young et al., 2007), and future research would be encouraged to explore this in more depth.

Interestingly, however, average levels of flourishing among those respondents who were in both waves decreased from 32% to 27%, while the group of moderate PMH increased. The size of the group of respondents categorised as struggling or languishing is unchanged.

How does the SWEMWBS compare psychometrically with other mental health scales in Understanding Society?

To evaluate the distinctiveness of a new scale, it can be helpful to compare it with other existing mental health scales, especially if those have been well-established and if there is a long history of using them in applied research.

Figure 7 accordingly combines four histograms and their normal distributions of the four main mental health variables in Understanding Society. All scales have been standardised to aid interpretability. The life satisfaction scale (“Here are some questions about how you feel about your life: your life overall”). Response options are 1: completely dissatisfied 2: mostly dissatisfied 3: somewhat dissatisfied 4: neither satisfied nor dissatisfied 5: somewhat satisfied 6: mostly satisfied 6: completely satisfied”) is evidently not continuous and has extreme clustering of values and a peaked distribution at the most common value. It is striking how life satisfaction has a very high mean and high clustering of frequencies at a high end of 5.27 on the 7-point Likert scale. Life satisfaction has proven to be of excellent use and is the dominant tool in the field of happiness research, even used in cost-effectiveness evaluations of policy programs (Atkinson and Mourato, 2015), but some scholars argue if the scale was proposed based on today’s psychometric standards it would maybe not have reached the prominence that it has (Ruggeri et al., 2020)

Like the SWEMWBS, the GHQ is scored on Likert response scales, but on four-point instead of five-point indicators: 1: not at all, 2: no more than usual, 3: rather more than usual 4: much more than usual. Compared to the SWEMWBS, the GHQ shows significant artefacts and common values that diverge from a normal distribution (Figure 7). The overall direction of the GHQ and SWEMWBS are somewhat similar, but the

GHQ has an even steeper drop at the highest scores (reverse code to mean fewest mental health symptoms) and a long tail of low scores (significant mental health problems) while the SWEMWBS captures a broader range of scores in with smoother distributional properties.

Given the population-standardised scoring and specific use purposes of the SF-12 for health-related quality of life, its relevance will not be discussed in much detail across the thesis and is here only shown for reference. The SF-12 is an excellent health-related quality of life scale, but this thesis tests whether theoretically predicted differences between NMH and PMH are confirmed empirically in the general population and not how the SF-12 differs from the SWEMWBS.

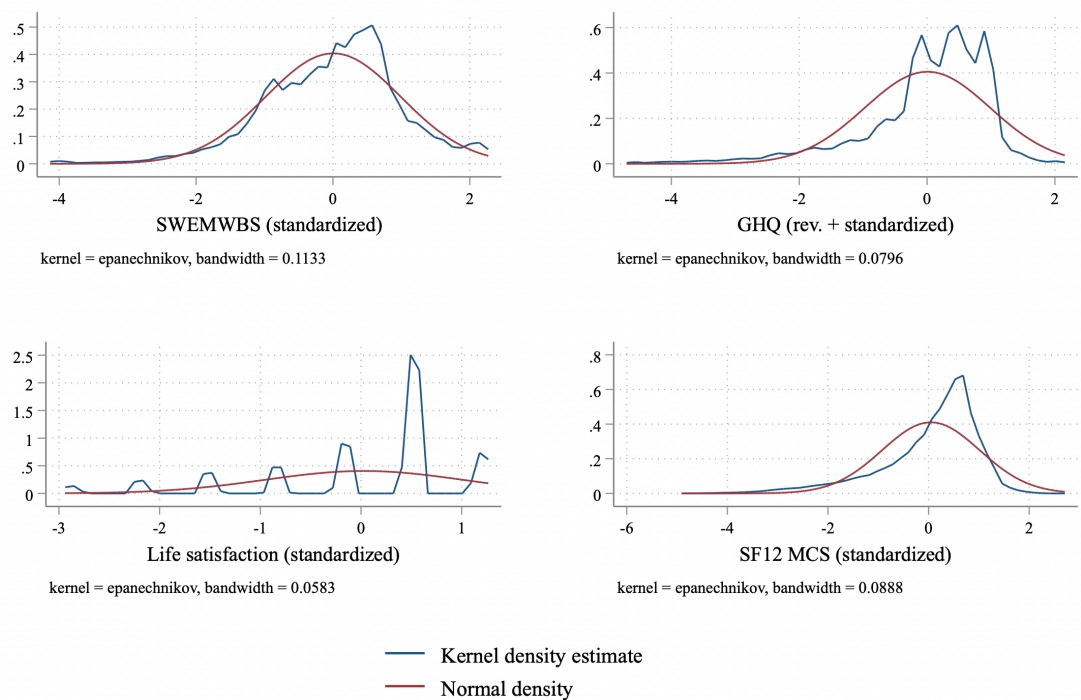


Figure 7 Density plots of the four main mental health variables (SWEMWBS, GHQ, life satisfaction and SF12-MCS (UKHLS wave 1))

Note: All the mental health scales are fully standardised to aid comparability. The GHQ (Likert scoring) has been reversed so that in line with the other scales, a higher score corresponds to better mental health or less mental illness. UKHLS wave 1.

Looking at the Pearson's correlations of the mental health scales in Table 19, the correlations are again “only” moderately high. In the UKHLS at wave one, positive mental health (SWEMWBS) and negative mental health (GHQ) are negatively correlated at -0.63. The correlation between SWEMWBS and life satisfaction (0.51) is relatively low, possibly because life satisfaction on its own is related to evaluative well-being. Some aspects of the SWEMWBS cause it to overlap more strongly with NMH than life satisfaction, possibly because of the SWEMWBS' partial focus on positive affect, which is shared by some items of the GHQ (in a negatively worded sense), while this is not as much the case for the optimism domain.

Critics of mental health research might have expected the correlations to be much higher, so the moderate correlations show that despite the significant overlap, the scales are not identical. Indeed, the correlations of the SWEMWBS with NMH in the general UK population are also lower than correlations in student samples in which the SWEMWBS was developed. With correlations of around 0.5 (when controlling for covariates), only 25% of the variance between NMH (GHQ) and PMH (SWEMWBS) would be shared.

Table 19 Pearson's correlations of the mental health scales (UKHLS wave 1)

Mental health scales	(1)	(2)	(3)
(1) SWEMWBS	1.00		
(2) GHQ	-0.63	1.00	
(3) Life satisfaction	0.51	-0.50	1.00

Note: Pearson's correlations. UKHLS wave 1. N=35,291.

If this unexplained variance cannot be captured through other psychological or sociological variables, one might be inclined to account for portions of the remainder to inheritance and genetic factors and/or gene-environment interactions. Yet, the majority of recent studies in this field have suggested the presence of gene expression differences

for eudaimonia and hedonia and similarly positive and negative mental health (Bartels and Baselmans 2018; Bartels et al. 2017; Baselmans and Bartels 2018a; Thege et al. 2017), and there were only a few opposing findings (Nickerson 2017).

The seven domains of the SWEMWBS and the 12 domains of the GHQ and their variable names are presented in Table 20; those can be used for reference in some of the following statistical outputs.

Table 20 List of SWEMWBS and GHQ domains and their variable names

Variable name (item name)	Domain / sub-dimension / indicator / name
SWEMWBS: PMH (last 2 weeks)	
scwemwba	Feeling optimistic about the future
scwemwbb	Feeling useful
scwemwbc	Feeling relaxed
scwemwbd	Dealing with problems well
scwemwbe	Thinking clearly
scwemwbf	Feeling close to others
GHQ: NMH (last few weeks)	
scghqa	concentration
scghqb	loss of sleep
scghqc	playing a useful role
scghqd	capable of making decisions
scghqe	constantly under strain
scghqf	problem overcoming difficulties
scghqg	enjoy day-to-day activities
scghqh	ability to face problems
scghqi	unhappy or depressed
scghqj	losing confidence
scghqk	believe in self-worth
scghql	general happiness

Based on an exploratory factor analysis computed through Maximum Likelihood techniques and oblique promax rotation on UKHLS data at wave 1, the standardised subscales clearly load on two distinct factors that directly recreate the two SWEMWBS and GHQ scales (Figure 8 and Table 21). The first factor has an Eigenvalue of 7.2, and the second factor has an Eigenvalue of 1.3. These results, therefore, are in support of the notion that the SWEMWBS and GHQ measure distinct concepts and that they are

empirically distinct scales, even if the SWEMWBS was retained as a somewhat weaker factor which might partially also be a result of the smaller number of indicators.

“Feeling close to others” opposes the GHQ factor most strongly, and this mirrors increasing evidence about the importance of social connections and social support for well-being and for preventing depression (George et al., 1989). It also emphasises that mental health is not an individualistic resource but that it has a significant social dimension. “Thinking clearly”, “dealing with problems well”, and “able to make up my mind” have the highest loading on the second factor, i.e., the one for SWEMWBS, while feeling “optimistic about the future” had the lowest loading (0.52). These factor analysis results correspond to the multidimensional scaling presented later.

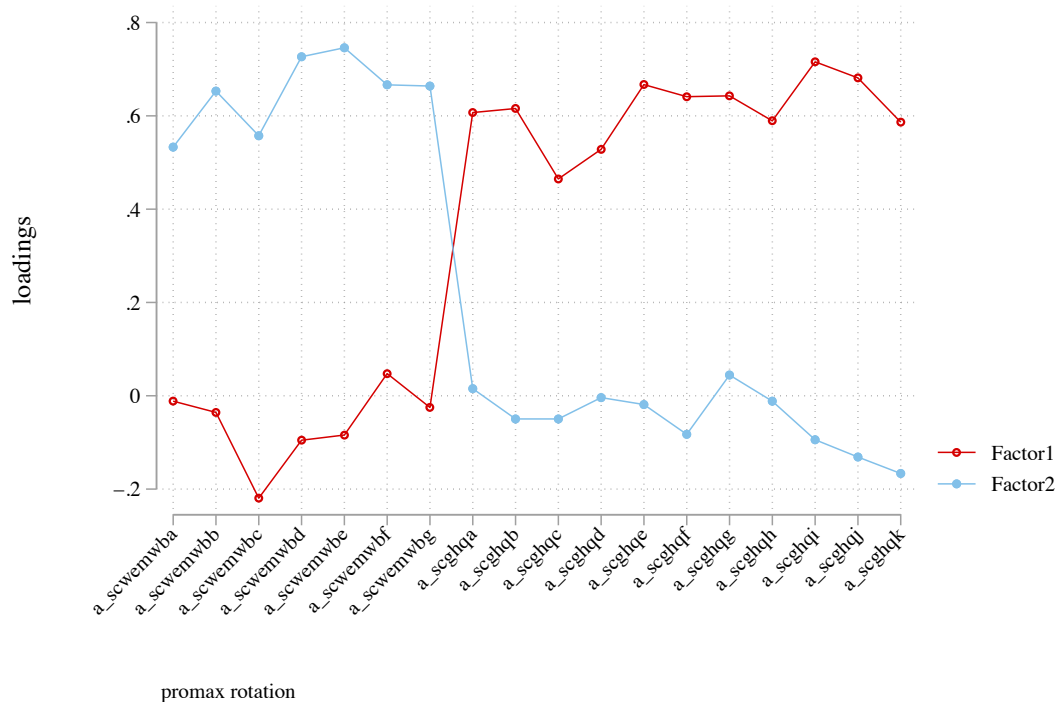


Figure 8 Profile factor loading plot of the SWEMWBS domains and GHQ domains (UKHLS wave 1)

Note: Retrieved factor one strongly loads on the SWEMWBS domains while retrieved factor two strongly loads on the GHQ domains. UKHLS wave 1. N=37.899

Table 21 Exploratory factor analysis loading with promax rotation of the GHQ and SWEMWBS (UKHLS wave 1).

Variable	Factor 1 loading	Factor 2 loading	Uniqueness
a_scwemwba	-0.03	0.52	0.71
a_scwemwbb	-0.04	0.64	0.55
a_scwemwbc	-0.21	0.57	0.50
a_scwemwbd	-0.09	0.73	0.38
a_scwemwbe	-0.07	0.75	0.36
a_scwemwbf	0.04	0.66	0.59
a_scwemwbg	-0.02	0.67	0.54
a_scghqa	0.61	0.02	0.64
a_scghqb	0.59	-0.07	0.59
a_scghqc	0.49	-0.03	0.74
a_scghqd	0.55	0.01	0.71
a_scghqe	0.64	-0.05	0.56
a_scghqf	0.62	-0.10	0.53
a_scghqg	0.67	0.06	0.60
a_scghqh	0.61	0.00	0.63
a_scghqi	0.70	-0.11	0.40
a_scghqj	0.66	-0.15	0.42
a_scghqk	0.59	-0.17	0.51
a_scghql	0.65	-0.01	0.57

Factor 1: Eigenvalue 7.2. Variance: 6.5

Factor 2 Eigenvalue 1.3 Variance: 5.4

Oblique promax rotation

Observations: 37,899

Figure 9 shows a binned scatterplot with hexagons sized according to their frequency weight of the SWEMWBS and the GHQ. As was apparent in the correlations shown previously, these two scales are indeed negatively correlated in that higher levels on the SWEMWBS are associated with lower levels on the GHQ (not reverse coded). Despite this, there is an amount of divergence at each level of this relationship, and so, for instance, some people have very high (bad) negative mental health but moderately high or average levels on the SWEMWBS. In turn, not everyone who scores very highly on the SWEMWBS is also free of symptoms on the GHQ. Keyes' dual continua model of mental health has been making the case for exactly this set of independence across negative and positive mental health, as shown in the dual continua categorisations form before.



Figure 9 Scatterplot of the SWEMWBS and GHQ (binned) (UKHLS wave 1)

Note: A higher score on the SWEMWBS represents better positive mental health, and a higher score on the GHQ represents more symptoms of negative mental health, i.e., worse mental health. UKHLS wave 1. N = 37,899

On top of the initial exploratory impression from the correlation models that the mental health scales are not all just measuring the same thing, further formal psychometric testing is needed to determine the differences between the SWEMWBS and GHQ. As such, a survey-weighted confirmatory factor analysis was run to test three potential model specifications: First, a specification with just one underlying mental health dimension that loads on all the PMH and NMH subdomains together. Second, a model in which the SWEMWBS domains and GHQ domains separately load on PMH and NMH latent factors. Third, specification 3, with the optimism and feeling useful subdomains of the SWEMWBS loading on a separate factor as they were found to be somewhat tapping in a uniquely “positive”, potentially eudaimonic, aspect of PMH in exploratory analyses.

As shown in

Table 22, which is based on the first wave of the UKHLS without any sample selections, shows that the best-fitting model specification in the confirmatory factor analyses is specification 3. Specification 2 is only marginally worse on some assessment criteria than specification 2, whereas specification 1 has the - comparatively - worst psychometric properties.

The standardised root mean squared residual of 0.052 in specification 2 is significantly smaller than the one of the underlying mental health models in specification 1 (0.07). Likewise, the coefficient of determination is increased from 0.929 to 0.981 (where close to 1 would be ideal) in the second specification. The AIC in specification 2 is smaller than in specification 1, suggesting a more parsimonious and more desirable model fit.

Comparing specification 3 to specification 2, further model fit improvements were seen: The SRMR now meets the standard benchmark of < 0.05 , which suggests excellent fit. The coefficient of determination improved further to 0.992, and the RMSEA now is below < 0.008 , for the first time meeting standard benchmarks. Nonetheless, the AIC increased, which is a deterioration, as the model became more complex, and the CFI had a minimal worsening as well. On balance, both the second and third specifications are acceptable, suggesting that it is recommended to differentiate PMH and NMH in any case. Whether one should further differentiate domains within PMH might depend on the use case and theoretical motivations but is arguably not necessary, although helpful when one has a substantive interest in these domains. Future research should validate these findings with even more elaborate modelling, such as bi-factor models, and focus on longitudinal confirmatory factor analyses as well as group differences and measurement invariances.

Table 22 Survey-weighted confirmatory factor analyses of PMH and NMH (UKHLS wave 1). N = 40,995

	One latent mental health model	Distinct PMH and NMH model	Distinct PMH and NMH model + SWEMWBS subdomains of optimism & usefulness separated on a third latent factor
	Specification 1	Specification 2	Specification 3
RMSEA	0.117	0.083	0.078
AIC	1.09E+06	9.10E+05	1.05E+06
CFI	0.77	0.896	0.895
SRMR	0.078	0.052	0.049
CD	0.929	0.981	0.992

RMSEA=Root mean squared error of approximation

AIC=Akaike's information criterion

CFI=Comparative fit index

SRMR=Standardized root mean squared residual

CD=Coefficient of determination

2.3.2.1 Longitudinal distributions of PMH and other mental health scales

This small section describes the SWEMWBS and other mental health scales over time.

To the best of the author's knowledge, this is the first study to analyse more than two waves of the SWEMWBS on high-quality nationally representative data.

Table 23 presents the correlations of the main mental health variables in which the numerical indicators (e.g., w1, w4, w7 and w10) denote wave one, wave four, wave seven, and wave ten, respectively. The GHQ and life satisfaction were measured at every wave, but as no comparisons with the SWEMWBS can be made at these waves, only those statistics are presented.

The table shows that life satisfaction in wave ten is only moderately correlated (0.35) with life satisfaction at wave one but that the SWEMWBS in wave ten has a higher relative correlation (0.46) with the SWEMWBS at wave one. This would imply a somewhat greater level of stability in PMH than in the cognitive-evaluative life and mental health domains. Factors such as optimism might be learned and accumulated over time and potentially reinforcing, which might potentially make a case for such measures. Across all the indicators, there is a linear decline in the size of the autocorrelation between the four waves.

Table 24 depicts the average scores on the seven domains of the SWEMWBS over time (10 waves and four measurement points). There appears to be stability in scores over time within people with only a minute downward trend. "Being able to make up one's own mind" is the most positively rated domain at wave one and across all waves.

Table 23 Longitudinal correlations between the main mental health variables (UKHLS waves 1 to 10). N = 14,236³⁵

Variables	SWEMWBS w1	SWEMWBS w2	SWEMWBS w3	SWEMWBS w4	GHQ w1	GHQ w2	GHQ w3	GHQ w4	Life satisfaction w1	Life satisfaction w2	Life satisfaction w3	Life satisfaction w4
SWEMWBS w1	1.00											
SWEMWBS w2	0.52	1.00										
SWEMWBS w3	0.48	0.53	1.00									
SWEMWBS w4	0.46	0.50	0.54	1.00								
GHQ w1	-0.54	-0.34	-0.33	-0.29	1.00							
GHQ w2	-0.31	-0.57	-0.36	-0.32	0.39	1.00						
GHQ w3	-0.27	-0.33	-0.58	-0.36	0.34	0.41	1.00					
GHQ w4	-0.26	-0.31	-0.36	-0.58	0.32	0.37	0.43	1.00				
Life satisfaction w1	0.51	0.36	0.32	0.30	-0.46	-0.27	-0.25	-0.22	1.00			
Life satisfaction w2	0.33	0.48	0.33	0.30	-0.30	-0.45	-0.27	-0.25	0.37	1.00		
Life satisfaction w3	0.33	0.38	0.56	0.39	-0.30	-0.33	-0.51	-0.32	0.37	0.40	1.00	
Life satisfaction w4	0.33	0.36	0.42	0.57	-0.29	-0.30	-0.34	-0.52	0.35	0.37	0.45	1.00

³⁵ Exceptionally, for the two analyses on this page in Table 23 and Table 24, only respondents who were in waves 1, 4, 7, and 10 were included, thus leading to the reduced sample size of 14,236 respondents. This sample selection likely introduced attrition bias and is only intended to represent the longitudinal time trends of this select group of respondents.

Table 24 Average longitudinal pattern on the SWEMWBS and other mean health scales over time (UKHLS wave 1, 4, 7, and 10).

	Wave 1	Wave 4	Wave 7	Wave 10
SWEMWBS	25.43	24.86	25.46	24.65
<u>SWEMWBS domains</u>				
feel optimistic	3.36	3.13	3.34	3.14
feel useful	3.58	3.46	3.57	3.42
feel relaxed	3.36	3.31	3.43	3.34
deal with problems well	3.63	3.60	3.66	3.56
think clearly	3.76	3.74	3.78	3.68
feel close to others	3.69	3.61	3.67	3.56
able to make up my mind	4.06	4.00	4.01	3.96
GHQ	10.86	10.86	10.82	11.18
Life satisfaction	5.33	5.10	5.29	5.17

2.3.2.2 Problems with ordinal measurement in the competing and well-established life satisfaction scale

Strong criticisms and concerns about ordinal subjective well-being scales have recently been made (Bond and Lang 2019). Firstly, the “reporting function” of the well-being of different people or even of the same people over time might change, thus, preventing reliable group or time comparisons. Secondly, there is a “dominance” problem of ordinal scales as a random change of the scale – which would be mathematically identical as the numerical values that are assigned to ordinal categories are random attributions, i.e., instead of scores from 7 to 35 the SWEMWBS could just as well be scored from 0 to 24 or with different spacing – could lead to potentially different results (Bond and Lang, 2019). Accordingly, all the country rankings of happiness could be biased as they use cardinal techniques such as mean scores and standard deviations.

Some of these points certainly represent valid statistical concerns, and the field of mental health research is continuously evolving: Approaches to mitigate these problems, such as modelling the median instead of mean (median regression), have been proposed (Chen et al. 2019). Two recent papers make it possible to assess the statistical and econometric qualities of ordinal well-being scales (Jenkins 2019a; Jenkins 2019b), this is a major advancement in the statistical analysis of well-being.

Table 25 Cumulative density function of life satisfaction and dominance checks by age groups (UKHLS wave 1)

Age groups	Life satisfaction categories	Numerical score	Density	Cumulative Density	Survivor Function	GL downward	GL upward
First age group: 25 -44	completely dissatisfied	1	0.023	0.023	1.000	0.001	0.632
	mostly dissatisfied	2	0.043	0.066	0.977	0.003	0.609
	somewhat dissatisfied	3	0.084	0.150	0.934	0.016	0.567
	Neither satisfied nor dissatisfied	4	0.111	0.262	0.850	0.045	0.489
	somewhat satisfied	5	0.203	0.465	0.738	0.140	0.394
	mostly satisfied	6	0.439	0.904	0.535	0.536	0.244
	completely satisfied	7	0.096	1.000	0.096	0.632	0.009
Second age group: 45-64	completely dissatisfied	1	0.032	0.032	1.000	0.001	0.629
	mostly dissatisfied	2	0.055	0.087	0.968	0.006	0.597
	somewhat dissatisfied	3	0.078	0.165	0.913	0.019	0.544
	Neither satisfied nor dissatisfied	4	0.098	0.263	0.835	0.044	0.473
	somewhat satisfied	5	0.169	0.432	0.737	0.118	0.391
	mostly satisfied	6	0.440	0.873	0.568	0.502	0.266
	completely satisfied	7	0.127	1.000	0.127	0.629	0.016
Third age group: 65 -89	completely dissatisfied	1	0.025	0.025	1.000	0.001	0.652
	mostly dissatisfied	2	0.030	0.056	0.975	0.002	0.627
	somewhat dissatisfied	3	0.039	0.095	0.944	0.006	0.597
	Neither satisfied nor dissatisfied	4	0.068	0.163	0.905	0.017	0.561
	somewhat satisfied	5	0.130	0.293	0.837	0.055	0.499
	mostly satisfied	6	0.476	0.769	0.707	0.422	0.390
	completely satisfied	7	0.231	1.000	0.231	0.652	0.053

One of the most widely used variables in all of the social sciences is Ed Diener's life-satisfaction scale (scored from 1 "completely dissatisfied" to 7 "completely satisfied" in the UKHLS) (Diener et al., 1985). Numerous variations of this scale exist, but life satisfaction is usually measured on a 7-point Likert scale in which respondents respond to a statement about a hypothetical ideal life from "strongly disagree" to "strongly agree". The following findings show that in Understanding Society, the life satisfaction scale does not meet statistical F and S dominance requirements when stratified by a condensed selection of age groups (25-44, 45-64, and 65-84) for interpretability. Suggesting that one of the most accepted and widely used SWB scales does not fully fulfil all required statistical assumptions, one would have relatively fewer reasons to criticise the SWEMWBS because of its novelty or because of its own statistical limitations should they arise.

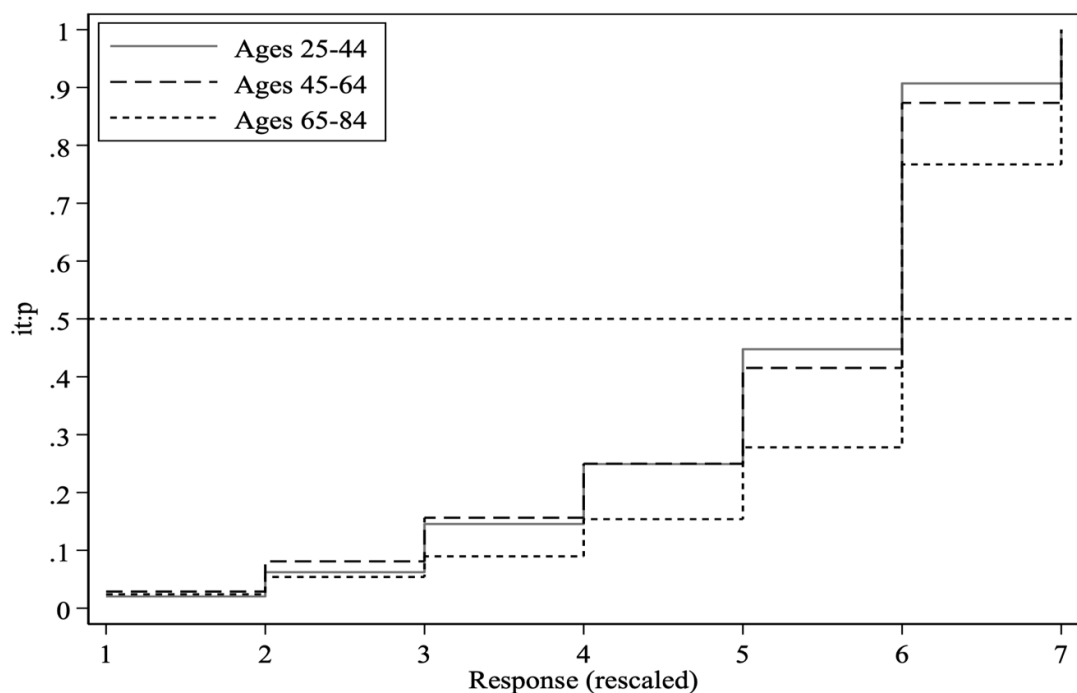


Figure 10 Cumulative distribution function and dominance checks of life satisfaction by age groups (UKHLS wave 1)

In the graph in Figure 10, the median of life satisfaction is 6, i.e., the point where it crosses the 0.5 line. The graph portrays the cumulative distribution function of life satisfaction across the age groups. The ranking of life satisfaction is consistently higher for the oldest age group of respondents aged 65-84, close to the median; lower density at low scores (on the left) than the youngest one (ages 25-44). However, the middle age group (45-64) *crosses* with the younger age group at scores below the median, thus violating F-dominance.

The finding demonstrates that established measures of mental health are not automatically better than new ones and that a dedicated PMH scale that meets philosophical and survey needs could be better suited in certain sociological applications, especially given that the SWEMWBS is a continuous scale that can capture a broad range of scores.

Following up on the previous dominance checks that portrayed the cumulative distributions functions of life satisfaction by age, another point of interest relates to measures of well-being inequalities (Grimes, Jenkins and Tranquilli 2020). Many famous happiness researchers acknowledge the problem of using standard deviations on ordinal data but then simply proceed ahead regardless (Frijters et al. 2020). While this may sometimes be justified for practical reasons, techniques exist to measure inequality in ordinal data. Using Lorenz curves that resemble analyses of inequality in Gini coefficients (Biewen and Jenkins 2006; De Maio 2007) could be an option for analysing inequalities in ordinal scales like satisfaction. Extremely famous social scientists such as Sir Richard Layard are strongly proposing policy changes based on their research findings that used life satisfaction as a continuous variable (Layard 2010), but given these tentative insights, one should be inclined to be careful with ordinal data and to use a multidimensional array of mental health items.

2.3.3 How are the domains of the SWEMWBS relating to each other and with sociological and demographic conditions? What are the details and psychometric properties of these domains?

The previous section provided explored the associations of PMH with important sociological and demographic covariates and control variables, and this section aims to identify and analyse the most unique and distinct subscales of the SWEMWBS with the aim of using them as particularly illustrative PMH indicators. It is essential to understand how each subdomain is related to and driving the associations of the overall latent trait; after all, the subdomains are the most concrete forms of PMH, even if they individually do not encompass the entire scope of PMH. Moreover, applied researchers may simply want to study a specific sub-aspect of PMH and may decide that a subdimension of the SWEMWBS is better suited than the overall scale, for instance, to focus on hope or optimism, domains of PMH which have attracted attention even among economists (O'Connor and Graham, 2019).

Before going into the nuances of the subdomains, one must start the section by noting that the SWEMWBS has favourable psychometric properties in the UKHLS (when measured at wave 1). A principal component analysis of its seven domains retained one dominant factor with an Eigenvalue of 3.86, whereas the second largest factor only had an Eigenvalue of 0.85, suggesting that the SWEMWBS subdomains all fall onto one PMH dimension. Furthermore, a confirmatory factor analysis also yielded supportive psychometric validity with a SRMR of 0.046 (< 0.05) and a high comparative fit index of 0.942. The only noticeable model fit improvement would be made if a covariance between the subdomains of optimism and feeling useful was added (MI 3360.469).

The following analyses proceed with depicting the nuanced domains of the SWEMWBS as there are some differences that prove to be useful in some research applications, but these results are only additional to the SWEMWBS, not a critique. Psychometricians often point out that summated or factor-score variables of a latent trait can be computed in many ways. Using different extraction and rotation methods can lead to substantively different outcomes (see Auerswald and Moshagen, 2019). Even though many researchers simply treat ordinal Likert scales as continuous (i.e., analysing mean levels, average scores or standard deviations), there is increasing awareness in subjective well-being, and mental health research that this assumption is not warranted (Jenkins, 2020); analysing the subscales on their original scores allows for more suitable statistical techniques such as Item Response Theory. Given that the SWEMWBS represents three of the four empirical chapters, it is necessary to look at the scale and its constituent parts in detail.

Polychoric correlations can account for the fact that ordinal data, such as Likert-scales are not continuous (Rigdon and Ferguson, 1991). This is important because a 1-point difference, such as between score 1: “none of the time” and 2: “rarely” cannot simply be assumed to be identical (of equal distance) as a 1-point difference at the higher end of the score. These polychoric correlations in Table 26 show that the SWEMWBS subdomains are moderately very highly correlated. The correlations range from 0.29 between “able to make up own mind” with “feeling optimistic” to 0.70 for “thinking clearly” and “dealing with problems well”.

As the SWEMWBS was developed to incorporate multiple dimensions of PMH into one overall scale, this could cause the relatively low correlations. It is noteworthy that social well-being (“feeling close to others”) only has moderate correlations with all of the

items. The indicators of “feeling optimistic” and “feeling useful” are only moderately correlated at 0.51, and a positive affect subscale such as “feeling relaxed” is only moderately correlated at 0.40 with the eudaimonic “feeling useful”. All of this demonstrates that mental health truly is a multidimensional construct, especially when considering that the SWEMWBS already represents a condensed version of a larger PMH scale that focuses on psychological functioning.

Table 26 Polychoric correlations of the SWEMWBS domains (UKHLS wave 1)

SWEMWBS domains	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) feel optimistic	1.00						
(2) feel useful	0.51	1.00					
(3) feel relaxed	0.40	0.47	1.00				
(4) deal with problems well	0.40	0.52	0.60	1.00			
(5) think clearly	0.36	0.50	0.57	0.70	1.00		
(6) feel close to others	0.38	0.46	0.45	0.48	0.51	1.00	
(7) able to make up my mind	0.29	0.41	0.43	0.56	0.64	0.47	1.00

Note: The SWEMWBS domains are scored from 1-5, with a higher score representing higher PMH. Polychoric correlations account for the ordinal nature of the Likert scoring. Data: UKHLS wave 1. N=37,899

Table 27 Survey-weighted average scores of the domains of the SWEMWBS with important sociological and demographic variables (UKHLS wave 1). N = 38,859

	feel optimistic	feel useful	feel relaxed	deal with problems well	think clearly	feel close to others	able to make up my mind
Gender							
Men	3.28	3.51	3.42	3.63	3.78	3.60	4.07
Women	3.33	3.51	3.27	3.55	3.68	3.71	4.01
Age groups							
10-19 years old	3.44	3.39	3.41	3.50	3.59	3.74	4.02
20-29 years old	3.44	3.51	3.24	3.50	3.62	3.64	3.97
30-39 years old	3.38	3.56	3.21	3.52	3.65	3.63	3.96
40-49 years old	3.26	3.51	3.21	3.53	3.66	3.59	3.98
50-59 years old	3.21	3.52	3.29	3.57	3.71	3.62	3.99
60-69 years old	3.29	3.58	3.58	3.75	3.93	3.76	4.19
70 years or older	3.17	3.40	3.62	3.75	3.94	3.75	4.22
Marital status							
Single	3.35	3.40	3.30	3.47	3.60	3.55	3.97
partnership	3.33	3.59	3.36	3.63	3.78	3.73	4.06
Separated	3.14	3.38	3.19	3.47	3.60	3.44	3.98
Widowed	3.14	3.30	3.51	3.67	3.81	3.73	4.14
Educational qualifications							
No qual	3.03	3.29	3.34	3.52	3.67	3.60	3.99
Other qual	3.15	3.43	3.38	3.61	3.77	3.63	4.07
GCSE etc	3.21	3.41	3.27	3.50	3.63	3.61	3.99
A level etc	3.35	3.52	3.32	3.58	3.69	3.66	4.03
Other higher	3.39	3.61	3.37	3.63	3.76	3.70	4.06
Degree	3.57	3.73	3.37	3.67	3.84	3.75	4.08
Employment status							
Employed	3.38	3.63	3.31	3.62	3.75	3.69	4.05
Unemployed	3.08	3.18	3.17	3.30	3.48	3.40	3.86
Retired	3.23	3.47	3.62	3.75	3.94	3.77	4.20
Home/maternity	3.25	3.46	3.16	3.47	3.58	3.60	3.89
Student	3.58	3.49	3.39	3.53	3.66	3.76	4.02
Long-term sick	2.67	2.70	2.71	2.91	3.07	3.15	3.52
other	3.25	3.39	3.11	3.43	3.56	3.49	3.87
Health problems							
Health problem	3.11	3.32	3.20	3.45	3.61	3.56	3.96
No health problem	3.42	3.61	3.41	3.66	3.79	3.72	4.08
Negative mental health							
Absence of NMH	3.42	3.65	3.52	3.74	3.89	3.77	4.16
Presence of NMH	2.82	2.92	2.53	2.88	3.01	3.18	3.48

Table 28 Survey-weighted cross-tabulation of the SWEMWBS optimism domain with important sociological and demographic variables (UKHLS wave 1). N = 38,859

Variable	Category	none of the time	rarely	some of the time	often	all of the time
Gender	Men	4.6%	13.5%	40.7%	32.2%	9.1%
	Women	4.4%	11.8%	41.1%	33.3%	9.5%
Age groups	10-19 years old	3.9%	10.8%	33.7%	37.7%	14.0%
	20-29 years old	3.8%	11.0%	34.6%	38.8%	11.9%
	30-39 years old	3.2%	11.5%	38.1%	38.0%	9.2%
	40-49 years old	4.3%	13.5%	42.7%	32.0%	7.5%
	50-59 years old	4.9%	13.7%	44.3%	30.2%	6.9%
	60-69 years old	4.6%	11.0%	44.1%	31.2%	9.1%
	70 years or older	5.8%	15.0%	46.6%	23.8%	8.8%
Marital status	Single	4.6%	12.4%	37.2%	34.8%	11.0%
	In partnership	3.8%	11.8%	41.2%	34.4%	8.8%
	Separated	6.0%	15.9%	44.2%	26.6%	7.4%
	Widowed	6.3%	15.2%	47.5%	22.1%	8.9%
Educational qualifications	No qual	8.9%	17.9%	43.5%	21.2%	8.6%
	Other qual	6.2%	15.9%	45.0%	24.0%	8.9%
	GCSE etc	4.9%	14.3%	43.6%	29.4%	7.8%
	A level etc	3.5%	11.9%	39.7%	35.2%	9.6%
	Other higher	2.4%	10.6%	41.0%	36.8%	9.2%
	Degree	1.6%	7.1%	35.5%	44.9%	10.8%
Employment status	Employed	3.0%	11.1%	40.6%	36.7%	8.7%
	Unemployed	8.5%	18.3%	40.9%	23.0%	9.4%
	Retired	5.1%	13.5%	45.2%	27.3%	8.9%
	Home/maternity	5.4%	14.3%	39.4%	31.1%	9.9%
	Student	2.7%	8.5%	31.3%	42.1%	15.4%
	Long-term sick	16.3%	24.6%	40.8%	12.9%	5.4%
	other	6.4%	12.6%	41.2%	27.9%	11.9%
Health	Health problem	6.2%	16.5%	44.7%	25.8%	6.8%
	No health problem	3.3%	10.2%	38.7%	37.2%	10.6%
Negative mental health	Absence of NMH	3.2%	9.6%	40.0%	36.9%	10.4%
	Presence of NMH	9.4%	25.7%	45.2%	16.0%	3.8%

Table 29 Survey-weighted cross-tabulation of the SWEMWBS domain of optimism with social class and father's social class (UKHLS wave 1)

Variable	Category	none of the time	rarely	some of the time	often	all of the time
Father's social class (NSSEC8)	Large employers & higher management	2%	9%	34%	42%	12%
	Higher professional	2%	8%	39%	41%	10%
	Lower management & professional	2%	10%	38%	40%	10%
	Intermediate	3%	11%	40%	36%	10%
	Small employers & own account	4%	13%	42%	34%	8%
	Lower supervisory & technical	4%	13%	43%	31%	9%
	Semi-routine	5%	13%	43%	29%	9%
	Routine	6%	14%	43%	29%	8%
Respondent's social class (NSSEC8)	Large employers & higher management	1%	7%	38%	45%	9%
	Higher professional	1%	8%	37%	44%	10%
	Lower management & professional	2%	9%	37%	43%	10%
	Intermediate	2%	11%	42%	36%	8%
	Small employers & own account	4%	10%	42%	36%	8%
	Lower supervisory & technical	3%	14%	41%	33%	8%
	Semi-routine	4%	14%	41%	31%	9%
	Routine	6%	15%	44%	27%	8%

As shown in Table 27, the overall age pattern of PMH is, of course, also evident across its constituent domains. There are some nuances in levels between the seven subscales of the SWEMWBS, however, with “able to make up my own mind” scoring very highly (mean of 4.22 points on a 5-point scale) in general, and older people score particularly highly. In contrast, feeling optimistic only scores about 3.2 points on average, but here young people aged 25-44 score (3.44) higher than people in the older age groups (3.17). There are no age differences for “feeling useful” and almost no age differences for “feeling close to others”. For “feeling relaxed”, “dealing with problems well”, and “thinking clearly”, the old age is clearly associated with higher levels of mental health. It seems that the oldest age group scores very highly on items that are related to mental functioning, but for feelings of optimism and feelings of usefulness, which already have a low average score overall, there are either no age differences or that young people score higher. On the other hand, it is concerning that many young and middle-aged respondents seem to struggle with psychological functioning as they score less high on these items.

Regarding gender differences across the domains of the SWEMWBS, men report higher levels of “feeling relaxed”, “dealing with problems well”, “thinking clearly”, and “able to make up own mind”, while women report higher levels of “optimism” and “feeling close to others”. There is not a statistically significant difference in “feeling useful” between men and women. While the differences are only relatively small at about 0.1 points on the 5-point Likert scale, they are very significant and likely to interact with other covariates. It has previously been found that women tend to foster more social relationships and social support (Antonocci and Akiyama, 1987), and it is telling that they report better on the eudaimonic indicators, while men report higher on mental functioning items. Of course, these are all self-reports, so it might be the case that men might be overconfident or simply perceive mental health less acutely.

As it is well-established that physical health is one of the strongest predictor variables of mental health (Doherty and Gaugran, 2014), not having a long-standing illness is consistently and substantively associated with higher levels of PMH across the domains of the SWEMWBS. The difference is particularly pronounced for “feeling useful” and “feeling optimistic”, the two subscales that have also stood out before. Educational qualifications have differential associations with the subscales of the SWEMWBS. As before, having a degree is associated with high mental health scores, but the differences between educational groups are especially strong for “feeling optimistic” or “feeling useful” while they are negligible regarding “feeling relaxed” and only small for the other subscales where it is only the degree group that has a significantly different score.

A consistent story is thus starting to emerge that these two indicators, although least strongly endorsed by respondents in terms of the descriptive statistics and average scores, show somewhat surprising patterns and unique associations with the demographic and social comparison variables.

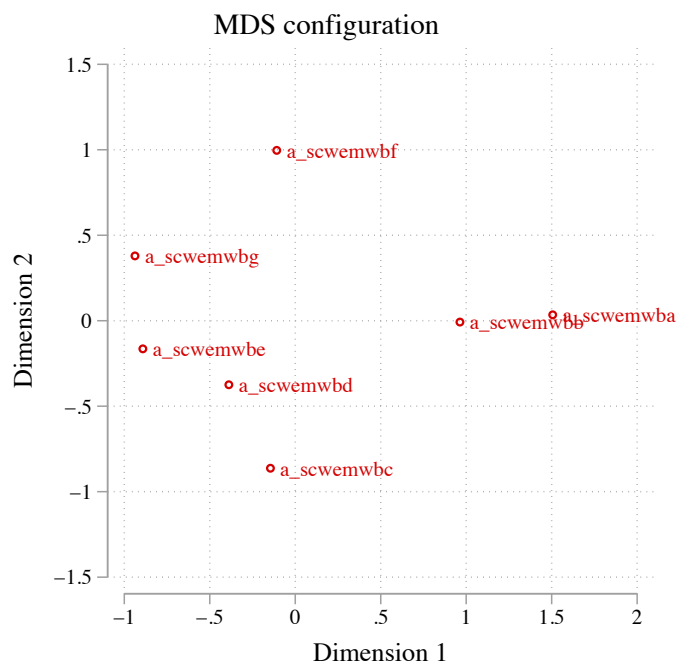
Based on multidimensional scaling (clustering) techniques (Carroll, 1998), the diagram in Figure 11 represents the distribution of the seven subscales of SWEMWBS plotted in two-dimensional Euclidian space. It is based on multidimensional scaling techniques, a form of data reduction and latent variable analysis. Multidimensional scaling is a powerful technique because it plots the data based on clusters of respondents and not based on variable correlations as in factor analyses; in this sense, it shows a direct picture of the way in which people tend to relate to these items.

This specification is based on pairwise spearman correlations, the following one on polychoric techniques to account for the ordinal nature of the data.

Table 30 Multidimensional scaling of the subdomains of the SWEMWBS across two dimensions (UKHLS wave 1).

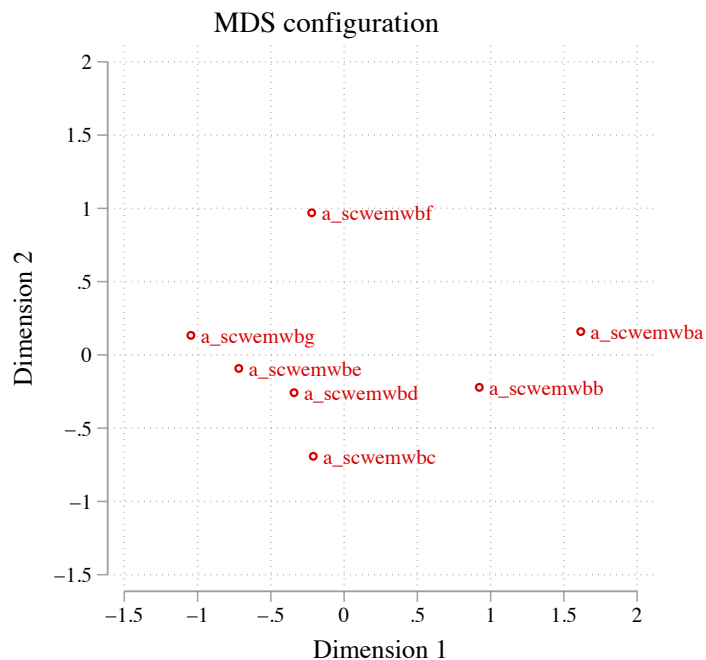
Variable Name	Variable Label	Dimension 1	Dimension 2
Spearman MDS			
a_scwemwba	feeling optimistic about the future	1.51	0.03
a_scwemwbb	feeling useful	0.96	-0.01
a_scwemwbc	feeling relaxed	-0.15	-0.86
a_scwemwbd	dealing with problems well	-0.39	-0.38
a_scwemwbe	thinking clearly	-0.89	-0.16
a_scwemwbf	feeling close to others	-0.11	1.00
a_scwemwbg	able to make up own mind	-0.93	0.38
Polychoric MDS			
a_scwemwba	feeling optimistic about the future	1.61	0.16
a_scwemwbb	feeling useful	0.92	-0.22
a_scwemwbc	feeling relaxed	-0.21	-0.69
a_scwemwbd	dealing with problems well	-0.34	-0.26
a_scwemwbe	thinking clearly	-0.72	-0.09
a_scwemwbf	feeling close to others	-0.22	0.97
a_scwemwbg	able to make up own mind	-1.05	0.13

Multidimensional scaling of the SWEMWBS domains for all available data at wave 1 of the UKHLS. The first panel presents results from continuous specifications (Spearman). The second panel presents the results when accounting for the categorical/ordinal nature of the Likert scales (polychoric). Settings are modern, loss criterion: stress, and transformation: monotonic.



Modern MDS (loss=stress; transform=monotonic)

Figure 11 Multidimensional scaling (spearman) of the subdomains of the SWEMWBS (UKHLS wave 1)



Modern MDS (loss=stress; transform=monotonic)

Figure 12 Multidimensional scaling (polychoric) of the subdomains of the SWEMWBS (UKHLS wave 1)

The diagram shows how feeling optimistic (“a_scwemwba”) and feeling useful (“a_scwemwb”) of the SWEMWBS on the positive x-axis represent one end of the first dimension. On the negatively scored side of the first dimension, the two variables are thinking clearly (“a_scwemwbe”) and being “able to make up one’s own mind” (“a_scwemwbg”). This points to a contrast between a somewhat eudaimonic, or rather psychological functioning that integrates psychological needs, cluster (optimism/usefulness) within the SWEMWBS scale; this also corresponds to the substantive difference with comparison variables that have been presented previously. It is noteworthy that this differentiation clearly emerged in the data without any further control variables. Interestingly, the low end of the dimension is not a purely hedonic dimension but a kind of mental decision-making mental-performance one that focuses on the here and now and practical considerations, while the other end is more abstract and possibly future-oriented.

On the second dimension (y-axis), there is a contrast between feeling relaxed (“a_scwemwbc”) and feeling close to others (“a_scwemwbf), however, the differentiation is less pronounced. It seems that the social dimension of PMH is strongly driving this association, but this is exactly what one would have expected given the design of the scale and its tripartite dimensions.

Extending the above type of analysis, this MDS plot in Figure 12 accounts for the ordinal nature of the subscales. Advanced polychoric correlations are used to analyse the relationships between the variables, and from statistical perspective, this should lead to more reliable and accurate results. The “feeling useful” and “feeling optimistic” cluster remains pronounced on the positive end of the first dimension. As mentioned, this finding is further validated in other types of analyses, and a significant aspect of the psychometric results is that future research on positive mental health based on the

SWEMWBS could focus on these two pronounced subscales. This represents a strength of the SWEMWBS as it allows for the analysis of dual continua of NMH and PMH at the population level, but also as the subdimensions allow for a focus on certain areas of interest that have been found to be important and predictive of important life course events. While the debate around the true philosophical nature of mental health is ongoing, findings like these show that the nuances of each scale have large effects on what “mental health” means and what is then driving the associations with other variables and outcomes.

Analysing PMH through Item Response Theory

In educational testing and psychological evaluations, Item Response Theory is often used to analyse difficulty and discrimination parameters of exam questions. Recently, there has been interest in these techniques in the well-being literature (Gomez and Fisher 2005; Nima et al. 2019). One could think of “mental health” not just as a latent factor or trait but also as a latent ability (theta) factor that determines which respondents “correctly” respond to mental health indicator questions (correctly here means scoring highly on a Likert-scale question, i.e., having high mental health). For instance, a respondent with high eudaimonic well-being is more likely to score highly (“accurately”) on the “feeling useful” item. What is particularly powerful about IRT is that one can easily account for the ordinal nature of the Likert items through graded response theory models. IRT allows for visualisations of the information that is provided at different theta-values.

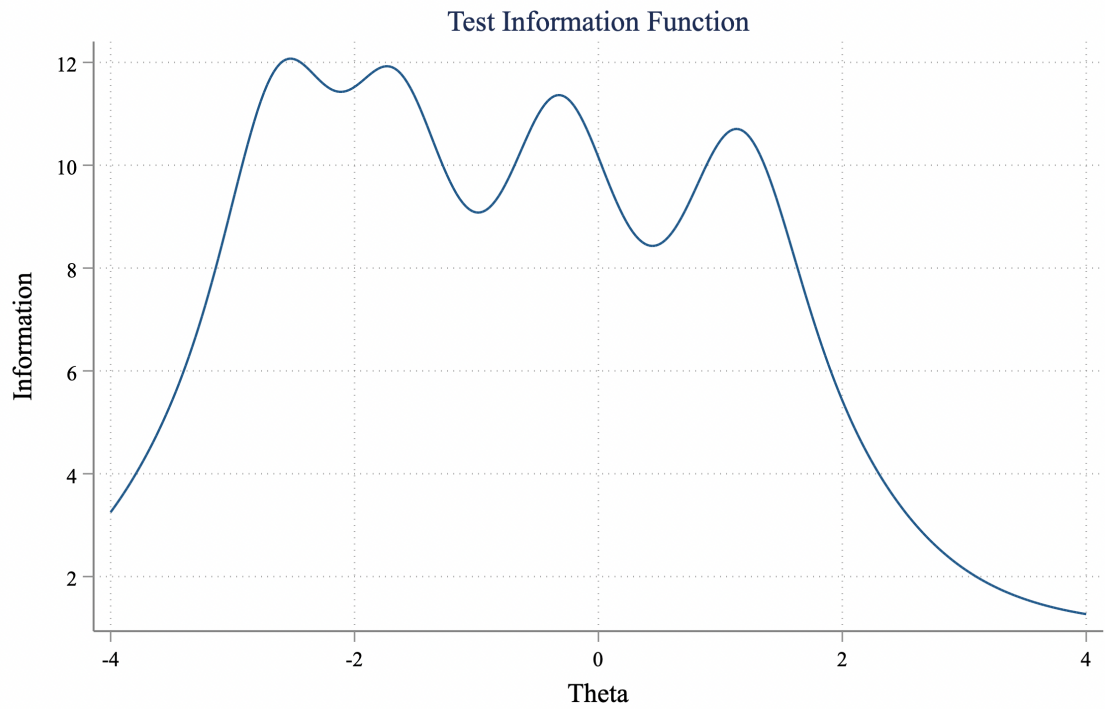


Figure 13 Test information function of an IRT model of the SWEMWBS (UKHLS wave 1)

Note: The SWEMWBS is scored from 7-3,5 with a higher score representing higher PMH. Item-response theory model with grade response theory (GRT) selections. UKHLS wave 1. N=39,851

Table 31 Table of IRT (GRT) results of the subdomains of the SWEMBS (UKHLS wave 1).

a_scwemwba	Coef	Std. Error.	L95	U95
Discrim	1.29	0.01	1.26	1.32
Diff				
>=2	-2.92	0.03	-2.98	-2.86
>=3	-1.59	0.02	-1.62	-1.56
>=4	0.26	0.01	0.24	0.28
5	2.13	0.02	2.09	2.18

a_scwemwbb	Coef	Std. Error.	L95	U95
Discrim	1.84	0.02	1.81	1.88
Diff				
>=2	-2.77	0.03	-2.82	-2.72
>=3	-1.70	0.02	-1.73	-1.68
>=4	-0.12	0.01	-0.14	-0.11
5	1.63	0.02	1.60	1.66

a_scwemwbc	Coef	Std. Error.	L95	U95
Discrim	2.07	0.02	2.03	2.11
Diff				
>=2	-2.56	0.02	-2.61	-2.52
>=3	-1.26	0.01	-1.28	-1.24
>=4	0.16	0.01	0.15	0.18
5	1.79	0.02	1.76	1.82

a_scwemwbd	Coef	Std. Error.	L95	U95
Discrim	3.22	0.03	3.16	3.29
Diff				
>=2	-2.44	0.02	-2.48	-2.40
>=3	-1.53	0.01	-1.56	-1.51
>=4	-0.18	0.01	-0.20	-0.17
5	1.30	0.01	1.28	1.33

a_scwemwbe	Coef	Std. Error.	L95	U95
Discrim	3.40	0.04	3.33	3.47
Diff				
>=2	-2.61	0.02	-2.65	-2.57
>=3	-1.64	0.01	-1.66	-1.61
>=4	-0.37	0.01	-0.39	-0.36
5	1.05	0.01	1.03	1.07

a_scwemwbf	Coef	Std. Error.	L95	U95
Discrim	1.72	0.02	1.69	1.76
Diff				
>=2	-3.15	0.03	-3.21	-3.08
>=3	-1.89	0.02	-1.92	-1.85
>=4	-0.36	0.01	-0.37	-0.34
5	1.35	0.01	1.32	1.38

a_scwemwbg	Coef	Std. Error.	L95	U95
Discrim	2.12	0.02	2.07	2.16
Diff				
>=2	-3.21	0.03	-3.28	-3.15
>=3	-2.24	0.02	-2.28	-2.20
>=4	-0.89	0.01	-0.91	-0.87
5	0.61	0.01	0.59	0.62

Graded response IRT model
Log likelihood = -292901.89
Number of obs = 39,851
All statistics are significant at p<0.01

Based on the graded-response IRT model of the seven domains of the SWEMWBS, the test information function in Figure 13 above shows the levels of theta ability and its relation to the latent positive mental health trait. A great amount of information is, of course, provided at the mean level of positive mental health ($\theta=0$); the items differentiate below average levels best at around $\theta=-2$, but less strongly at the top end of PMH (after the high at $\theta=1.6$ it drops while on the negative end, it succeeds until -2.3). This suggests that SWEMWBS items measure lower to medium positive mental health levels best, yet low positive mental health is not the same as the presence of negative mental health, as shown before.

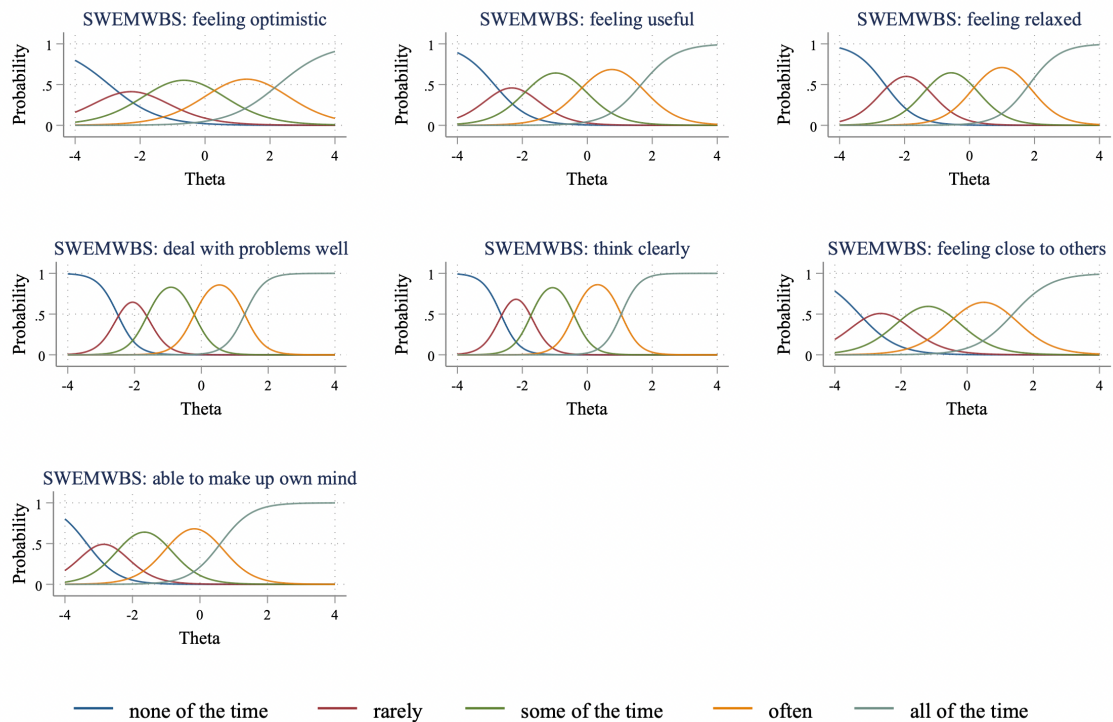


Figure 14 Item-characteristic curves of graded response IRT models of the SWEMWBS subscales (UKHLS wave 1)

Note: The SWEMWBS is scored from 7-35, with a higher score representing higher PMH. Item-response theory model with grade response theory (GRT) selections. UKHLS wave 1.

The item-characteristic-curves in Figure 14 show the levels of discrimination of the subscales along the latent trait of positive mental health (theta). Given the ordinal nature, “all of the time” is, of course, the hardest to pick choice across the items. Moreover, this “all of the time” dimension has the most substantive statistical power at above-average levels of the latent trait, which is important for understanding top levels of PMH and for understanding flourishing. All of this connects to findings on languishing in the PMH and mortality chapter later in the thesis. Among the subscales, the curve of feeling optimistic “all of the time” is particularly shifted to the right, i.e., it differentiates “top levels” of PMH; this, therefore, confirms the substantive bivariate comparisons that were discussed before and that optimism and feeling useful are a powerful predictor of PMH, especially at very high levels.

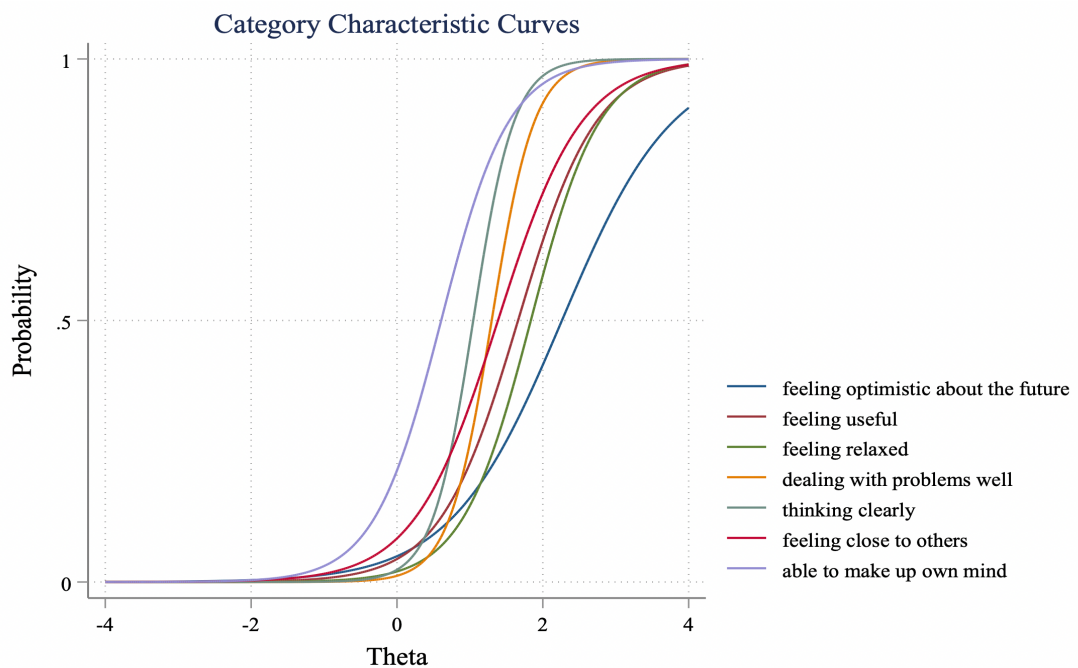


Figure 15 Category characteristic curve at the highest level (fifth) of a graded response IRT model of the SWEMWBS subscales (UKHLS wave 1)

Note: The SWEMWBS is scored from 7-35, with a higher score representing higher PMH. Item-response theory model with grade response theory (GRT) selections. UKHLS wave 1. N = 39,851

The category characteristic curve for the “all of the time” response to the seven subscales is presented in Figure 15. With increasing levels of difficulty as one moves along the x-axis of theta, “feeling optimistic” is the hardest item and even at $\theta=4$ of positive mental health, not all of the respondents would be predicted to have selected “all of the time”. In contrast, with regards to “able to make up own mind”, almost all respondents chose “all of the time” at $\theta=1.5$.

The multidimensional scaling and Item Response Theory testing thus highlighted that the optimism and usefulness subdomains are somewhat different from the other five items and that they are also the most “difficult” in the sense that even at high levels of latent positive mental health, many respondents would not select “all of the time” on these subdomains. The other SWEMWBS items are most suited to differentiate PMH at low to medium levels. Nonetheless, as seen in the confirmatory factor analysis, the SWEMWBS overall has favourable psychometric properties and is a valid overall measure of PMH, so these finer differentiations are only intended for nuanced analyses of specific domains.

2.3.4 What are the associations of PMH with objective health in terms of allostatic load measures?

In addition to the psychometric evaluation, Understanding Society enables the usage of allostatic load (AL) data that were collected in nurse interviews between waves two and three (Cernat and Sakshaug 2020). Allostatic load can be understood as a physiological measure of chronic stress and relates to mechanisms of allostasis and homeostasis (Guidi et al. 2020; McEwen 2005). Long-term stress over the life course has been found to have strongly negative effects on health and longevity (Chandola, Brunner and Marmot 2006; Wahrendorf and Chandola 2016). Allostatic load is informally understood to represent the “wear and tear” of the human body (Maestripieri and Hoffman 2011). This represents a neat overlap with the SWEMWBS as a positive mental health measure, namely that both include notions of resilience and proper functioning.

The modelling approach of Präg and Richards (2019) is followed to facilitate the coding of the blood sample data and to ensure the replicability of the analysis. Based on eleven biomarkers, five physiological allostatic load systems can be computed:

- Lipid metabolism (total cholesterol, HDL cholesterol (reversed), and triglycerides)
- Glucose metabolism (glycated haemoglobin HbA1c)
- Inflammation (C-reactive protein (CRP) and fibrinogen)
- Body fat deposition (BMI and waist circumference)
- Cardiovascular (systolic and diastolic blood pressure and resting heart rate)

Präg and Richards (2019) outline that even though there is no definitive list of allostatic load measurements, these five variables cover the main dimensions. The scores on these

variables as well as the overall allostatic load scale are fully standardised. Further details of the specific set up can be consulted in Präg and Richards (2019)'s paper which was also based on the UKHLS. Some nuances pertain to the coding of allostatic data with or without accounting for medication and body mass index, but here in this chapter, focus is placed on the unadjusted and unweighted scores.

The distributions of the allostatic load items (the overall score and the 5 five separate scores) are visualised in Figure 16. The items are all standardised so that they have a mean score of 0. The histograms show the continuous distribution of the scales.

As the allostatic load data was measured at waves 2 and 3 and as PMH, measured at wave 1, is conceived as a predictor of poor physical health or even mortality risk over time, we treat the allostatic load data as the outcome variables. The analytic sample size is reduced to 9485 cases as only a minority of respondents agreed to have the nurse interview in which the blood samples were taken.

Descriptive statistics of the respondents are presented in Table 32. The cross-sectional survey weight from wave one can no longer be used as this analysis constitute a short longitudinal follow-up period.³⁶ OLS regressions are employed to analyses the associations of PMH with the allostatic load measures (Models 1a to Models 1f).

Pertaining to the dual continua model of mental health, Models 2a to 2f then further add a binary indicator for the presence of negative mental health (GHQ caseness scoring cut-off > 3) to jointly estimate both continua of mental health and to isolate the distinct dimensions of PMH that are not captured by negative mental health.

³⁶ The UKHLS provides a dedicated weight variable for the nurse interview, but it was not unambiguously clear if this weight would still correctly adjust for the baseline selection properties on the SWEMWBS at wave.

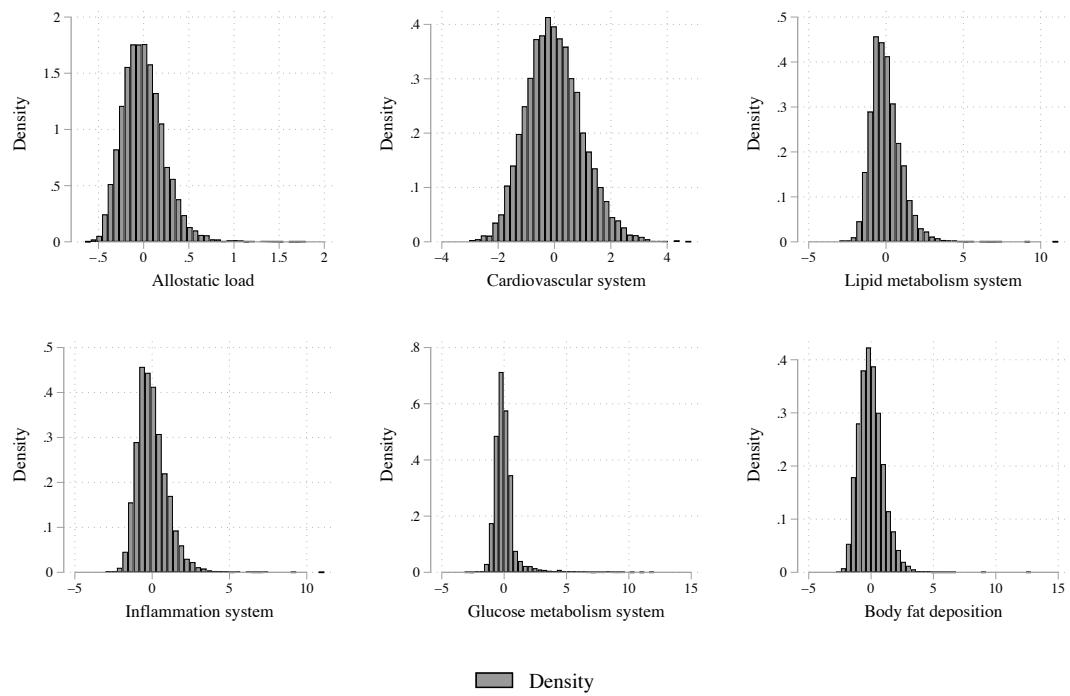


Figure 16 Histograms of the allostatic load scale and 5 components (UKHLS waves 1 and 2) N= 9,485.

Table 32 Descriptive statistics of the allostatic load measure from the nurse interview data in wave 2 and control variables (UKHLS wave 1 and 2). N = 9,485

	Mean/Prop.	n	Freq.
Focal variables			
Allostatic load	.00	9340	
Cardiovascular system	.00	7841	
Lipid metabolism system	.00	9213	
Inflammation system	.00	9213	
Glucose metabolism system	.00	8685	
Body fat deposition	.00	9430	
SWEMWBS	25.40	8224	
Negative mental health (binary)	.18	8418	
Control variables			
Gender: Female	.56	9485	
Age	51.32	9485	
<u>Highest qualification</u>		9476	
No qual	.15		1458
Other qual	.12		1105
GCSE etc	.20		1887
A level etc	.18		1673
Other higher	.13		1278
Degree	.22		2075
<u>Marital status</u>		9482	
Single	.14		1309
In partnership	.69		6512
Separated	.10		995
Widowed	.07		666
Children in hhold	.26	9485	

Table 33 Regression results (Model 1 and Model 2) of allostatic load on PMH (UKHLS waves 1 and 2). N = 9,485

	Model 1a	Model 1b	Model 1c	Model 1d	Model 1e	Model 1f
VARIABLES	Allostatic load	Cardiovascular system	Lipid metabolism system	Inflammation system	Glucose metabolism system	Body fat deposition
SWEMWBS	-0.00*** (-0.00 - -0.00)	-0.01** (-0.01 - -0.00)	-0.01*** (-0.01 - -0.00)	-0.01*** (-0.01 - -0.00)	-0.01*** (-0.02 - -0.01)	-0.02*** (-0.02 - -0.01)
Gender: Female = 2, Women	-0.04*** (-0.05 - -0.03)	-0.16*** (-0.21 - -0.12)	-0.47*** (-0.51 - -0.42)	-0.47*** (-0.51 - -0.42)	-0.11*** (-0.16 - -0.07)	-0.40*** (-0.44 - -0.36)
Age	0.00*** (0.00 - 0.00)	0.01*** (0.01 - 0.01)	0.00 (-0.00 - 0.00)	0.00 (-0.00 - 0.00)	0.02*** (0.02 - 0.02)	0.01*** (0.01 - 0.01)
Highest qualification = 2, Other qual	-0.03** (-0.05 - -0.01)	-0.03 (-0.13 - 0.06)	0.01 (-0.07 - 0.10)	0.01 (-0.07 - 0.10)	-0.16*** (-0.24 - -0.08)	-0.08 (-0.16 - 0.00)
Highest qualification = 3, GCSE etc	-0.03*** (-0.05 - -0.01)	-0.00 (-0.09 - 0.08)	0.07 (-0.01 - 0.14)	0.07 (-0.01 - 0.14)	-0.16*** (-0.24 - -0.09)	-0.10** (-0.18 - -0.02)
Highest qualification = 4, A level etc	-0.04*** (-0.06 - -0.02)	-0.01 (-0.10 - 0.07)	-0.04 (-0.12 - 0.04)	-0.04 (-0.12 - 0.04)	-0.19*** (-0.26 - -0.11)	-0.16*** (-0.24 - -0.08)
Highest qualification = 5, Other higher	-0.05*** (-0.06 - -0.03)	-0.02 (-0.11 - 0.07)	0.01 (-0.08 - 0.09)	0.01 (-0.08 - 0.09)	-0.18*** (-0.26 - -0.10)	-0.18*** (-0.26 - -0.10)
Highest qualification = 6, Degree	-0.09*** (-0.11 - -0.07)	-0.11** (-0.20 - -0.03)	-0.13*** (-0.21 - -0.05)	-0.13*** (-0.21 - -0.05)	-0.28*** (-0.35 - -0.20)	-0.32*** (-0.40 - -0.25)
Marital status = 2, In partnership	0.04*** (0.02 - 0.05)	0.09* (0.00 - 0.17)	0.26*** (0.19 - 0.33)	0.26*** (0.19 - 0.33)	0.03 (-0.03 - 0.10)	0.21*** (0.14 - 0.28)
Marital status = 3, Separated	0.07*** (0.04 - 0.09)	0.20*** (0.09 - 0.30)	0.34*** (0.25 - 0.44)	0.34*** (0.25 - 0.44)	0.11* (0.02 - 0.20)	0.22*** (0.13 - 0.32)
Marital status = 4, Widowed	0.03* (0.00 - 0.05)	0.11 (-0.02 - 0.24)	0.19** (0.07 - 0.30)	0.19** (0.07 - 0.30)	0.02 (-0.09 - 0.13)	0.12* (0.00 - 0.24)
Children in hhold = 1, 1 or more	-0.01 (-0.02 - 0.00)	-0.07* (-0.13 - -0.00)	-0.03 (-0.08 - 0.03)	-0.03 (-0.08 - 0.03)	-0.06* (-0.12 - -0.01)	0.08** (0.03 - 0.14)
Constant	-0.06*** (-0.10 - -0.02)	-0.10 (-0.28 - 0.08)	0.22** (0.05 - 0.38)	0.22** (0.05 - 0.38)	-0.44*** (-0.59 - -0.28)	0.11 (-0.05 - 0.27)
Observations	8,085	6,817	7,970	7,970	7,525	8,173
R-squared	0.13	0.03	0.07	0.07	0.13	0.09

95% confidence intervals in parentheses

*** p<0.001, ** p<0.01, * p<0.05, + p<0.01

Table 34 Regression results (Model 1 and Model 2) of allostatic load on PMH while controlling for negative mental health (UKHLS waves 1 and 2). N = 9,485

	Model 2a	Model 2b	Model 2c	Model 2d	Model 2e	Model 2f
VARIABLES	Allostatic load	Cardiovascular system	Lipid metabolism system	Inflammation system	Glucose metabolism system	Body fat deposition
SWEMWBS	-0.00*** (-0.00 - -0.00)	-0.01** (-0.02 - -0.00)	-0.00 (-0.01 - 0.00)	-0.00 (-0.01 - 0.00)	-0.01** (-0.01 - -0.00)	-0.01*** (-0.02 - -0.01)
Negativ mental health (binary)	0.03*** (0.01 - 0.04)	-0.02 (-0.09 - 0.05)	0.16*** (0.10 - 0.23)	0.16*** (0.10 - 0.23)	0.07* (0.01 - 0.13)	0.10** (0.04 - 0.16)
Gender: Female = 2, Women	-0.04*** (-0.05 - -0.03)	-0.16*** (-0.21 - -0.11)	-0.47*** (-0.52 - -0.43)	-0.47*** (-0.52 - -0.43)	-0.11*** (-0.16 - -0.07)	-0.40*** (-0.45 - -0.36)
Age	0.00*** (0.00 - 0.00)	0.01*** (0.01 - 0.01)	0.00 (-0.00 - 0.00)	0.00 (-0.00 - 0.00)	0.02*** (0.02 - 0.02)	0.01*** (0.01 - 0.01)
Highest qualification = 2, Other qual	-0.03** (-0.05 - -0.01)	-0.03 (-0.13 - 0.06)	0.01 (-0.08 - 0.09)	0.01 (-0.08 - 0.09)	-0.15*** (-0.23 - -0.07)	-0.07 (-0.15 - 0.01)
Highest qualification = 3, GCSE etc	-0.03** (-0.05 - -0.01)	-0.01 (-0.10 - 0.08)	0.06 (-0.02 - 0.14)	0.06 (-0.02 - 0.14)	-0.16*** (-0.23 - -0.08)	-0.10* (-0.17 - -0.02)
Highest qualification = 4, A level etc	-0.04*** (-0.06 - -0.02)	-0.02 (-0.11 - 0.07)	-0.04 (-0.12 - 0.04)	-0.04 (-0.12 - 0.04)	-0.18*** (-0.26 - -0.11)	-0.16*** (-0.23 - -0.08)
Highest qualification = 5, Other higher	-0.05*** (-0.07 - -0.03)	-0.02 (-0.11 - 0.07)	-0.00 (-0.08 - 0.08)	-0.00 (-0.08 - 0.08)	-0.18*** (-0.25 - -0.10)	-0.18*** (-0.26 - -0.10)
Highest qualification = 6, Degree	-0.09*** (-0.11 - -0.07)	-0.11** (-0.20 - -0.03)	-0.14*** (-0.22 - -0.06)	-0.14*** (-0.22 - -0.06)	-0.28*** (-0.35 - -0.21)	-0.32*** (-0.39 - -0.25)
Marital status = 2, In partnership	0.04*** (0.02 - 0.05)	0.08* (0.00 - 0.16)	0.26*** (0.19 - 0.33)	0.26*** (0.19 - 0.33)	0.04 (-0.03 - 0.11)	0.21*** (0.14 - 0.28)
Marital status = 3, Separated	0.06*** (0.04 - 0.08)	0.19*** (0.08 - 0.30)	0.34*** (0.24 - 0.43)	0.34*** (0.24 - 0.43)	0.10* (0.01 - 0.19)	0.22*** (0.12 - 0.31)
Marital status = 4, Widowed	0.03 (-0.00 - 0.05)	0.10 (-0.03 - 0.23)	0.17** (0.05 - 0.29)	0.17** (0.05 - 0.29)	0.03 (-0.08 - 0.14)	0.11 (-0.00 - 0.23)
Children in hhold = 1, 1 or more	-0.01 (-0.02 - 0.00)	-0.07* (-0.13 - -0.00)	-0.03 (-0.08 - 0.03)	-0.03 (-0.08 - 0.03)	-0.07* (-0.12 - -0.01)	0.09** (0.03 - 0.14)
Constant	-0.10*** (-0.14 - -0.06)	-0.08 (-0.29 - 0.12)	0.01 (-0.17 - 0.19)	0.01 (-0.17 - 0.19)	-0.54*** (-0.71 - -0.37)	-0.01 (-0.19 - 0.17)
Observations	7,993	6,741	7,879	7,879	7,441	8,080
R-squared	0.13	0.03	0.07	0.07	0.13	0.09

95% confidence intervals in parentheses

*** p<0.001, ** p<0.01, * p<0.05, + p<0.01

Models 1a to 1f in Table 33 show that the SWEMWBS is statistically significantly associated with all of the allostatic load indicators at the alpha 0.99 or 0.999 levels (i.e., $p < 0.01$ or $p < 0.001$): Higher levels of PMH are linked with lower levels of allostatic load. The size of this association seems to be the largest for body fat deposition and glucose metabolism system. Interestingly educational status only has a partial association with these outcome variables, for instance, none for the inflammation system or lipid metabolism system apart from at the highest level for having a university compared (vs no qualifications as the reference group). Women report lower levels of allostatic load (b -0.04; 95% confidence interval -0.05 to -0.03).

While these results are already telling, it might be the case that this was just driven by a shared latent mental health domain with mental illness. To test this, as part of the dual continua model, Models 2a to 2f (Table 34) replicate the analyses but add the indicator for negative mental health. Overall, the results are that PMH is still significantly associated with most of the allostatic load measures. This implies that the association of PMH with allostatic load is mostly distinct and not explained by NMH, which might be striking when considering that the concept of allostatic load is essentially concerned with negative physiological health. One might speculate, for instance, that higher SWEMWBS may have a unique pathway protecting from cardiovascular stress, for instance, through better immune responses, while this is not the case for the GHQ. The last paper of this chapter assesses mortality differences based on Keyes' Mental Health Continuum Short Form, a positive mental health scale, over a more than 21-year follow up period.

However, two measures, the inflammation system and lipid metabolism system, were no longer statistically significantly associated with the SWEMWBS once controlling for NMH. Still, taken together, these findings imply that the SWEMWBS is indeed

measuring a significant dimension of well-being that robustly relates to chronic stress and which may have detrimental cumulative health effects later in life.

Future research could expand upon these findings and control for other covariates as well as include changes in conditions such as job status in between the included waves.

2.4 Discussion

This chapter has provided a wealth of analysis and detail about the SWEMWBS, its domains, its psychometric properties, its associations with demographic and sociological variables as well as allostatic load data. To the authors' knowledge, this has been the most extensive analysis of the SWEMWBS that has ever been conducted.

These analyses are important because they are representative of the general population – an arena in which both the SWEMWBS and the larger WEMWBS have not been tested in as much.

First research question (“Who is flourishing?”)

The SWEMWBS is very strongly associated with sociological and demographic conditions. Demographically, there is some evidence of a U-shaped distribution of PMH over age, with the lowest values across age ranges from 40-54 (“midlife crisis”).

Somewhat contrary to predictions, PMH is most pronounced in older age, especially around the retirement age and up to age 74. However, these results are only cross-sectional and might be partially confounded by cohort differences or other selection effects.

People with the highest levels of educational attainment are clearly reporting much higher levels of PMH than respondents with lower educational attainment (about 1.5 to

2 points difference). There is a strong socio-economic gradient in PMH in terms of social class and even parental social class, in which the highest class (“larger employers and higher management”) is consistently associated with the highest levels of PMH.

Second research question: Does the dual continua model, based on the SWEMWBS and GHQ, hold up in empirical reality in the UK?

Based on Keyes' dual continua model, the prevalence, predictors, and consequence of being grouped in the four groups of flourishing, floundering, struggling, and languishing (as well as a conditional group on moderate PMH, as well as an intermediate group of moderate positive mental health) has been tested. The results revealed that the dual continua model could be operationalised empirically with the SWEMWBS and GHQ even though these two scales share a moderately high correlation and even though these measures have not been selected together to be maximally different. Indeed, one might argue that the approach of the thesis is conservative and tends towards the cautious side because of this.

A relatively large share of people in the UK is flourishing, i.e., they have high PMH and no mental illness. The off-diagonal groups of struggling and languishing were found to be important. Even though only a smaller share of UK people has a mental illness but also high PMH (struggling), many of the people in this group developed much more desirable health and behavioural outcomes over time, seemingly undoing and overcoming some of the detrimental effects of mental illness. Likewise, the languishing group appeared to be at increased risk of problems even though the absence of mental illness in this group would not have traditionally given concern to be included in screening instruments for health interventions.

Third research question (“Which domain of the SWEMWBS is most relevant?”)

New insights of the chapter have shown that the domains of the SWEMWBS are very important and that the eudaimonic “feeling useful” and “feeling optimistic” dimensions do indeed diverge most strongly from the GHQ, and they do most strongly differ on a set of comparison variables such as age groups. The SWEMWBS combined three distinct dimensions of hedonic, eudaimonic, and social well-being, but by combining these aspects, it seems to dilute some important differences that would help to explain aspects of positive mental health. This pooling of scores may be justified when no alternative mental health scales are available, but given the rich data in Understanding Society, more specificity and novelty regarding the top levels of PMH is arguably what is most fruitful. Of course, researchers are free to pick and choose subscale, and the findings of this chapter shall encourage them to experiment.

Fourth research question (“How does the SWEMWBS compare to other scales?”)

The SWEMWBS is a psychometrically valid scale of overall mental health that performs at least similarly well as competing or rather more established mental health scales such as the GHQ and life satisfaction. It captures important age differences in mental health and relates strongly to educational attainment, social class and even to parental social class. Because of its scores as a continuous scale, it might have better measurement qualities than a genuinely ordinal scale like life satisfaction. The correlations of the SWEMWBS with the GHQ or life satisfaction are only moderate.

The implicit and explicit promise of positive mental health is exactly to measure the most positive and highest levels of mental well-being. The term “flourishing”, on which the field is based, relates to top levels of mental health. The SWEMWBS behaves similarly to the other mental health scales; interestingly, it captures the “languishing”

dimension of positive mental health best: People with low positive mental health.

However, low positive mental health appears to be substantively different from generic negative mental health, and this issue will be further explored in other parts of this thesis.

Nonetheless, the analyses also show that SWEMWBS is not identical to the GHQ, as seen in the relatively modest correlations and good psychometric evaluations and in the fact that even when controlling for NMH, this does not fully explain differences in the SWEMWBS. In this sense, the SWEMWBS does not simply mirror the GHQ, but it also does not fully get at PMH. The SWEMWBS might perform better in this regard as the full WEMWBS is mainly focused on psychological functioning. Moreover, recent advances in the literature have stressed the need to account for and jointly control for NMH and PMH in the same equation (Lee et al 2021), otherwise it becomes hard, if not impossible, to tell the unique contributions of each concept apart. Future researchers who actively care about the positive dimension of PMH, should therefore control for NMH when using the overall SWEMWBS.

In practice, if a researcher simply wants to control for overall mental health, it might sometimes not make much difference whether he or she picks the GHQ or SWEMWBS or life satisfaction. However, if there is a substantive interest in mental well-being or particularly positive mental health, one would be advised to carefully hypothesise which domains are most important. For instance, a case has been made for a specific linkage between ratings of autonomy in adolescence and fertility (Billari 2017). Such specific hypotheses can then be tested, and they can inform our understanding of PMH. In the UKHLS, the two mentioned (eudaimonic) subscales, as well as the social well-being dimension have been found to be quite promising for future research. Optimism has been reported to have a significant protective effect on mortality (Kim et al. 2017); in

this sense understanding the subscales of PMH might be more informative than understanding a combined overall scale.

There is a note of caution to be made, namely that researchers should be careful when using terms such as “gold standard”; because the burden of proof will almost always be unachievably high, and failure will give sceptics of the field too much unnecessary scope for an attack. The results show that the SWEMWBS is a decent mental health measure, but it is not in a revolution per se against other well-established alternative measures based on the population-representative findings. While it is natural to make promising statements when one is enthusiastic about a new idea or pitching a new scale for inclusion in major surveys, only time will tell which scales and ideas prove to be useful and relevant.

Fifth research question (“Associations of PMH with allostatic load”)

Addressing the fourth research question, the chapter found that PMH is associated with allostatic load information and that the “feeling optimistic” domain is most significantly associated. The SWEMWBS is about as strongly associated with allostatic load, thus suggesting that it is very predictive of objective health. Strikingly, the strong results of the SWEMWBS on allostatic load remain, even when controlling for the GHQ.

2.4.1 Limitations and future avenues

The bivariate comparisons between the SWEMWBS and other variables should be robust, and they do not make any causal assumptions that could have been violated. Nonetheless, other psychological factors, such as stable psychological traits and unmeasurable characteristics, could suppress some of the relationships. The choice of comparison variables is certainly not exhaustive, and some relevant differences might have been missed. Many of the findings are based on descriptive analyses and overall

averages, so despite being representative, one cannot infer individual-level mechanisms. The other chapters in the thesis will look at these micro-level models in more detail. If the SWEMWBS had been measured annually, one would have been able to address important questions about changes in PMH and looked at time trends.

It would be beneficial to conduct a longitudinal confirmatory factor analysis of the SWEMWBS as well as the other mental health scales. Establishing measurement invariance across groups, e.g., for gender or for ethnic groups (King et al 2021), and especially over time across waves, would be an appropriate statistical test of the qualities of the SWEMWBS. It might be the case that some items of the SWEMWBS (either in terms of the means, error terms, or factor loadings) do not hold up well across time. However, the presented results already suggest that the SWEMWBS is generally a good measure, and the most important issue is the application of PMH in substantive sociological research.

When these results are developed into journal manuscripts, more formalised statistical tests such as log-likelihood statistics or the AIC or BIC criterion and theoretical models could be employed to validate the significance of the reported findings. Similarly, in a structural equation modelling framework, it would be possible to account for the latent nature of the various mental health scales and to model error terms in more depth, for instance, via bifactor models. This would also make it possible to use FIML techniques to account for missingness in the data.

The allostatic load data (wave 2) were not collected at the same time as the SWEMWBS (wave 1), and the analysis has not considered major events or changes in SWEMWBS that would have affected the AL relationship.

2.5 Conclusion

The findings of this first empirical chapter have shown that the SWEMWBS is a well-performing mental health scale from a sociological, psychometric, and substantive perspective and that even though there is expected overlap with the competing mental health scales (GHQ and life satisfaction), there is sufficient uniqueness and independence to warrant its usage in sociological and demographic applications. Indeed, the results suggest that in terms of socio-economic stratification, the SWEMWBS is particularly responsive because it captures a broader and distinct range of positive scores and dimensions than the negative mental health or life satisfaction scale.

This chapter has provided ample evidence for the empirical relevance of the dual continua model of mental health. The diagonal off groups revealed finer details that would not have been captured by just assessing the absence or presence of negative (or positive) mental in isolation. These findings are in support of the recent literature on the dual continua model of mental health (Iasiello and van Agteren, 2020). The predictors of the groups of the dual continua model varied substantively, as did the consequences of membership in these groups in terms of smoking behaviour or the development of mental illness ten years later. Depending on the choice of the mental health scale or even domain, different conclusions could sometimes be drawn in sociological or demographic research applications.

Despite the empirical confirmation, however, one might argue that the dual continua model could seem to imply complete orthogonal relationships across negative and positive mental health: This would be an overstatement as PMH and NMH are clearly still correlated. Future empirical chapters will follow the dual continua model, but instead of categorising the multiple groups (at multiple time points), a more efficient specification of jointly accounting for negative and positive mental health will be

Chapter 2: The Short Warwick-Edinburgh Mental Well-Being Scale in the UK's Understanding Society
chosen (also see Lee et al, 2021 for justification). The facts and arguments for a single continuum of mental health (i.e., mental illness to mental well-being on the same scale) or the dual continua probably lie somewhere in the middle in that the details of what scholars mean by those terms define the content and consequences: for instance, when a survey of limited space or time only allows for a single mental health measure, it could be reasonable to use the SWEMWBS as an indicator of mental health overall.

Two domains of the SWEMWBS have been found to be particularly interesting from a positive mental health perspective: The “feeling optimistic” and “feeling useful” domains which one could classify to be most eudaimonic from a philosophical perspective, differ significantly from the more affective and psychological functioning domains. The lack of hope and optimism, according to Carol Graham, a leading scholar of happiness research, is one of the crucial explanatory factors for many negative life events, including mortality (O'Connor and Graham, 2019).

2.6 References

- Atkinson, G., & Mourato, S. (2015). Cost-benefit analysis and the environment. Paris: OECD Publications.
- Antonucci, T. C., & Akiyama, H. (1987). An examination of sex differences in social support among older men and women. *Sex roles*, 17(11), 737-749.
- Auerswald, M., & Moshagen, M. (2019). How to determine the number of factors to retain in exploratory factor analysis: A comparison of extraction methods under realistic conditions. *Psychological methods*, 24(4), 468.
- Bartels, M., and B. Baselmans. 2018. "First genetic variants for eudaimonia and the genetic overlap with hedonia." *Behavior Genetics* 48(6):456-56.
- Bartels, M., M. Van de Weijer, G. Willemsen, and B. Baselmans. 2017. "Overlap and distinction between hedonic and eudaimonic well-being: a genetically-informative approach to elucidate current discussions." *Behavior Genetics* 47(6):690-90.
- Bartram, David J., Ghasem Yadegarfar, Julia M.A. Sinclair, and David S. Baldwin. 2011. "Validation of the Warwick–Edinburgh Mental Well-being Scale (WEMWBS) as an overall indicator of population mental health and well-being in the UK veterinary profession." *The Veterinary Journal* 187(3):397-98.
- Baselmans, B. M. L., and M. Bartels. 2018. "A genetic perspective on the relationship between eudaimonic -and hedonic well-being." *Sci Rep* 8(1):14610.
- Bass, M, M Dawkin, S Muncer, S Vigurs, and J Bostock. 2016. "Validation of Warwick-Edinburgh Mental Well-being Scale (WEMWBS) in a population of

people using Secondary Care Mental Health Services." *J Ment Health* 25(4):323-29.

Biewen, Martin, and Stephen P Jenkins. 2006. "Variance estimation for generalized entropy and Atkinson inequality indices: the complex survey data case." *Oxford bulletin of economics and statistics* 68(3):371-83.

Billari, Francesco C. "Youth autonomy and higher fertility: A new life course regime?" *NICO VAN NIMWEGEN: THE RESOURCEFUL DEMOGRAPHER*:82.

Bond, Timothy N, and Kevin Lang. 2019. "The sad truth about happiness scales." *Journal of Political Economy* 127(4):1629-40.

Carroll, J. D., & Arabie, P. (1998). Multidimensional scaling. Measurement, judgment and decision making, 179-250.

Castellví, P, CG Forero, M Codony, G Vilagut, P Brugulat, A Medina, A Gabilondo, A Mompart, J Colom, R Tresserras, M Ferrer, S Stewart-Brown, and J Alonso. 2014. "The Spanish version of the Warwick-Edinburgh mental well-being scale (WEMWBS) is valid for use in the general population." *Qual Life Res* 23(3):857-68.

Cernat, Alexandru, and Joseph W Sakshaug. 2020. "Nurse effects on measurement error in household biosocial surveys." *BMC medical research methodology* 20(1):1-9.

Chandola, Tarani, Eric Brunner, and Michael Marmot. 2006. "Chronic stress at work and the metabolic syndrome: prospective study." *BMJ* 332(7540):521-25.

- Chen, Le-Yu, Ekaterina Oparina, Nattavudh Powdthavee, and Sorawoot Srisuma. 2019. "Have econometric analyses of happiness data been futile? A simple truth about happiness scales."
- Chiappelli, J., Kvarata, M., Bruce, H., Chen, S., Kochunov, P., & Hong, L. E. (2021). Stressful life events and openness to experience: Relevance to depression. *Journal of affective disorders*, 295, 711-716.
- Cowden, R. G., Rueger, S. Y., Davis, E. B., Counted, V., Kent, B. V., Chen, Y., ... & Worthington, E. L. (2022). Resource loss, positive religious coping, and suffering during the COVID-19 pandemic: A prospective cohort study of US adults with chronic illness. *Mental Health, Religion & Culture*, 25(3), 288-304.
- Davis, J. E. (2020). *Chemically imbalanced: Everyday suffering, medication, and our troubled quest for self-mastery*. University of Chicago Press.
- De Maio, Fernando G. 2007. "Income inequality measures." *Journal of Epidemiology & Community Health* 61(10):849-52.
- Diener, E, RA Emmons, RJ Larsen, and S Griffin. 1985. "The Satisfaction With Life Scale." *J Pers Assess* 49(1):71-5.
- Diener, Ed. 1984. "Subjective well-being." *Psychological Bulletin* 95(3):542-75.
- Doherty, A. M., & Gaughran, F. (2014). The interface of physical and mental health. *Social psychiatry and psychiatric epidemiology*, 49(5), 673-682.
- Dong, A, X Chen, L Zhu, L Shi, Y Cai, B Shi, L Shao, and W Guo. 2016. "Translation and validation of a Chinese version of the Warwick–Edinburgh Mental Well-

being Scale with undergraduate nursing trainees." *Journal of psychiatric and mental health nursing* 23(9-10):554-60.

Ferguson, E., & Bibby, P. A. (2012). Openness to experience and all-cause mortality: A meta-analysis and reequivalent from risk ratios and odds ratios. *British journal of health psychology*, 17(1), 85-102.

Frijters, Paul, Andrew E. Clark, Christian Krekel, and Richard Layard. 2020. "A happy choice: wellbeing as the goal of government." *Behavioural Public Policy*:1-40.

Fung, S. F. 2019a. "Psychometric evaluation of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS) with Chinese University Students." *Health Qual Life Outcomes* 17(1):46.

Fung, SF. 2019b. "Psychometric evaluation of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS) with Chinese University Students." *Health Qual Life Outcomes* 17(1):46.

George, L. K., Blazer, D. G., Hughes, D. C., & Fowler, N. (1989). Social support and the outcome of major depression. *The British Journal of Psychiatry*, 154(4), 478-485.

Goldberg, D. P., and V. F. Hillier. 1979. "A scaled version of the General Health Questionnaire." *Psychological Medicine* 9(01):139.

Gomez, R, and J Fisher. 2005. "Item response theory analysis of the spiritual well-being questionnaire." *Personality and Individual Differences*.

- Gremigni, Paola, and Sarah Stewart-Brown. 2011. "Measuring mental well-being: Italian validation of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS)." *Giornale italiano di psicologia* 38(2):485-508.
- Grimes, Arthur, Stephen P Jenkins, and Florencia Tranquilli. 2020. "The Relationship between Subjective Wellbeing and Subjective Wellbeing Inequality: Taking Ordinality and Skewness Seriously."
- Guidi, Jenny, Marcella Lucente, Nicoletta Sonino, and Giovanni A Fava. 2020. "Allostatic load and its impact on health: a systematic review." *Psychotherapy and psychosomatics*:1-17.
- Haver, A, K Akerjordet, P Caputi, T Furunes, and C Magee. 2015. "Measuring mental well-being: A validation of the Short Warwick-Edinburgh Mental Well-Being Scale in Norwegian and Swedish." *Scand J Public Health* 43(7):721-7.
- Iasiello, M., & Van Agteren, J. (2020). Mental health and/or mental illness: A scoping review of the evidence and implications of the dual-continua model of mental health. *Evidence Base: A journal of evidence reviews in key policy areas*, (1), 1-45.
- Ikink, Jasper GM, SM Lamers, and JM Bolier. 2012. "De Warwick-Edinburgh Mental Well-being Scale (WEMWBS) als meetinstrument voor mentaal welbevinden in Nederland." University of Twente, unpublished thesis.
- Jenkins, Stephen. 2019a. "INEQORD: Stata module to calculate indices of inequality and polarization for ordinal data."
- Jenkins, Stephen P. 2019b. "Better off? Distributional comparisons for ordinal data about personal well-being." *New Zealand Economic Papers* 54(3):211-38.

- Kim, Eric S, Kaitlin A Hagan, Francine Grodstein, Dawn L DeMeo, Immaculata De Vivo, and Laura D Kubzansky. 2017. "Optimism and cause-specific mortality: a prospective cohort study." *American journal of epidemiology* 185(1):21-29.
- Kim, Sewoong, Han-Yong Jung, Kyoung-Sae Na, Soyoung Irene Lee, Shin-Gyeom Kim, A Reum Lee, and Joon Tag Cho. 2014. "A validation study of the Korean version of warwick-edinburgh mental well-being scale." *Journal of Korean Neuropsychiatric Association* 53(4):237-45.
- Koushede, Vibeke, Mathias Lasgaard, Carsten Hinrichsen, Charlotte Meilstrup, Line Nielsen, Signe Boe Rayce, Manuel Torres-Sahli, Dora Gudrun Gudmundsdottir, Sarah Stewart-Brown, and Ziggi Ivan Santini. 2019. "Measuring mental well-being in Denmark: Validation of the original and short version of the Warwick-Edinburgh mental well-being scale (WEMWBS and SWEMWBS) and cross-cultural comparison across four European settings." *Psychiatry Research* 271:502-09.
- Land, Kenneth C., and Alex C. Michalos. 2018. "Fifty Years After the Social Indicators Movement: Has the Promise Been Fulfilled." *Social Indicators Research* 135(3):835-68.
- Lang, Gert, and Almut Bachinger. 2017. "Validation of the German Warwick-Edinburgh Mental Well-Being Scale (WEMWBS) in a community-based sample of adults in Austria: a bi-factor modelling approach." *Journal of Public Health* 25(2):135-46.
- Layard, Richard. 2010. "The greatest happiness principle: Its time has come." *CESifo DICE Report* 8(4):26-31.

- Lee, M. T., Kubzansky, L. D., & VanderWeele, T. J. (Eds.). (2021). Measuring well-being: Interdisciplinary perspectives from the social sciences and the humanities. Oxford University Press.
- Lloyd, K, and P Devine. 2012. "Psychometric properties of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS) in Northern Ireland." *J Ment Health* 21(3):257-63.
- Lomas, T., Bartels, M., Van De Weijer, M., Pluess, M., Hanson, J., & VanderWeele, T. J. (2022). The Architecture of Happiness. Emotion Review, 17540739221114109.
- López, María Andrée, Andrea Gabilondo, Miquel Codony, Carlos García-Forero, Gemma Vilagut, Pere Castellví, Montse Ferrer, and Jordi Alonso. 2013. "Adaptation into Spanish of the Warwick–Edinburgh Mental Well-being Scale (WEMWBS) and preliminary validation in a student sample." *Quality of Life Research* 22(5):1099-104.
- Minichino, A., Bersani, F. S., Calò, W. K., Spagnoli, F., Francesconi, M., Vicinanza, R., ... & Biondi, M. (2013). Smoking behaviour and mental health disorders—mutual influences and implications for therapy. *International Journal of Environmental Research and Public Health*, 10(10), 4790-4811.
- Maestripieri, Dario, and Christy L Hoffman. 2011. "Chronic stress, allostatic load, and aging in nonhuman primates." *Development and Psychopathology* 23(4):1187.
- Maheswaran, Hendramoorthy, Scott Weich, John Powell, and Sarah Stewart-Brown. 2012. "Evaluating the responsiveness of the Warwick Edinburgh Mental Well-

Being Scale (WEMWBS): Group and individual level analysis." *Health and Quality of Life Outcomes* 10(1):156.

McEwen, Bruce S. 2005. "Glucocorticoids, depression, and mood disorders: structural remodeling in the brain." *Metabolism* 54(5):20-23.

Ng Fat, L, S Scholes, S Boniface, J Mindell, and S Stewart-Brown. 2017. "Evaluating and establishing national norms for mental wellbeing using the short Warwick-Edinburgh Mental Well-being Scale (SWEMWBS): findings from the Health Survey for England." *Qual Life Res* 26(5):1129-44.

Nickerson, C. A. 2017. "No Evidence for Differential Relations of Hedonic Well-Being and Eudaimonic Well-Being to Gene Expression: A Comment on Statistical Problems in Fredrickson et al. (2013)." *Collabra-Psychology* 3(1).

Nima, A. A., K. M. Cloninger, B. N. Persson, S. Sikstrom, and D. Garcia. 2019. "Validation of Subjective Well-Being Measures Using Item Response Theory." *Front Psychol* 10:3036.

O'Connor, K. J., & Graham, C. (2019). Longer, more optimistic, lives: Historic optimism and life expectancy in the United States. *Journal of Economic Behavior & Organization*, 168, 374-392.

Präg, Patrick, and Lindsay Richards. 2019. "Intergenerational social mobility and allostatic load in Great Britain." *J Epidemiol Community Health* 73(2):100-05.

Rigdon, E. E., & Ferguson Jr, C. E. (1991). The performance of the polychoric correlation coefficient and selected fitting functions in confirmatory factor analysis with ordinal data. *Journal of marketing research*, 28(4), 491-497.

- Ruggeri, K., Garcia-Garzon, E., Maguire, Á., Matz, S., & Huppert, F. A. (2020). Well-being is more than happiness and life satisfaction: a multidimensional analysis of 21 countries. *Health and quality of life outcomes*, 18(1), 1-16.
- Santos, Jefferson Jovelino Amaral dos, Telma Aparecida da Costa, Juliane Honório Guilherme, Watusi Camila da Silva, Lilian Regina Lengler Abentroth, Jessica Aline Krebs, and Priscila Sotoriva. 2015. "Adaptation and cross-cultural validation of the Brazilian version of the Warwick-Edinburgh mental well-being scale." *Revista da Associação Médica Brasileira* 61(3):209-14.
- Sayer, A. (2020). Critiquing—and rescuing—‘character’. *Sociology*, 54(3), 460-481.
- Saari, A. J., Kentala, J., & Mattila, K. J. (2015). Weaker self-esteem in adolescence predicts smoking. *BioMed research international*, 2015.
- Schnittker, J, and V Bacak. 2014. "The increasing predictive validity of self-rated health." *PLoS One* 9(1):e84933.
- Smith, Otto RF, Daniele E Alves, Marit Knapstad, Ellen Haug, and Leif E Aarø. 2017. "Measuring mental well-being in Norway: validation of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS)." *BMC Psychiatry* 17(1):182.
- Stewart-Brown, S, A Tennant, R Tennant, S Platt, J Parkinson, and S Weich. 2009a. "Internal construct validity of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS): a Rasch analysis using data from the Scottish Health Education Population Survey." *Health Qual Life Outcomes* 7:15.
- Stewart-Brown, S. L., S. Platt, A. Tennant, H. Maheswaran, J. Parkinson, S. Weich, R. Tennant, F. Taggart, and A. Clarke. 2011. "The Warwick-Edinburgh Mental Well-Being Scale (Wemwbs): A Valid and Reliable Tool for Measuring Mental

Well-Being in Diverse Populations and Projects." *Journal of Epidemiology and Community Health* 65.

Stewart-Brown, S., A. Tennant, R. Tennant, S. Platt, J. Parkinson, and S. Weich. 2009b.

"Internal construct validity of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS): a Rasch analysis using data from the Scottish Health Education Population Survey." *Health Qual Life Outcomes* 7:15.

Stewart-Brown, Sarah. 2013. "The Warwick-Edinburgh Mental Well-being Scale

(WEMWBS): performance in different cultural and geographical groups." Pp. 133-50 in *Mental well-being*: Springer.

—. 2015. "Measuring wellbeing: What does the Warwick-Edinburgh Mental Well-being Scale have to offer integrated care." *European Journal of Integrative Medicine* 7(4):384-88.

Taggart, F, T Friede, S Weich, A Clarke, M Johnson, and S Stewart-Brown. 2013.

"Cross cultural evaluation of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS) --a mixed methods study." *Health Qual Life Outcomes* 11:27.

Tennant, R, L Hiller, R Fishwick, S Platt, S Joseph, S Weich, J Parkinson, J Secker, and

S Stewart-Brown. 2007a. "The Warwick-Edinburgh Mental Well-being Scale (WEMWBS): development and UK validation." *Health Qual Life Outcomes* 5:63.

Tennant, R., L. Hiller, R. Fishwick, S. Platt, S. Joseph, S. Weich, J. Parkinson, J.

Secker, and S. Stewart-Brown. 2007b. "The Warwick-Edinburgh Mental Well-being Scale (WEMWBS): development and UK validation." *Health Qual Life Outcomes* 5:63.

- Tennant, R., S. Joseph, and S. Stewart-Brown. 2007. "The Affectometer 2: a measure of positive mental health in UK populations." *Quality of Life Research* 16(4):687-95.
- Thege, B. K., L. Littvay, D. L. Tarnoki, and A. D. Tarnoki. 2017. "Genetic and Environmental Effects on Eudaimonic and Hedonic Well-Being: Evidence from a Post-Communist Culture." *Current Psychology* 36(1):84-89.
- Trousselard, M, D Steiler, F Dutheil, D Claverie, F Canini, F Fenouillet, G Naughton, S Stewart-Brown, and N Franck. 2016. "Validation of the Warwick-Edinburgh Mental Well-Being Scale (WEMWBS) in French psychiatric and general populations." *Psychiatry Res* 245:282-90.
- van Agteren, J., Iasiello, M., Lo, L., Bartholomaeus, J., Kopsaftis, Z., Carey, M., & Kyrios, M. (2021). A systematic review and meta-analysis of psychological interventions to improve mental wellbeing. *Nature Human Behaviour*, 5(5), 631-652.
- Voytenko, V. L., Pargament, K. I., Cowden, R. G., Lemke, A. W., Kurniati, N. M. T., Bechara, A. O., ... & Worthington Jr, E. L. (2021). Religious coping with interpersonal hurts: Psychosocial correlates of the brief RCOPE in four non-Western countries. *Psychology of Religion and Spirituality*.
- Wahrendorf, Morten, and Tarani Chandola. 2016. "A life course perspective on work stress and health." Pp. 43-66 in *Work Stress and Health in a Globalized Economy*: Springer.
- Waqas, Ahmed, Waqas Ahmad, Frances Taggart, Zerwah Muhammad, Muhammad Hamza HB Bukhari, Shahzad Ahmed Sami, Sayyeda Mehak Batool, Fiza

Najeeb, Ayesha Hanif, and Zehra Ali Rizvi. 2015. "Validation of Warwick-Edinburgh Mental Well-being Scale (WEMWBS) in Pakistani healthcare professionals." PeerJ PrePrints.

Young, A. F., Powers, J. R., & Bell, S. L. (2006). Attrition in longitudinal studies: who do you lose?. *Australian and New Zealand journal of public health*, 30(4), 353-361.

Yu, Y., & Williams, D. R. (1999). Socioeconomic status and mental health. In *Handbook of the sociology of mental health* (pp. 151-166). Springer, Boston, MA.

3 POSITIVE MENTAL HEALTH AND NEIGHBOURHOOD CONDITIONS IN ENGLAND

This study examines the extent to which objective neighbourhood deprivation (as measured through the index of Multiple Deprivation) and perceived/social neighbourhood (neighbourhood cohesion) are associated with positive mental health (PMH). Four previous studies report a strong effect of social and perceived (social) neighbourhood incivilities on PMH (Elliott et al. 2014; Gale et al. 2011; Jones et al. 2014; Toma, Hamer and Shankar 2015). Only one of the studies included a measure of objective neighbourhood deprivation, but no association with PMH was detected (Gale et al. 2011).

The contributions of this study firstly are that it is based on large-scale and nationally representative data and that it uses multilevel models which account for the clustering and nesting of individuals in neighbourhoods for cross-sectional analyses at wave one. Multilevel models in which survey respondents (level 1) are nested in LSOAs (level 2) are used to study the associations of neighbourhood deprivation and neighbourhood cohesion with PMH, on the separate domains of PMH, as well as when jointly account for negative mental health (GHQ). Secondly, random effects and fixed effects regression are compiled on longitudinal (waves one to ten) data of English households (N = 51,769 respondents with 113,119 person-period observations). Random and fixed effects models of changes in neighbourhood residency and changes in PMH are used to generate insightful longitudinal descriptions and to partially differentiate between causal neighbourhood effects and selective residential mobility.

This study finds that objective neighbourhood deprivation and social neighbourhood factors are strongly associated with PMH. In support of the dual continua model of mental health, these findings remain robust even when jointly accounting for negative mental health, suggesting that neighbourhoods have a distinct association with PMH. Moreover, from a longitudinal perspective, people who reside in or move into a less

deprived neighbourhood subsequently report better PMH, and this pattern remains robust even when accounting for the simultaneous changes in negative mental health. The results of this study thus suggest that both objective and subjective neighbourhood factors are robustly associated with PMH and that PMH is very well-suited for the sociological analyses of neighbourhood conditions. Further research is needed to identify the causal longitudinal effect of neighbourhood changes on PMH more robustly.

3.1 Introduction

Do deprived neighbourhoods make people ill? Do advantaged neighbourhoods contribute to the mental well-being of their residents? Over the last 30 years or so, much has been written about the associations of neighbourhood deprivation with mental and physical health, but there is still no agreement on whether neighbourhoods have a causal or just compositional association with health (Oakes et al. 2015).

Recently there has been much interest in the effects of neighbourhoods on PMH. Four studies found an association of perceived social neighbourhood characteristics like neighbourhood belonging with PMH (Elliott et al. 2014; Gale et al. 2011; Jones et al. 2014; Toma, Hamer and Shankar 2015). Only Gale et al.'s (2011) study also employed an objective neighbourhood deprivation measure in the analysis, but unexpectedly no association with PMH was found. A lack of an association between objective neighbourhood deprivation and PMH would contradict most other studies that are based on more established mental health outcomes in which such an association is reported. The reason for this surprising finding concerning PMH might be that the study used cross-sectional data from a small regional sample of respondents: The Hertfordshire Cohort Study covers only around 3000 people born between 1931-39. The other studies used more sophisticated data sources, but none of them covered any indicators of

objective neighbourhood deprivation. There is also another problem, namely that all the existing studies on PMH have completely ignored the issue of causality: Any association (or lack thereof) between objective and social neighbourhood factors might be due to selective residential mobility.

This study addresses these limitations by analysing longitudinal data of a rich nationally representative sample of people in England that includes data on objective neighbourhood deprivation via the Index of Multiple Deprivation (IMD). This study addresses two research questions:

1. How are objective neighbourhood deprivation and stratification (as measured through the IMD) and perceived/social neighbourhood factors (neighbourhood cohesion) associated with PMH in England?
 - a. Which dimensions of neighbourhood deprivation are most associated with PMH?
 - b. Is the strength of the association of objective neighbourhood deprivation with PMH weaker than the one of perceived/social neighbourhood factors?
2. Which domains of PMH are most strongly associated with neighbourhood deprivation and perceived/social neighbourhood factors?

Because of the conceptual overlap, one might expect the social well-being domain of PMH and the close social relations items on the SWEMWBS to be more strongly associated with social neighbourhood factors than with the IMD.
3. Do the associations of neighbourhood conditions with PMH remain significant when accounting for negative mental health at the same?
4. Do these associations hold up from a longitudinal perspective in which neighbourhood transitions are analysed? Could these associations be attributed

to causal neighbourhood effects, or must the associations be attributed to selective residential mobility?

3.2 Literature and theory

Most research on the determinants of mental well-being deals with individual-level (life-course) variables. There is, however, a substantial body of research that suggests that mental well-being can be strongly influenced by neighbourhood factors (Leventhal and Brooks-Gunn 2003; Manley et al. 2013; O'campo, Salmon and Burke 2009; Propper et al. 2005). Most studies find that people who live in deprived neighbourhoods have worse health than people who live in less deprived neighbourhoods. Objective neighbourhood factors that are often stated to play an influential role are traffic and noise (Botteldooren, Dekoninck and Gillis 2011), the physical environment (Guite, Clark and Ackrill 2006), green spaces (van den Berg et al. 2015), socio-economic deprivation (O'campo, Salmon and Burke 2009), relative social position (Kearns et al. 2013), social cohesion (Fone et al. 2007), and crime (Curry, Latkin and Davey-Rothwell 2008).

Similarly, neighbourhood factors are considered to shape people's health behaviour and lifestyle. For instance, it is more likely that there will be shops that sell healthy food and fresh produce in neighbourhoods with wealthy inhabitants because more people will be able to afford these items; and, in turn, the presence of these shops may encourage the neighbourhood's residents to eat healthy food (Meijer et al. 2012). Furthermore, the social environment (social ties, social support and social capital) in a neighbourhood can affect mental health as it is linked to people's stress-coping resources (Kawachi and Berkman 2001). Social characteristics of neighbourhoods have been reported to have an effect on life-satisfaction (Shields, Price and Wooden 2009). Identifying the factors that

lead to vibrant and active neighbourhoods and vibrant communities has been recognised as a priority public policy area (Johnson, Headey and Jensen 2006).

Scholars often differentiate between objective neighbourhood deprivation (both absolute and relative), and perceptions about social neighbourhood characteristics such as neighbourhood belonging, social integration, and perceptions of safety (Elliott et al. 2014; Gale et al. 2011; Jones et al. 2014; Toma, Hamer and Shankar 2015).

Neighbourhood belonging, for instance, had substantial effect sizes on health in several studies (Baum et al. 2009; Wen, Hawkey and Cacioppo 2006). Yen, Michael and Perdue (2009) suggest that social neighbourhood characteristics are more strongly associated with health than objective neighbourhood factors. With regards to PMH, it was indeed found that neighbourhood perceptions were strong predictors of PMH (Elliott et al. 2014; Gale et al. 2011; Jones et al. 2014). In prospective studies, it was reported that social networks and neighbourhood belonging have a protective effect on health (Wright and Strickley 2013). Furthermore, it has been suggested that social characteristics like high social support, active social participation and social belonging might be more strongly or even differentially associated with PMH than NMH (Kawachi and Berkman 2001; Winzer et al. 2014).

PMH can be defined as the combined presence of emotional, psychological and social well-being (Keyes 2002; Seligman 2008b). It is proposed that whereas one can meaningfully distinguish between multiple dimensions of mental health like emotions (happiness), life satisfaction, autonomy, self-esteem, meaning, social support and various others, one can also combine them into an integrated measure (Diener et al. 2010; Kahneman, Diener and Schwarz 1999; Keyes 2005). According to the dual continua model, PMH and NMH are distinct but correlated, dimensions of mental well-being (Keyes 2007). PMH as a functioning-based approach could be useful in

explaining the enabling rather than constraining neighbourhoods mechanisms that are usually studied with regard to NMH (Lee Duckworth, Steen and Seligman 2005). The rationale for considering PMH measures hence is that they may provide added insights into the relationship of the environment with health.

Nonetheless, there is also opposing evidence that indicates that neighbourhood factors are either not at all associated with NMH (Propper et al. 2005) or that the effect size of any potential relation is only tiny (Shields, Price and Wooden 2009). Once one controls for individual-level factors such as income, the association between neighbourhood factors and health often decreases substantially (Pickett and Pearl 2001).

Fewer studies have engaged with longitudinal data that make it possible to differentiate between-individual effects from within-individual effects, the evidence of which is mostly indicative of selective residential mobility rather than causal neighbourhood effects. Jokela (2015) investigated whether several waves of data moving between neighbourhoods are associated with changes in health (multilevel analyses with several observations for each individual). It is found that – for the same individual – moving from a relatively advantaged to a deprived neighbourhood is not associated with a change in health. However, there was robust evidence for selective residential mobility, i.e., people with worse health are more likely to move to poor neighbourhoods. People who moved into deprived neighbourhoods were less healthy (both in terms of mental and physical health) and had a worse health lifestyle than those who moved into a better neighbourhood (Jokela 2014). In another study based on first difference models of 6 years of longitudinal data, there was no causal link between urban sprawl and obesity (Eid and Larsen 2008). Airaksinen et al. (2015) used longitudinal data on 3,145 young people in Finland to determine whether neighbourhoods affect health behaviour: They found that young Finns who live in urban postcodes were more likely to smoke and

drink than those in rural areas, but there was no effect on physical activity. These results only partly persisted when focusing on within-individual analyses, and the between-individual effects were found to be the strongest, thus suggesting that the causal neighbourhood effect is comparatively small.

The best causal evidence for neighbourhood effects on health could come from experimental research as it removes the problem of selection bias and social causation. In the Moving to Opportunity (MTO) experiment, 4600 low incomes families who lived in deprived neighbourhoods were randomly assigned to wealthy neighbourhoods. The results of this experiment, however, have been mixed and, at times, even contradictory. Apart from moving people to different neighbourhoods, there have also been targeted interventions to improve the neighbourhoods themselves (Oakes et al. 2015). Researchers might also be able to find natural experiments such as large-scale infrastructure upgrades or severe policy changes such as local rent controls (recently in selected cities in Germany) but it is not well-researched yet, with a few exceptions (Baker et al. 2016).

A general problem affecting neighbourhood research is that it is complicated to correctly define neighbourhoods, to account for changes in neighbourhood boundaries over time and to incorporate the fact that people's engagement with their neighbourhood may vary substantially over time, especially with increasing residential mobility (Perchoux et al. 2013).

This study contributes to the presented literature by first examining the relation between objective neighbourhood deprivation and perceived/social neighbourhood characteristics with PMH and NMH. Importantly, it is one of the first studies to jointly account for PMH and NMH, as this allows for a comparison of the relative effects, and it allows for the isolation of the unique associations. It also tests the previously reported

relation between subjective neighbourhood perceptions and PMH. Secondly, it differentiates between the domains of the SWEMWBS that might be differentially associated with neighbourhood deprivation factors. Thirdly, it is attempted to address issues of selective residential mobility (social causation) at least partially on the one hand and causal neighbourhood effects on the other hand.

3.3 Methodology

3.3.1 Participants and data

Data is taken from Understanding Society, the UK Household Longitudinal Study, waves one to ten (University of Essex et al. 2020). Understanding Society is a longitudinal (annual) nationally representative survey of 40,000 British households. The analysis sample has been limited to people between the ages of 25-85, as young adults might leave their parental home to attend university. This study compares people's neighbourhood residency patterns from waves one to waves 10, but respondents could join the panel dynamically at later waves as well.

A special access licence was secured from the UK Data Archive at the University of Essex to gain access to the small-scale geographic information of survey participants in each wave (LSOAs). The separate data sets of the household identification numbers and LSOA codes were provided for each wave. The ten files were merged into a longitudinal file, and individuals from the main respondent files for each wave were

matched with the household neighbourhood file created previously. Moreover, external data on the Index of Multiple Deprivation were linked with the LSOA codes^{37 38}.

3.3.2 Variables

Mental health

This study uses the Short Warwick-Edinburgh Mental Well-Being-Scale (SWEMWBS) that has been designed to combine all three dimensions of mental well-being (emotional, psychological, and social well-being) into an integrated PMH measure (Stewart-Brown et al. 2009a; Tennant et al. 2007a). In Understanding Society, the 7-item short-version of the scale is employed.³⁹ The internal consistency of the SWEMWBS is high (Cronbach's alpha of 0.92). Each question is scored from 1-5, and the total scale consists of the summated score of each question (7-35), with a higher score indicating higher PMH. A unique feature of the SWEMWBS is that all sub-items are positively worded and that it probably is not limited by ceiling effects (Maheswaran et al. 2012).

NMH is measured via the popular and validated General Health Questionnaire (GHQ). The GHQ is intended to detect symptoms of psychiatric morbidity. The GHQ consists of 12 questions, with a higher score relating to worse mental health. The GHQ is most responsive to depressive symptomatology and most useful as a screening device for psychiatric morbidity (Romppel et al. 2013). The GHQ is considered to measure

³⁷ <https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019>

³⁸

<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/ad-hocs/13773populationsbyindexofmultipledeprivationinmddecileenglandandwales2020>

³⁹ It consists of the following questions: “feeling good about myself”, “feeling close to other people”, “feeling confident”, “able to make up my own mind”, “feeling loved”, “interested in new things” and “feeling cheerful”.

psychological distress along the domains of anxiety/depression, social dysfunction, and loss of confidence (Aalto et al., 2012)

Neighbourhood factors

The residents' neighbourhoods are classified through Lower Super Output Areas (LSOA). There are 32,482 LSOAs in England, and each LSOA contains between 1000 to 3,000 people, with a mean of 1,500. Given that the IMDs for Northern Ireland, Scotland and Wales are not identical, cases from these regions are excluded (Knies and Menon, 2014). Each LSOA is intended to be a good reflection of the spatial scale (boundaries) and social proximity of each actual neighbourhood (Knies and Menon, 2014).

The 2011 Index of Multiple Deprivation (IMD) is used as the neighbourhood-level (LSOA) objective deprivation indicator. Seven subscales of deprivation, income, barriers to housing and services, employment, health and disability, skills and training, crime (violence, burglary, theft, criminal damages all per 1000 at-risk population), education and living environment (e.g. nitrogen dioxide, benzene, sulphur dioxide and particulates and road traffic accidents) are included (Noble et al. 2006). The IMDs are designed to capture distinct dimensions of deprivation, but they can also be combined into a single unified measure. For this project, the overall IMD that integrates all aspects of deprivation, as well as the main subdomains, are analysed. Instead of considering the numeric scores of the IMD, the ranks from 1 (most deprived) to 10 (least deprived) are employed, representing a relative ranking rather than a ranking in terms of actual scores or absolute units of interest.

Neighbourhood cohesion (sense of community) is measured through Buckner's (1988) 8-item scale. The respondents are asked about their sense of neighbourhood belonging

and community, intention to stay in the neighbourhood as well as social interaction in the neighbourhood. The items are: “belong to neighbourhood”, “local friends mean a lot”, “advice obtainable locally”, “can borrow things from neighbours”, “willing to improve neighbourhood”, “am similar to others in neighbourhood”, “talk regularly to neighbours”.

Control variables

A number of control variables that are known to be associated with mental well-being are included: Education (1: no qualifications, 2: GCSE, 3: A-Levels/other higher qualifications, 4: degree), age (25-86), gender (0: male, 1: female), employment status (1: employed, 2: unemployed, 3: retired, 4: home/maternity, 5: student, 6: long-term sick, 7: other), marital status (1: single/never married, 2: married/in a civil partnership, 3: divorced/widowed/separated), the number of children present in the household, and physical health (dummy variable for long-standing limitations: 0: disability or impairment, 1: no disability or impairment). Including these variables in the multilevel regressions partially accounts for the differences in mental health between respondents that are not attributable to neighbourhood conditions.

3.3.3 Statistical approach

Linear multilevel modelling techniques are used in Models 1a to 6b to estimate the associations of PMH with neighbourhood conditions.

In models 1a to 1h, the associations between neighbourhood deprivation and PMH (SWEMWBS) are assessed via linear multilevel regressions where individuals (level 1) are nested in LSOAs (level 2). Multilevel modelling allows for statistical control for the clustering of respondents and their responses in the same neighbourhoods, somewhat like the setting in which school pupils are clustered in classes and schools, which is

partly where multilevel modelling emerged. Multilevel modelling is one of the standard statistical tools in the medical and epidemiological analysis of health and illness (Goldstein, 2002).

Model 1a considers the overall IMD score while also controlling for the mentioned covariates. Models 1b-1h then focus on each dimension of the IMD separately to be able to compare the relative strengths of the associations. Throughout all models in this paper, the SWEMWBS has been standardised and a higher score corresponds to better mental health. Statistically, these models represent multilevel random intercept models in which the associations of the IMD (and its dimensions) can vary by neighbourhood (LSOA).

Models 2a-2i follow a similar pattern, and an identical statistical approach of linear multilevel modelling is used, but here the focus lies on the perceived/social neighbourhood factors (neighbourhood cohesion). In Models 2a to 2h, the individual items/subscales are added separately, and all items/subscales are added simultaneously in Model 2i.

Models 3a-3g now consider the seven domains of the SWEMWBS instead of the overall scale, with each domain treated as an independent outcome variable in the multilevel regressions. For reasons of parsimony, only the overall IMD and overall neighbourhood belonging scale, which takes the average across the items, are employed and added jointly.

Models 4a-4h as well as models 5a-5i copy models 1a-1h and models 2a-2i, respectively, but now look at the GHQ (NMH) jointly with the overall SWEMWBS (PMH). This allows for a comparison of the levels of significance and strengths of

associations between the two opposing positive and negative continua of mental health as conceptualised by the dual continua model.

The final multilevel model (Models 6a and 6b) now presents overall results when jointly accounting for the SWEMWBS and GHQ at the same time (jointly), thereby making it possible to identify the unique and distinct associations of PMH with objective neighbourhood deprivation and neighbourhood cohesion added jointly as well. This way, one can check whether the association between neighbourhood deprivation and mental health is dependent on the specific mental health dimension under investigation.

Random (and fixed) effects regressions

Having presented numerous linear multilevel linear models of cross-sectional associations at wave 1 of the UKHLS, attempts are made to describe the longitudinal pattern of neighbourhood changes and associated changes in mental health and to partially identify the causal pattern. Random effects models are fitted to account for longitudinal time patterns in well-being and neighbourhood transitions (Models 7a to 7h), with fixed effects models as the final analytical method.

The hypothesised associations (or lack thereof) between neighbourhood factors and mental health could be due to selective residential mobility. Fixed effects econometrics allow for the removal of unobserved differences between individuals that – in this study – are likely to be related to their levels of well-being and neighbourhood satisfaction as well as to their inclinations to switch neighbourhoods. In panel effects regressions, one is analysing changes in neighbourhood residence with changes in PMH, which is separate from the associations presented previously.

Statistical notes, sample selection and missingness

In order to conduct the longitudinal random and fixed effect analyses, a person-period (so-called long) data file has been compiled in which there are up to 10 rows for each respondent that correspond to the neighbourhood (LSOA) locations of each individual in each wave as well as other variables provided by the UKHLS at each wave. As the SWEMWBS was only measured in waves 1, 4, 7, and 10, the spacing of neighbourhood moves and the subsequent measurement of PMH might sometimes be narrow- when the move occurred shortly between one of the mentioned waves – or sometimes be temporally distant - if the move occurred straight after one of those waves.

The IMD information is not provided by the UKHLS but from an official UK government website at the Office for National Statistics, and there was no missingness in these pieces of information. This means that in the cross-sectional and longitudinal analyses, the sample size for objective neighbourhood data (IMD) is not markedly different from any of the other analyses in this thesis and would indeed be better if the self-reported data on mental health were not missing or if respondents did not end their participation in follow-up waves of the UKHLS.

Levels of missingness on the neighbourhood cohesion scale were modest (around 1000-1500 cases) and around the same as on the SWEMWBS, once accounting for the fact that this information was only provided if the self-completion module of UKHLS was completed. In the cross-sectional analyses, cases with missing data at wave one were dropped in a listwise fashion. Cross-sectional survey weights could be used to account for the propensity of respondents to have been completing the self-completion questionnaire and to have been invited to take part in the study (Fumagalli et al, 2017),

but this weighting would not allow for multilevel modelling techniques⁴⁰. As a robustness or rather sensitivity check, full information maximum likelihood models of PMH on the IMD and neighbourhood cohesion are presented, which did not alter the results.

Another related concern has to do with the longitudinal pattern of missingness and panel attrition, namely that a significant share of survey respondents from wave 1 are no longer part of the study at later stages. People with poor mental health (low positive mental health; high negative mental health) might be more likely to drop out of the survey over time which would bias the results (Graaf et al., 2000): People who stay in the survey could, to some extent, constitute a positive selection bias on mental health (de Graaf et al., 2013). As a result, the analytic sample in this chapter is not restricted to people who are part of all waves of the UKHLS, but instead, all possible panel information is employed to estimate the longitudinal trends and to generate descriptive statistics on neighbourhood movements. There is also concern that ethnic minority members might have higher rates of panel attrition (Maura and Weisman de Mamani, 2017), which might interact with neighbourhood sampling challenges and the fact that ethnic minorities are harder to reach in the first place (Lynn et al., 2018).

Many of these limitations cannot be overcome in a straightforward manner, but the large size of the UKHLS should still lead to better estimates than studies that are based on unrepresentative convenience samples or studies that are based on small sample sizes (see Platt et al., 2020, for an assessment of the strengths of the UKHLS). By making the limitations explicit and by hypothesising about potential implications, future research

⁴⁰ In Stata, so-called mixed methods do not work with the `svyset` suite of commands which are required because of the PSU and strata design of the survey.

can gradually improve the knowledge base as new methods and data become available and as a multitude of studies can corroborate and synthesise the findings from different contexts.

Missing data imputation could have been used when only a partial response was missing on certain items (e.g., when one of the neighbourhood cohesion items was missing), but item-specific missingness was relatively small compared to the larger issue of the sample selection and selective attrition. Imputation of missing data when an entire wave for a respondent was missing would be complex (Young and Johnson, 2015). One of the two focal variables, neighbourhood cohesion, was only measured once, that is, in wave one, in which the UKHLS was still at its most representative level, so that in the presented cross-sectional analyses the sample should still be on the higher end of representativeness. For the longitudinal analyses only the IMD are used, which was not affected by missingness. Strategic choices such as these are one option of dealing with the issue of missing data and attrition, but they are, of course, not perfect remedies.

We start the discussion by describing the distribution of the sample over time.

3.4 Results

Table 35 Summary of the longitudinal sample (UKHLS waves 1 to 10)

All available data									
Wave	UKHLS GB	UKHLS NI	BHPS GB	BHPS SCO	BHPS WAL	BHPS NI	UKHLS EMB	UKHLS IEMB	Total
1	41,586	2,088	0	0	0	0	7,320	0	50,994
2	35,101	1,858	6,602	1,576	1,793	2,067	5,572	0	54,569
3	31,657	1,598	6,297	1,442	1,711	1,916	5,071	0	49,692
4	30,292	1,378	5,883	1,295	1,594	1,791	4,838	0	47,071
5	28,858	1,256	5,712	1,235	1,522	1,607	4,643	0	44,833
6	25,880	1,216	5,351	1,169	1,375	1,526	4,056	4,615	45,188
7	24,612	1,211	5,165	1,112	1,300	1,505	3,789	3,474	42,168
8	22,953	1,132	4,945	1,059	1,205	1,441	3,542	3,016	39,293
9	21,273	1,059	4,727	960	1,125	1,349	3,118	2,444	36,055
10	20,475	1,000	4,490	908	1,056	1,262	2,908	2,219	34,318
Total	282,687	13,796	49,172	10,756	12,681	14,464	44,857	15,768	444,181

Data for respondents in England									
Wave	UKHLS GB	UKHLS NI	BHPS GB	BHPS SCO	BHPS WAL	BHPS NI	UKHLS EMB	UKHLS IEMB	Total
1	35,768	0	0	0	0	0	7,204	0	42,972
2	30,230	1	5,681	38	70	11	5,500	0	41,531
3	27,351	3	5,417	38	74	21	4,990	0	37,894
4	26,177	4	5,051	41	87	20	4,765	0	36,145
5	25,052	5	4,939	45	87	23	4,584	0	34,735
6	22,567	7	4,634	42	94	16	3,990	4,590	35,940
7	21,525	9	4,478	39	84	21	3,730	3,450	33,336
8	20,117	14	4,265	31	89	17	3,473	3,002	31,008
9	18,641	15	4,081	33	98	19	3,060	2,427	28,374
10	17,970	14	3,864	29	88	16	2,860	2,202	27,043
Total	245,398	72	42,410	336	771	164	44,156	15,671	348,978

As seen in Table 35, there were 50,994 respondents at wave 1, with the majority part of the UKHLS GB sample and small shares coming from the Northern Ireland sample and ethnic minority boost (EMB). In wave 2 the sample becomes larger and grows to 54,569 respondents, which mainly results from the inclusion of the BHPS, the predecessor of the UKHLS. Indeed, the original UKHLS sample declines significantly from 41,586 in wave 1 to 35,101 in wave 2 and only 20,475 in wave 10. Over the ten waves, the total sample drops to 34,318 individual survey respondents, and this already includes further added members at wave 6. It is important to note that in the longitudinal analyses, the unit of analysis is not the single respondent but person-period observations, and because

of the long format of the data, this represents a very large number of 444,181 observations.

As the LSOA and IMD information was only available for England, the analytic sample of this study is reduced to 42,972 respondents at wave 1 and 348,867 observations in total over the ten waves. The table shows that a small number of respondents who were not living in England at a previous point in time were living in England and thus included in the analyses. In turn, sample members who were living in England at a point within the ten waves and then moved away to Scotland or Northern Ireland, or even further abroad, were no longer part of the analysis. However, again, as the unit of analysis of person-period years, their information was analysed while they were resident in England.

Moving to the results, the descriptive statistics of all continuous variables are presented in Table 36, and the categorical variables in are shown in Table 37.

Table 36 Descriptive statistics of continuous variables including the SWEMWBS and its domains, the IMD and its domains, and the perceived/social neighbourhood factors (UKHLS wave 1). N = 42,927.

	Mean/Prop.	Min.	Max.	SD	n
Age in years	45.3	16.0	101.0	18.2	42972
SWEMWBS and its domains					
SWEMWBS	25.2	7.0	35.0	4.5	32015
feel optimistic	3.3	1.0	5.0	1.0	32803
feel useful	3.5	1.0	5.0	0.9	32718
feel relaxed	3.3	1.0	5.0	0.9	32724
deal with problems well	3.6	1.0	5.0	0.9	32771
think clearly	3.7	1.0	5.0	0.8	32714
feel close to others	3.7	1.0	5.0	0.9	32734
able to make up own mind	4.0	1.0	5.0	0.8	32916
Perceived/social neighbourhood cohesion scale and its domains					
Neighbourhood cohesion scale	0.0	-3.0	1.6	0.7	33299
Belong to neighbourhood	2.2	1.0	5.0	0.9	32953
Local friends mean a lot	2.3	1.0	5.0	1.0	32815
Advice obtainable locally	2.6	1.0	5.0	1.1	32619
Can borrow things from neighbours	2.9	1.0	5.0	1.2	32458
Willing to improve neighbourhood	2.1	1.0	5.0	0.8	32568
Plan to stay in neighbourhood	2.3	1.0	5.0	1.1	32687
Am similar to others in neighbourhood	2.5	1.0	5.0	1.0	32677
Talk regularly to neighbours	2.3	1.0	5.0	1.0	32805
Objective neighbourhood deprivation measures					
Decile rank of IMD	5.2	1.0	10.0	2.9	42972
Income Decile (where 1 is most deprived 10% of LSOAs)	5.1	1.0	10.0	2.9	42972
Employment Decile (where 1 is most deprived 10% of LSOAs)	5.2	1.0	10.0	2.8	42972
Education, Skills and Training Decile (where 1 is most deprived 10% of LSOAs)	5.3	1.0	10.0	2.8	42972
Decile rank of health deprivation	5.3	1.0	10.0	2.8	42972
Crime Decile (where 1 is most deprived 10% of LSOAs)	5.2	1.0	10.0	2.9	42972
Decile rank of barriers to housing/services	5.1	1.0	10.0	3.0	42972
Decile rank of living environment deprivation	5.2	1.0	10.0	2.9	42972

Table 37 Descriptive statistics of categorical control variables (UKHLS wave 1).

	Mean/Prop.	Freq.	n
Gender: Female	.54		42971
<u>Economic activity</u>			42963
Employed	.53	22870	
Unemployed	.07	2889	
Retired	.19	8337	
Home/maternity	.08	3557	
Student	.08	3329	
Long-term sick	.04	1589	
other	.01	392	
White British	.73		41324
Children in household	.30		42972
<u>Marital status</u>			42945
Single	.24	10193	
In partnership	.62	26695	
Separated	.08	3635	
Widowed	.06	2422	
<u>Highest qualification</u>			42885
No qual	.17	7390	
Other qual	.10	4439	
GCSE etc	.21	9006	
A level etc	.19	7985	
Other higher	.11	4557	
Degree	.22	9508	
Health: Long-standing illness	1.66		42864

Table 38 Average levels of the SWEMWBS by IMD ranks (deciles) in England (UKHLS wave 1).

IMD rank	SWEMWBS
1	24.1
2	24.6
3	24.8
4	25.1
5	25.2
6	25.4
7	25.4
8	25.6
9	25.7
10	25.9

Table 39 Models 1a to 1h: Linear multilevel regressions of the SWEMWBS on the IMD (UKHLS wave 1)

VARIABLES	Model 1a SWEMWBS	Model 1b SWEMWBS	Model 1c SWEMWBS	Model 1d SWEMWBS	Model 1e SWEMWBS	Model 1f SWEMWBS	Model 1g SWEMWBS	Model 1h SWEMWBS
Focal variables								
Decile rank of IMD	0.015*** (0.011 - 0.020)							
Income Decile		0.017*** (0.012 - 0.021)						
Employment Decile			0.016*** (0.012 - 0.020)					
Education, Skills and Training Decile				0.015*** (0.011 - 0.019)				
Decile rank of health deprivation					0.015*** (0.010 - 0.019)			
Crime Decile						0.011*** (0.007 - 0.016)		
Decile rank of barriers to housing/services							-0.001 (-0.005 - 0.003)	
Decile rank of living environment deprivation								0.004 (-0.000 - 0.008)
Control Variables								
Age in years	0.004*** (0.003 - 0.005)	0.004*** (0.003 - 0.005)	0.004*** (0.003 - 0.005)	0.004*** (0.003 - 0.005)	0.004*** (0.003 - 0.005)	0.004*** (0.003 - 0.005)	0.004*** (0.003 - 0.005)	0.004*** (0.003 - 0.005)
Gender: Female = 2, Women	-0.022* (-0.044 - -0.000)	-0.022* (-0.043 - -0.000)	-0.022 (-0.043 - 0.000)	-0.022* (-0.044 - -0.000)	-0.022 (-0.043 - 0.000)	-0.021 (-0.043 - 0.001)	-0.020 (-0.042 - 0.002)	-0.020 (-0.042 - 0.001)
Economic activity = 2, Unemployed	-0.259*** (-0.304 - -0.214)	-0.258*** (-0.303 - -0.213)	-0.259*** (-0.304 - -0.214)	-0.262*** (-0.307 - -0.217)	-0.262*** (-0.307 - -0.216)	-0.265*** (-0.310 - -0.220)	-0.273*** (-0.318 - -0.228)	-0.271*** (-0.317 - -0.226)
Economic activity = 3, Retired	0.147*** (0.107 - 0.187)	0.148*** (0.107 - 0.188)	0.148*** (0.108 - 0.188)	0.148*** (0.108 - 0.188)	0.149*** (0.108 - 0.189)	0.144*** (0.104 - 0.184)	0.145*** (0.105 - 0.185)	0.145*** (0.104 - 0.185)
Economic activity = 4, Home/maternity	-0.072** (-0.115 - -0.029)	-0.072** (-0.115 - -0.029)	-0.073*** (-0.116 - -0.030)	-0.073*** (-0.116 - -0.030)	-0.075*** (-0.118 - -0.032)	-0.075*** (-0.118 - -0.032)	-0.078*** (-0.121 - -0.035)	-0.077*** (-0.120 - -0.034)
Economic activity = 5, Student	0.126*** (0.077 - 0.174)	0.123*** (0.074 - 0.172)	0.122*** (0.073 - 0.171)	0.124*** (0.075 - 0.173)	0.127*** (0.078 - 0.176)	0.128*** (0.080 - 0.177)	0.130*** (0.081 - 0.179)	0.131*** (0.082 - 0.179)
Economic activity = 6, Long-term sick	-0.721*** (-0.785 - -0.658)	-0.720*** (-0.784 - -0.657)	-0.721*** (-0.785 - -0.658)	-0.726*** (-0.789 - -0.662)	-0.723*** (-0.787 - -0.660)	-0.731*** (-0.794 - -0.667)	-0.741*** (-0.805 - -0.678)	-0.739*** (-0.803 - -0.676)
Economic activity = 7, other	-0.121* (-0.232 - -0.009)	-0.121* (-0.232 - -0.009)	-0.120* (-0.232 - -0.009)	-0.124* (-0.236 - -0.012)	-0.122* (-0.234 - -0.011)	-0.126* (-0.237 - -0.014)	-0.131* (-0.242 - -0.019)	-0.130* (-0.241 - -0.018)
White British = 1, Yes	-0.039** (-0.067 - -0.011)	-0.042** (-0.070 - -0.014)	-0.032* (-0.059 - -0.004)	-0.023 (-0.050 - 0.004)	-0.026 (-0.053 - 0.002)	-0.038** (-0.066 - -0.009)	-0.014 (-0.043 - 0.014)	-0.022 (-0.050 - 0.006)
Children in hhold = 1, 1 or more	-0.125*** (-0.152 - -0.097)	-0.123*** (-0.151 - -0.095)	-0.123*** (-0.151 - -0.095)	-0.123*** (-0.151 - -0.095)	-0.125*** (-0.153 - -0.097)	-0.126*** (-0.154 - -0.098)	-0.127*** (-0.155 - -0.099)	-0.128*** (-0.156 - -0.100)
Marital status = 2, In partnership	0.157*** (0.124 - 0.190)	0.156*** (0.123 - 0.189)	0.158*** (0.124 - 0.191)	0.161*** (0.128 - 0.195)	0.159*** (0.126 - 0.193)	0.159*** (0.126 - 0.192)	0.165*** (0.131 - 0.198)	0.163*** (0.130 - 0.196)
Marital status = 3, Separated	-0.024 (-0.071 - 0.023)	-0.023 (-0.070 - 0.024)	-0.023 (-0.070 - 0.024)	-0.021 (-0.068 - 0.026)	-0.023 (-0.070 - 0.024)	-0.027 (-0.074 - 0.021)	-0.026 (-0.074 - 0.021)	-0.027 (-0.074 - 0.020)
Marital status = 4, Widowed	0.035 (-0.027 - 0.098)	0.036 (-0.026 - 0.098)	0.037 (-0.026 - 0.099)	0.038 (-0.024 - 0.100)	0.038 (-0.024 - 0.100)	0.034 (-0.028 - 0.097)	0.036 (-0.027 - 0.098)	0.035 (-0.027 - 0.097)
Highest qualification	0.053*** (0.046 - 0.060)	0.052*** (0.046 - 0.059)	0.052*** (0.045 - 0.059)	0.052*** (0.045 - 0.059)	0.054*** (0.047 - 0.060)	0.056*** (0.050 - 0.063)	0.058*** (0.051 - 0.065)	0.058*** (0.051 - 0.065)
Health: Long-standing illness	0.297*** (0.273 - 0.321)	0.297*** (0.273 - 0.321)	0.297*** (0.273 - 0.321)	0.297*** (0.272 - 0.321)	0.297*** (0.272 - 0.321)	0.299*** (0.274 - 0.323)	0.299*** (0.275 - 0.324)	0.300*** (0.275 - 0.324)
Constant	-0.964*** (-1.043 - -0.885)	-0.966*** (-1.045 - -0.886)	-0.972*** (-1.052 - -0.893)	-0.971*** (-1.050 - -0.891)	-0.973*** (-1.053 - -0.893)	-0.966*** (-1.046 - -0.887)	-0.938*** (-1.019 - -0.858)	-0.954*** (-1.034 - -0.873)
Observations	31,937	31,937	31,937	31,937	31,937	31,937	31,937	31,937
Number of groups	11,484	11,484	11,484	11,484	11,484	11,484	11,484	11,484

95% confidence intervals in parentheses
 *** p<0.001, ** p<0.01, * p<0.05, + p<0.01

Table 39 (Models 1a-1h) presents the associations of PMH with the IMD indicators as modelled via multilevel linear regressions in which individuals (level 1) are nested in LSOAs (level 2). As seen in model 1a, living in a higher-ranked LSOA in terms of IMD deprivation – that is in a *less*-deprived neighbourhood – is associated with 0.015 standard deviations higher PMH (95% confidence interval: 0.011 - 0.020) while holding all other sociological and demographic control variables constant, even the indicator for long-standing health problems. This association is highly statistically significant at $p < 0.001$ and represents a relatively strong association when considering that the IMD rank variables is operationalized on a 10-point decile scale. While holding everything else constant, living in a neighbourhood that is in the least deprived IMD decile as compared with living in a neighbourhood that is in the most deprived IMD decile is associated with 0.16 standard deviations better positive mental health. The size of this association is comparable to the PMH benefit of marriage or partnerships (0.198 95% confidence interval 0.158-0.238) when compared to being single or never married.

When considering the individual dimensions of the IMD, income, employment, education, skills and training, health deprivation and crime all have a comparable and equally significant association with the overall IMD rank, suggesting that there are not any major differences between these dimensions. However, the associations for barriers to housing/services and for the living environment (Model 1g and Model 1h) are not statistically significantly associated with the SWEMWBS.

Having shown that objective neighbourhood deprivation (IMD) is associated with PMH, it is also useful to consider the associations of neighbourhood cohesion or, rather, perceived/social neighbourhood factors (neighbourhood cohesion). The results in Models 2a-2i (Table 40) demonstrate that similarly to the IMD, there are very strong associations between perceived/social neighbourhood factors and PMH: Indeed, when

regressed individually in the linear multilevel models, all of the dimensions are statistically significantly associated with PMH at the $p < 0.01$ level. The size of these associations, e.g., 0.19 standard deviations higher PMH for a standard deviation increase in neighbourhood belonging (95% confidence interval: 0.18-0.20), is very large and again as powerful or even more powerful than the one of marriage (in reference to being single).

Table 40 Models 2a-2i: Linear multilevel regressions of the SWEMWBS on perceived/social neighbourhood items (UKHLS wave 1)

VARIABLES	Model 2a SWEMWBS	Model 2b SWEMWBS	Model 2c SWEMWBS	Model 2d SWEMWBS	Model 2e SWEMWBS	Model 2f SWEMWBS	Model 2g SWEMWBS	Model 2h SWEMWBS	Model 2i SWEMWBS
Focal variables									
Belong to neighbourhood	0.19*** (0.18 - 0.20)								0.12*** (0.11 - 0.14)
Local friends mean a lot		0.15*** (0.14 - 0.16)							0.01 (-0.01 - 0.02)
Advice obtainable locally			0.15*** (0.13 - 0.16)						0.04*** (0.03 - 0.06)
Can borrow things from neighbours				0.09*** (0.08 - 0.11)					-0.03*** (-0.05 - -0.02)
Willing to improve neighbourhood					0.13*** (0.12 - 0.14)				0.06*** (0.04 - 0.07)
Plan to stay in neighbourhood						0.12*** (0.11 - 0.13)			-0.01 (-0.02 - 0.01)
Am similar to others in neighbourhood							0.14*** (0.13 - 0.15)		0.02** (0.01 - 0.04)
Talk regularly to neighbours								0.16*** (0.15 - 0.17)	0.06*** (0.04 - 0.07)
Control variables									
Age in years	0.00** (0.00 - 0.00)	0.00*** (0.00 - 0.00)	0.00*** (0.00 - 0.00)	0.00*** (0.00 - 0.00)	0.00*** (0.00 - 0.00)	0.00*** (0.00 - 0.00)	0.00*** (0.00 - 0.00)	0.00*** (0.00 - 0.00)	0.00 (-0.00 - 0.00)
Gender: Female = 2, Women	-0.03** (-0.05 - -0.01)	-0.04*** (-0.06 - -0.02)	-0.04*** (-0.06 - -0.02)	-0.03* (-0.05 - -0.00)	-0.03* (-0.05 - -0.01)	-0.02* (-0.04 - -0.00)	-0.03* (-0.05 - -0.01)	-0.04*** (-0.06 - -0.02)	-0.05*** (-0.07 - -0.02)
Economic activity = 2, Unemployed	-0.27*** (-0.31 - -0.22)	-0.27*** (-0.32 - -0.23)	-0.28*** (-0.32 - -0.23)	-0.27*** (-0.31 - -0.22)	-0.27*** (-0.31 - -0.22)	-0.26*** (-0.30 - -0.22)	-0.26*** (-0.31 - -0.22)	-0.27*** (-0.31 - -0.22)	-0.26*** (-0.30 - -0.21)
Economic activity = 3, Retired	0.14*** (0.10 - 0.18)	0.14*** (0.10 - 0.18)	0.13*** (0.09 - 0.17)	0.14*** (0.10 - 0.18)	0.16*** (0.12 - 0.20)	0.15*** (0.11 - 0.19)	0.15*** (0.11 - 0.19)	0.14*** (0.10 - 0.18)	0.15*** (0.11 - 0.19)
Economic activity = 4, Home/maternity	-0.08*** (-0.13 - -0.04)	-0.09*** (-0.13 - -0.05)	-0.09*** (-0.13 - -0.05)	-0.08*** (-0.12 - -0.04)	-0.08*** (-0.12 - -0.03)	-0.07*** (-0.12 - -0.03)	-0.08*** (-0.12 - -0.04)	-0.09*** (-0.13 - -0.05)	-0.08*** (-0.12 - -0.04)
Economic activity = 5, Student	0.12*** (0.07 - 0.17)	0.11*** (0.07 - 0.16)	0.12*** (0.07 - 0.17)	0.13*** (0.08 - 0.18)	0.14*** (0.09 - 0.19)	0.15*** (0.10 - 0.20)	0.14*** (0.09 - 0.18)	0.14*** (0.09 - 0.19)	0.13*** (0.09 - 0.18)
Economic activity = 6, Long-term sick	-0.73*** (-0.80 - -0.67)	-0.76*** (-0.82 - -0.69)	-0.75*** (-0.82 - -0.69)	-0.75*** (-0.82 - -0.69)	-0.73*** (-0.80 - -0.67)	-0.75*** (-0.81 - -0.68)	-0.75*** (-0.81 - -0.69)	-0.74*** (-0.81 - -0.68)	-0.74*** (-0.81 - -0.68)
Economic activity = 7, other	-0.12* (-0.23 - -0.01)	-0.13* (-0.25 - -0.02)	-0.13* (-0.24 - -0.02)	-0.14* (-0.25 - -0.03)	-0.13* (-0.24 - -0.02)	-0.10 (-0.21 - -0.01)	-0.11* (-0.22 - -0.00)	-0.13* (-0.24 - -0.02)	-0.11 (-0.22 - 0.00)
White British = 1, Yes	0.00 (-0.02 - 0.03)	0.01 (-0.02 - 0.03)	-0.01 (-0.03 - 0.02)	-0.02 (-0.05 - 0.01)	-0.00 (-0.03 - 0.03)	-0.01 (-0.04 - 0.01)	-0.00 (-0.03 - 0.02)	-0.02 (-0.05 - 0.00)	0.01 (-0.02 - 0.04)
Children in hhold = 1, 1 or more	-0.15*** (-0.17 - -0.12)	-0.15*** (-0.18 - -0.12)	-0.15*** (-0.18 - -0.12)	-0.15*** (-0.18 - -0.12)	-0.14*** (-0.17 - -0.11)	-0.15*** (-0.17 - -0.12)	-0.14*** (-0.17 - -0.11)	-0.16*** (-0.19 - -0.13)	-0.16*** (-0.18 - -0.13)
Marital status = 2, In partnership	0.16*** (0.13 - 0.19)	0.16*** (0.13 - 0.20)	0.17*** (0.13 - 0.20)	0.16*** (0.13 - 0.19)	0.15*** (0.12 - 0.18)	0.15*** (0.12 - 0.18)	0.14*** (0.11 - 0.18)	0.15*** (0.12 - 0.18)	0.15*** (0.11 - 0.18)
Marital status = 3, Separated	-0.01 (-0.06 - 0.04)	-0.02 (-0.06 - 0.03)	-0.01 (-0.06 - 0.03)	-0.01 (-0.06 - 0.03)	-0.03 (-0.08 - 0.01)	-0.02 (-0.07 - 0.02)	-0.03 (-0.08 - 0.01)	-0.03 (-0.07 - 0.02)	-0.02 (-0.06 - 0.03)
Marital status = 4, Widowed	0.04 (-0.03 - 0.10)	0.03 (-0.03 - 0.09)	0.03 (-0.03 - 0.10)	0.05 (-0.02 - 0.11)	0.04 (-0.02 - 0.11)	0.03 (-0.03 - 0.09)	0.02 (-0.05 - 0.08)	0.04 (-0.02 - 0.10)	0.04 (-0.03 - 0.10)
Highest qualification	0.06*** (0.05 - 0.07)	0.06*** (0.06 - 0.07)	0.06*** (0.06 - 0.07)	0.06*** (0.05 - 0.06)	0.05*** (0.05 - 0.06)	0.06*** (0.05 - 0.07)	0.06*** (0.06 - 0.07)	0.06*** (0.06 - 0.07)	0.06*** (0.06 - 0.07)
Health: Long-standing illness	0.28*** (0.26 - 0.30)	0.29*** (0.27 - 0.31)	0.29*** (0.27 - 0.31)	0.29*** (0.27 - 0.32)	0.30*** (0.27 - 0.32)	0.29*** (0.27 - 0.32)	0.29*** (0.26 - 0.31)	0.29*** (0.27 - 0.32)	0.28*** (0.26 - 0.31)
Constant	-0.80*** (-0.88 - -0.72)	-0.83*** (-0.91 - -0.75)	-0.84*** (-0.92 - -0.77)	-0.89*** (-0.97 - -0.81)	-0.88*** (-0.96 - -0.80)	-0.84*** (-0.92 - -0.76)	-0.84*** (-0.92 - -0.76)	-0.82*** (-0.90 - -0.74)	-0.77*** (-0.84 - -0.69)
Observations	31,736	31,666	31,540	31,437	31,532	31,578	31,604	31,658	30,895
Number of groups	11,454	11,444	11,420	11,406	11,422	11,433	11,434	11,447	11,317

95% confidence intervals in parentheses

*** p<0.001, ** p<0.01, * p<0.05, + p<0.10

Table 41 Models 3a to 3g: Linear multilevel regressions of the domains of the SWEMWBS on the IMD and the perceived/social neighbourhood scale (UKHLS wave 1).

VARIABLES	Model 3a feel optimistic	Model 3b feel useful	Model 3c feel relaxed	Model 3d deal with problems well	Model 3e think clearly	Model 3f feel close to others	Model 3g able to make up my mind
Focal variables							
Decile rank of IMD	0.020*** (0.016 - 0.024)	0.008*** (0.004 - 0.013)	0.005* (0.001 - 0.009)	0.007*** (0.003 - 0.011)	0.006** (0.002 - 0.010)	0.005* (0.001 - 0.009)	-0.002 (-0.006 - 0.002)
Perceived/neighbourhood factors	0.141*** (0.126 - 0.156)	0.224*** (0.210 - 0.239)	0.199*** (0.185 - 0.214)	0.174*** (0.159 - 0.189)	0.152*** (0.138 - 0.167)	0.303*** (0.289 - 0.318)	0.138*** (0.123 - 0.153)
Control variables							
Age in years	-0.006*** (-0.007 - -0.004)	-0.000 (-0.001 - 0.001)	0.004*** (0.003 - 0.005)	0.003*** (0.002 - 0.005)	0.007*** (0.006 - 0.008)	-0.005*** (-0.006 - -0.004)	0.004*** (0.002 - 0.005)
Gender: Female = 2, Women	0.058*** (0.036 - 0.079)	0.014 (-0.008 - 0.035)	-0.155*** (-0.176 - -0.133)	-0.092*** (-0.114 - -0.071)	-0.085*** (-0.106 - -0.063)	0.133*** (0.111 - 0.154)	-0.064*** (-0.086 - -0.042)
Economic activity = 2, Unemployed	-0.160*** (-0.205 - -0.116)	-0.336*** (-0.380 - -0.291)	-0.067** (-0.111 - -0.022)	-0.242*** (-0.287 - -0.197)	-0.177*** (-0.222 - -0.132)	-0.158*** (-0.203 - -0.114)	-0.151*** (-0.197 - -0.106)
Economic activity = 3, Retired	0.097*** (0.057 - 0.137)	-0.070*** (-0.110 - -0.031)	0.244*** (0.204 - 0.283)	0.096*** (0.056 - 0.136)	0.102*** (0.063 - 0.142)	0.146*** (0.107 - 0.186)	0.089*** (0.048 - 0.129)
Economic activity = 4, Home/maternity	-0.057*** (-0.100 - -0.015)	-0.128*** (-0.171 - -0.086)	0.007 (-0.035 - 0.050)	-0.048* (-0.091 - -0.005)	-0.079*** (-0.122 - -0.037)	-0.090*** (-0.133 - -0.048)	-0.098*** (-0.142 - -0.055)
Economic activity = 5, Student	0.183*** (0.135 - 0.232)	-0.035 (-0.083 - 0.013)	0.127*** (0.078 - 0.175)	0.027 (-0.022 - 0.076)	0.089*** (0.040 - 0.137)	0.211*** (0.163 - 0.259)	0.069** (0.020 - 0.119)
Economic activity = 6, Long-term sick	-0.394*** (-0.456 - -0.331)	-0.771*** (-0.833 - -0.709)	-0.460*** (-0.522 - -0.397)	-0.629*** (-0.692 - -0.566)	-0.595*** (-0.658 - -0.532)	-0.393*** (-0.455 - -0.331)	-0.514*** (-0.577 - -0.450)
Economic activity = 7, other	-0.030 (-0.141 - 0.081)	-0.138* (-0.248 - -0.028)	-0.131* (-0.242 - -0.021)	-0.086 (-0.198 - 0.026)	-0.090 (-0.201 - 0.020)	-0.082 (-0.193 - 0.028)	-0.132* (-0.245 - -0.019)
White British = 1, Yes	-0.085*** (-0.113 - -0.057)	-0.084*** (-0.111 - -0.057)	-0.038** (-0.065 - -0.010)	-0.005 (-0.033 - 0.022)	-0.059*** (-0.087 - -0.032)	0.102*** (0.075 - 0.130)	0.090*** (0.062 - 0.118)
Children in hhold = 1, 1 or more	-0.103*** (-0.131 - -0.076)	-0.088*** (-0.116 - -0.061)	-0.207*** (-0.234 - -0.179)	-0.113*** (-0.141 - -0.085)	-0.099*** (-0.126 - -0.071)	-0.149*** (-0.176 - -0.121)	-0.064*** (-0.092 - -0.036)
Marital status = 2, In partnership	0.106*** (0.073 - 0.140)	0.168*** (0.135 - 0.201)	-0.005 (-0.038 - 0.028)	0.088*** (0.055 - 0.121)	0.085*** (0.052 - 0.118)	0.260*** (0.227 - 0.293)	0.005 (-0.029 - 0.039)
Marital status = 3, Separated	0.023 (-0.024 - 0.070)	0.050* (0.003 - 0.096)	-0.100*** (-0.147 - -0.054)	-0.009 (-0.056 - 0.038)	-0.047* (-0.094 - -0.000)	0.004 (-0.043 - 0.050)	-0.013 (-0.061 - 0.034)
Marital status = 4, Widowed	0.065* (0.004 - 0.126)	-0.050 (-0.111 - -0.010)	-0.052 (-0.113 - 0.009)	0.030 (-0.031 - 0.091)	-0.040 (-0.101 - 0.021)	0.213*** (0.152 - 0.273)	-0.012 (-0.074 - 0.050)
Highest qualification	0.083*** (0.076 - 0.090)	0.067*** (0.060 - 0.074)	0.021*** (0.014 - 0.028)	0.032*** (0.026 - 0.039)	0.041*** (0.034 - 0.048)	0.032*** (0.025 - 0.039)	0.027*** (0.020 - 0.034)
Health: Long-standing illness	0.186*** (0.162 - 0.210)	0.214*** (0.190 - 0.238)	0.281*** (0.257 - 0.305)	0.250*** (0.226 - 0.274)	0.232*** (0.208 - 0.256)	0.147*** (0.123 - 0.171)	0.149*** (0.125 - 0.174)
Constant	-0.484*** (-0.564 - -0.405)	-0.581*** (-0.659 - -0.503)	-0.579*** (-0.658 - -0.500)	-0.674*** (-0.753 - -0.595)	-0.796*** (-0.875 - -0.716)	-0.464*** (-0.543 - -0.385)	-0.504*** (-0.584 - -0.423)
Observations	32,648	32,571	32,576	32,621	32,561	32,586	32,758
Number of groups	11,568	11,547	11,557	11,562	11,557	11,561	11,579

95% confidence intervals in parentheses

*** p<0.001, ** p<0.01, * p<0.05, + p<0.01

Concerning the individual domains of the SWEMWBS, some differences emerged (Table 41). Firstly, the “dealing with problems well”, “thinking clearly”, and “feel close to other” domains are less strongly associated with the overall IMD than the other domains, and the 95% confidence intervals only narrowly exceed the zero-benchmark. However, the domains are strongly associated with neighbourhood cohesion, thus pointing to a difference between objective and perceived/social neighbourhood factors. Importantly, the “able to make up own mind” domain does not reach a statistically significant association with the IMD ($p > 0.1$) and the coefficient sign is even negative.

These domains might be classified as being less eudaimonic and more hedonic, whereas the “feeling optimistic” and “feeling useful” domains (most eudaimonic) show the strongest associations with the IMD (B 0.020, 95% confidence interval 0.016 – 0.024, $p < 0.001$). In contrast, the perceived/social neighbourhood factors relate very strongly and are consistently associated with all domains of the SWEMWBS, particularly with “feeling close to others” (B 0.303; 95% confidence interval 0.289 – 0.318; $p < 0.001$), as one would expect given the conceptual overlap. “Feeling relaxed” (B 0.199; 95% confidence interval 0.185 - 0.214; $p < 0.001$) is also very strongly associated with the perceived/social neighbourhood scale. These findings suggest similar trends between the objective and perceived/social neighbourhood factors. Interestingly, the objective neighbourhood factors appear to matter the most on the eudaimonic scales.

Table 42 Models 4a to 4h: Linear multilevel regressions of the SWEMWBS on the IMD while accounting for negative mental health in relation to the dual continua model (UKHLS wave 1).

VARIABLES	Model 4a SWEMWBS	Model 4b SWEMWBS	Model 4c SWEMWBS	Model 4d SWEMWBS	Model 4e SWEMWBS	Model 4f SWEMWBS	Model 4g SWEMWBS	Model 4h SWEMWBS
Focal variables								
Decile rank of IMD	0.011*** (0.007 - 0.015)							
Income Decile		0.012*** (0.009 - 0.016)						
Employment Decile			0.012*** (0.008 - 0.016)					
Education, Skills and Training Decile				0.012*** (0.008 - 0.016)				
Decile rank of health deprivation					0.011*** (0.007 - 0.015)			
Crime Decile						0.007*** (0.003 - 0.011)		
Decile rank of barriers to housing/services							-0.001 (-0.005 - 0.003)	
Decile rank of living environment deprivation								0.001 (-0.003 - 0.004)
Negative mental health	-1.057*** (-1.082 - -1.031)	-1.057*** (-1.082 - -1.031)	-1.057*** (-1.082 - -1.031)	-1.057*** (-1.083 - -1.032)	-1.057*** (-1.082 - -1.031)	-1.057*** (-1.083 - -1.032)	-1.059*** (-1.084 - -1.033)	-1.059*** (-1.084 - -1.033)
Control variables								
Age in years	0.003*** (0.002 - 0.004)	0.003*** (0.002 - 0.004)	0.003*** (0.002 - 0.004)	0.003*** (0.002 - 0.004)	0.003*** (0.002 - 0.004)	0.003*** (0.002 - 0.004)	0.003*** (0.002 - 0.004)	0.003*** (0.002 - 0.004)
Gender: Female = 2, Women	0.028** (0.008 - 0.048)	0.028** (0.008 - 0.047)	0.028** (0.008 - 0.048)	0.027** (0.007 - 0.047)	0.028** (0.008 - 0.047)	0.028** (0.008 - 0.048)	0.029** (0.009 - 0.049)	0.029** (0.009 - 0.049)
Economic activity = 2, Unemployed	-0.124*** (-0.165 - -0.082)	-0.122*** (-0.164 - -0.081)	-0.123*** (-0.165 - -0.082)	-0.125*** (-0.166 - -0.083)	-0.125*** (-0.167 - -0.083)	-0.129*** (-0.170 - -0.087)	-0.134*** (-0.175 - -0.092)	-0.133*** (-0.174 - -0.092)
Economic activity = 3, Retired	0.125*** (0.089 - 0.162)	0.126*** (0.089 - 0.162)	0.126*** (0.090 - 0.163)	0.126*** (0.089 - 0.163)	0.126*** (0.090 - 0.163)	0.123*** (0.087 - 0.160)	0.124*** (0.087 - 0.160)	0.124*** (0.087 - 0.160)
Economic activity = 4, Home/maternity	-0.043* (-0.083 - -0.004)	-0.043* (-0.082 - -0.003)	-0.043* (-0.083 - -0.004)	-0.043* (-0.083 - -0.004)	-0.045* (-0.084 - -0.005)	-0.046* (-0.085 - -0.006)	-0.047* (-0.087 - -0.008)	-0.047* (-0.086 - -0.007)
Economic activity = 5, Student	0.124*** (0.080 - 0.169)	0.122*** (0.078 - 0.167)	0.121*** (0.077 - 0.166)	0.123*** (0.078 - 0.167)	0.125*** (0.080 - 0.170)	0.127*** (0.082 - 0.171)	0.128*** (0.083 - 0.172)	0.128*** (0.083 - 0.172)
Economic activity = 6, Long-term sick	-0.391*** (-0.450 - -0.332)	-0.389*** (-0.448 - -0.330)	-0.390*** (-0.449 - -0.331)	-0.393*** (-0.452 - -0.334)	-0.391*** (-0.450 - -0.332)	-0.399*** (-0.457 - -0.340)	-0.405*** (-0.464 - -0.346)	-0.404*** (-0.463 - -0.346)
Economic activity = 7, other	-0.046 (-0.147 - 0.056)	-0.046 (-0.147 - 0.056)	-0.045 (-0.146 - 0.057)	-0.048 (-0.149 - 0.054)	-0.047 (-0.148 - 0.055)	-0.050 (-0.151 - 0.051)	-0.053 (-0.154 - 0.048)	-0.053 (-0.154 - 0.049)
White British = 1, Yes	-0.073*** (-0.098 - -0.047)	-0.076*** (-0.102 - -0.050)	-0.068*** (-0.093 - -0.043)	-0.062*** (-0.087 - -0.037)	-0.064*** (-0.089 - -0.039)	-0.070*** (-0.096 - -0.044)	-0.054*** (-0.080 - -0.028)	-0.057*** (-0.083 - -0.032)
Children in hhold = 1, 1 or more	-0.104*** (-0.130 - -0.079)	-0.103*** (-0.128 - -0.078)	-0.103*** (-0.128 - -0.077)	-0.103*** (-0.128 - -0.077)	-0.104*** (-0.130 - -0.079)	-0.105*** (-0.131 - -0.080)	-0.106*** (-0.131 - -0.081)	-0.106*** (-0.132 - -0.081)
Marital status = 2, In partnership	0.137*** (0.107 - 0.167)	0.136*** (0.106 - 0.167)	0.137*** (0.107 - 0.168)	0.140*** (0.110 - 0.170)	0.139*** (0.108 - 0.169)	0.139*** (0.109 - 0.170)	0.143*** (0.112 - 0.173)	0.142*** (0.112 - 0.173)
Marital status = 3, Separated	0.015 (-0.028 - 0.058)	0.016 (-0.028 - 0.059)	0.016 (-0.027 - 0.059)	0.017 (-0.026 - 0.061)	0.016 (-0.028 - 0.059)	0.013 (-0.030 - 0.056)	0.013 (-0.030 - 0.056)	0.013 (-0.030 - 0.056)
Marital status = 4, Widowed	0.061* (0.004 - 0.118)	0.061* (0.004 - 0.118)	0.062* (0.005 - 0.119)	0.063* (0.006 - 0.120)	0.063* (0.006 - 0.120)	0.060* (0.003 - 0.117)	0.061* (0.004 - 0.118)	0.061* (0.004 - 0.118)
Highest qualification	0.053*** (0.047 - 0.059)	0.052*** (0.046 - 0.058)	0.052*** (0.046 - 0.058)	0.051*** (0.045 - 0.058)	0.053*** (0.047 - 0.059)	0.055*** (0.049 - 0.062)	0.056*** (0.050 - 0.063)	0.056*** (0.050 - 0.063)
Health: Long-standing illness	0.171*** (0.149 - 0.193)	0.171*** (0.149 - 0.193)	0.171*** (0.148 - 0.193)	0.170*** (0.148 - 0.193)	0.171*** (0.148 - 0.193)	0.172*** (0.150 - 0.195)	0.173*** (0.150 - 0.195)	0.173*** (0.150 - 0.195)
Constant	-0.509*** (-0.582 - -0.436)	-0.511*** (-0.585 - -0.438)	-0.517*** (-0.590 - -0.444)	-0.516*** (-0.590 - -0.443)	-0.517*** (-0.591 - -0.444)	-0.509*** (-0.582 - -0.435)	-0.489*** (-0.564 - -0.415)	-0.496*** (-0.570 - -0.422)
Observations	31,460	31,460	31,460	31,460	31,460	31,460	31,460	31,460
Number of groups	11,421	11,421	11,421	11,421	11,421	11,421	11,421	11,421

95% confidence intervals in parentheses

*** p<0.001, ** p<0.01, * p<0.05, + p<0.01

Table 43 Models 5a to 5i: Linear multilevel regressions of the SWEMWBS on perceived/social neighbourhood factors while accounting for negative mental health in relation to the dual continua model (UKHLS wave 1).

VARIABLES	Model 5a	Model 5b	Model 5c	Model 5d	Model 5e	Model 5f	Model 5g	Model 5h	Model 5i
	SWEMWBS	SWEMWBS	SWEMWBS	SWEMWBS	SWEMWBS	SWEMWBS	SWEMWBS	SWEMWBS	SWEMWBS
Focal variables									
Belong to neighbourhood	0.14*** (0.13 - 0.15)								0.08*** (0.07 - 0.10)
Local friends mean a lot		0.13*** (0.12 - 0.14)							0.01 (-0.00 - 0.03)
Advice obtainable locally			0.11*** (0.10 - 0.12)						0.03*** (0.01 - 0.04)
Can borrow things from neighbours				0.08*** (0.07 - 0.09)					-0.03*** (-0.04 - -0.02)
Willing to improve neighbourhood					0.12*** (0.11 - 0.13)				0.07*** (0.06 - 0.08)
Plan to stay in neighbourhood						0.09*** (0.08 - 0.10)			-0.02* (-0.03 - -0.00)
Am similar to others in neighbourhood							0.11*** (0.10 - 0.12)		0.02* (0.00 - 0.03)
Talk regularly to neighbours								0.14*** (0.13 - 0.15)	0.06*** (0.04 - 0.07)
Negative mental health (binary) = 1	-1.02*** (-1.05 - -1.00)	-1.04*** (-1.06 - -1.01)	-1.04*** (-1.06 - -1.01)	-1.05*** (-1.08 - -1.03)	-1.05*** (-1.08 - -1.03)	-1.05*** (-1.07 - -1.02)	-1.04*** (-1.07 - -1.02)	-1.04*** (-1.06 - -1.01)	-1.02*** (-1.05 - -1.00)
Control variables									
Age in years	0.00** (0.00 - 0.00)	0.00** (0.00 - 0.00)	0.00*** (0.00 - 0.00)	0.00*** (0.00 - 0.00)	0.00*** (0.00 - 0.00)	0.00*** (0.00 - 0.00)	0.00*** (0.00 - 0.00)	0.00** (0.00 - 0.00)	0.00 (-0.00 - 0.00)
Gender: Female = 2, Women	0.02 (-0.00 - 0.04)	0.01 (-0.01 - 0.03)	0.01 (-0.01 - 0.03)	0.02* (0.01 - 0.04)	0.02* (0.00 - 0.04)	0.03** (0.01 - 0.05)	0.02* (0.00 - 0.04)	0.01 (-0.01 - 0.03)	0.01 (-0.01 - 0.03)
Economic activity = 2, Unemployed	-0.13*** (-0.17 - -0.09)	-0.14*** (-0.18 - -0.10)	-0.14*** (-0.18 - -0.10)	-0.13*** (-0.17 - -0.09)	-0.13*** (-0.17 - -0.08)	-0.12*** (-0.17 - -0.08)	-0.13*** (-0.17 - -0.09)	-0.13*** (-0.17 - -0.09)	-0.12*** (-0.17 - -0.08)
Economic activity = 3, Retired	0.12*** (0.08 - 0.16)	0.12*** (0.08 - 0.15)	0.11*** (0.08 - 0.15)	0.12*** (0.08 - 0.16)	0.14*** (0.10 - 0.17)	0.12*** (0.09 - 0.16)	0.13*** (0.09 - 0.16)	0.12*** (0.09 - 0.16)	0.13*** (0.09 - 0.16)
Economic activity = 4, Home/maternity	-0.05** (-0.09 - -0.01)	-0.06** (-0.10 - -0.02)	-0.06** (-0.10 - -0.02)	-0.05* (-0.09 - -0.01)	-0.05* (-0.09 - -0.01)	-0.04* (-0.08 - -0.00)	-0.05* (-0.09 - -0.01)	-0.06** (-0.10 - -0.02)	-0.05* (-0.09 - -0.01)
Economic activity = 5, Student	0.12*** (0.08 - 0.16)	0.11*** (0.07 - 0.16)	0.12*** (0.07 - 0.16)	0.12*** (0.08 - 0.17)	0.13*** (0.09 - 0.18)	0.14*** (0.10 - 0.19)	0.13*** (0.09 - 0.18)	0.14*** (0.09 - 0.18)	0.13*** (0.09 - 0.18)
Economic activity = 6, Long-term sick	-0.41*** (-0.47 - -0.35)	-0.42*** (-0.48 - -0.36)	-0.42*** (-0.48 - -0.36)	-0.41*** (-0.47 - -0.35)	-0.39*** (-0.45 - -0.34)	-0.41*** (-0.47 - -0.35)	-0.41*** (-0.47 - -0.36)	-0.41*** (-0.47 - -0.35)	-0.41*** (-0.47 - -0.35)
Economic activity = 7, other	-0.04 (-0.14 - 0.06)	-0.06 (-0.16 - 0.05)	-0.06 (-0.16 - 0.05)	-0.06 (-0.16 - 0.04)	-0.05 (-0.15 - 0.05)	-0.02 (-0.13 - 0.08)	-0.04 (-0.14 - 0.06)	-0.05 (-0.15 - 0.05)	-0.04 (-0.14 - 0.06)
White British = 1, Yes	-0.04** (-0.06 - -0.02)	-0.04** (-0.06 - -0.01)	-0.05*** (-0.07 - -0.02)	-0.06*** (-0.08 - -0.03)	-0.04** (-0.07 - -0.02)	-0.05*** (-0.08 - -0.03)	-0.04*** (-0.07 - -0.02)	-0.06*** (-0.09 - -0.04)	-0.03* (-0.06 - -0.01)
Children in hhold = 1, 1 or more	-0.12*** (-0.15 - -0.10)	-0.12*** (-0.15 - -0.10)	-0.13*** (-0.15 - -0.10)	-0.12*** (-0.15 - -0.10)	-0.12*** (-0.14 - -0.09)	-0.12*** (-0.15 - -0.10)	-0.12*** (-0.14 - -0.09)	-0.13*** (-0.16 - -0.11)	-0.13*** (-0.16 - -0.11)
Marital status = 2, In partnership	0.14*** (0.11 - 0.17)	0.14*** (0.11 - 0.17)	0.14*** (0.11 - 0.17)	0.14*** (0.10 - 0.17)	0.13*** (0.10 - 0.16)	0.13*** (0.10 - 0.16)	0.12*** (0.09 - 0.15)	0.13*** (0.10 - 0.16)	0.12*** (0.09 - 0.15)
Marital status = 3, Separated	0.02 (-0.02 - 0.06)	0.02 (-0.03 - 0.06)	0.02 (-0.02 - 0.07)	0.02 (-0.02 - 0.06)	0.00 (-0.04 - 0.05)	0.01 (-0.03 - 0.06)	0.00 (-0.04 - 0.05)	0.01 (-0.03 - 0.05)	0.01 (-0.03 - 0.05)
Marital status = 4, Widowed	0.06* (0.00 - 0.12)	0.05 (-0.00 - 0.11)	0.06* (0.00 - 0.12)	0.07* (0.01 - 0.13)	0.07* (0.01 - 0.13)	0.06* (0.00 - 0.11)	0.04 (-0.01 - 0.10)	0.06* (0.00 - 0.12)	0.06* (0.00 - 0.12)
Highest qualification	0.06*** (0.05 - 0.06)	0.06*** (0.05 - 0.07)	0.06*** (0.05 - 0.07)	0.06*** (0.05 - 0.06)	0.05*** (0.04 - 0.06)	0.06*** (0.05 - 0.07)	0.06*** (0.06 - 0.07)	0.06*** (0.06 - 0.07)	0.06*** (0.05 - 0.07)
Health: Long-standing illness	0.16*** (0.14 - 0.19)	0.17*** (0.14 - 0.19)	0.17*** (0.15 - 0.19)	0.17*** (0.15 - 0.19)	0.17*** (0.15 - 0.19)	0.17*** (0.15 - 0.19)	0.16*** (0.14 - 0.19)	0.17*** (0.15 - 0.19)	0.16*** (0.14 - 0.19)
Constant	-0.40*** (-0.48 - -0.33)	-0.41*** (-0.49 - -0.34)	-0.43*** (-0.50 - -0.36)	-0.45*** (-0.53 - -0.38)	-0.44*** (-0.51 - -0.36)	-0.42*** (-0.50 - -0.35)	-0.42*** (-0.49 - -0.35)	-0.40*** (-0.47 - -0.33)	-0.37*** (-0.45 - -0.30)
Observations	31,272	31,204	31,081	30,982	31,078	31,126	31,149	31,198	30,466
Number of groups	11,392	11,382	11,357	11,344	11,363	11,374	11,374	11,386	11,261

95% confidence intervals in parentheses

*** p<0.001, ** p<0.01, * p<0.05, + p<0.01

A key exercise of the thesis is the empirical application of the dual continua model in which PMH and NMH mental health are tested as distinct concepts. As such, in the following models, NMH is added as a control variable; both aspects of mental health are now jointly accounted for to draw out the distinct association of PMH and NMH with neighbourhood conditions (Table 42 and Table 43).

The IMD and its subscales were strongly associated with PMH (Models 1a to 1h), except for barriers to housing and the living environment, and the results remain statistically significant even when accounting for NMH (Models 4a to 4h). The results, therefore, indicate that PMH is significantly associated with the IMD and that only a small and partial attribution of this linkage in terms of slightly reduced coefficient sizes of PMH is made by NMH. In Models 5a to 5i (Table 43), for neighbourhood cohesion (perceived/social neighbourhood factors) as the focal predictor variable, the associations with PMH remain highly significant and are again only slightly reduced by the inclusion of NMH.

Models 6a and 6b (Table 44) jointly account for NMH and PMH when considering the overall IMD and summated neighbourhood cohesion scales together. When adding NMH as a predictor of PMH in addition to the neighbourhood factors and control variables in model 6b, the size of the coefficient of the IMD is reduced from 0.009 ($p < 0.005$) to 0.005 ($p < 0.01$), and the size of the coefficient of neighbourhood belonging is reduced from 0.290 ($p < 0.001$) to 0.225 ($p < 0.001$). What this shows is that even though some parts of the associations of PMH with neighbourhood factors are tapping into an overall shared or latent domain of mental health and are hence correlated with the GHQ, the majority share of those associations is uniquely identified with PMH as predicted by the dual continua model of mental health. As mentioned before, there is evidence of distinct associations of the IMD subscales with the PMH and NMH.

Table 45 provides a robustness check to the presented findings by analysing the relationship between neighbourhood factors and mental health using full information maximum likelihood techniques that can use partially missing cases of information rather than applying listwise deletion. The results show that both the IMD and neighbourhood cohesion remain statistically significant predictors of PMH.

Table 44 Models 6a and 6b: Linear multilevel regressions of the SWEMWBS on the IMD and perceived/social neighbourhood scale with NMH (UKHLS wave 1).

VARIABLES	M6a SWEMWBS	M6b SWEMWBS
Focal variables		
Decile rank of IMD	0.010*** (0.006 - 0.015)	0.007*** (0.003 - 0.011)
Perceived/social neighbourhood cohesion	0.266*** (0.251 - 0.281)	0.217*** (0.203 - 0.231)
Control variables		
Gender: Female = 2, Women	-0.038*** (-0.060 - -0.017)	0.013 (-0.007 - 0.033)
Age in years	0.001 (-0.000 - 0.002)	0.001 (-0.000 - 0.002)
Economic activitiy = 2, Unemployed	-0.255*** (-0.300 - -0.211)	-0.125*** (-0.166 - -0.084)
Economic activitiy = 3, Retired	0.146*** (0.107 - 0.186)	0.126*** (0.089 - 0.162)
Economic activitiy = 4, Home/maternity	-0.087*** (-0.129 - -0.044)	-0.057** (-0.096 - -0.018)
Economic activitiy = 5, Student	0.127*** (0.079 - 0.175)	0.125*** (0.081 - 0.169)
Economic activitiy = 6, Long-term sick	-0.727*** (-0.790 - -0.665)	-0.406*** (-0.464 - -0.347)
Economic activitiy = 7, other	-0.120* (-0.230 - -0.010)	-0.047 (-0.147 - 0.053)
White British = 1, Yes	-0.021 (-0.048 - 0.007)	-0.055*** (-0.081 - -0.030)
Children in hhold = 1, 1 or more	-0.166*** (-0.193 - -0.138)	-0.139*** (-0.164 - -0.114)
Marital status = 2, In partnership	0.139*** (0.106 - 0.171)	0.123*** (0.093 - 0.153)
Marital status = 3, Separated	-0.020 (-0.066 - 0.027)	0.017 (-0.026 - 0.059)
Marital status = 4, Widowed	0.030 (-0.031 - 0.091)	0.056 (-0.000 - 0.112)
Highest qualification	0.058*** (0.052 - 0.065)	0.057*** (0.051 - 0.063)
Health: Long-standing illness	0.284*** (0.260 - 0.308)	0.165*** (0.143 - 0.187)
Negative mental health		-1.022*** (-1.047 - -0.996)
Constant	-0.776*** (-0.855 - -0.697)	-0.370*** (-0.443 - -0.297)
Observations	31,877	31,405
Number of groups	11,474	11,411

95% confidence intervals in parentheses

*** p<0.001, ** p<0.01, * p<0.05, + p<0.01

Table 45 FIML regression of the SWEMWBS and each of its domains on the IMD and neighbourhood cohesion as a robustness check to the previous models (UKHLS wave 1)⁴¹

VARIABLES	FIML 1	FIML 2	FIML 3	FIML 4	FIML 5	FIML 6	FIML 7	FIML 8	FIML 9
	SWEMWBS	GHQ	feel optimistic	feel useful	feel relaxed	deal with problems well	think clearly	feel close to others	able to make up my mind
Focal variables									
IMD rank	5.173*** (5.145 - 5.200)	5.173*** (5.145 - 5.200)	5.173*** (5.145 - 5.200)	5.173*** (5.145 - 5.200)	5.173*** (5.145 - 5.200)	5.173*** (5.145 - 5.200)	5.173*** (5.145 - 5.200)	5.173*** (5.145 - 5.200)	5.173*** (5.145 - 5.200)
Perceived/social neighbourhood factors	0.008* (0.000 - 0.016)	0.008* (0.000 - 0.016)	0.008* (0.001 - 0.016)	0.008* (0.000 - 0.016)	0.009* (0.001 - 0.017)	0.008* (0.000 - 0.016)	0.009* (0.001 - 0.016)	0.008* (0.000 - 0.016)	0.008* (0.000 - 0.016)
Control variables									
Gender: Female	1.541*** (1.537 - 1.546)	1.541*** (1.537 - 1.546)	1.541*** (1.537 - 1.546)	1.541*** (1.537 - 1.546)	1.541*** (1.537 - 1.546)	1.541*** (1.537 - 1.546)	1.541*** (1.537 - 1.546)	1.541*** (1.537 - 1.546)	1.541*** (1.537 - 1.546)
Age	45.317*** (45.146 - 45.489)	45.317*** (45.146 - 45.489)	45.317*** (45.146 - 45.489)	45.317*** (45.146 - 45.489)	45.317*** (45.146 - 45.489)	45.317*** (45.146 - 45.489)	45.317*** (45.146 - 45.489)	45.317*** (45.146 - 45.489)	45.317*** (45.146 - 45.489)
Job status	2.253*** (2.238 - 2.268)	2.253*** (2.238 - 2.268)	2.253*** (2.238 - 2.268)	2.253*** (2.238 - 2.268)	2.253*** (2.238 - 2.268)	2.253*** (2.238 - 2.268)	2.253*** (2.238 - 2.268)	2.253*** (2.238 - 2.268)	2.253*** (2.238 - 2.268)
White British	0.726*** (0.722 - 0.730)	0.726*** (0.722 - 0.730)	0.726*** (0.722 - 0.730)	0.726*** (0.722 - 0.730)	0.726*** (0.722 - 0.730)	0.726*** (0.722 - 0.730)	0.726*** (0.722 - 0.730)	0.726*** (0.722 - 0.730)	0.726*** (0.722 - 0.730)
Number of children in hhold	0.300*** (0.295 - 0.304)	0.300*** (0.295 - 0.304)	0.300*** (0.295 - 0.304)	0.300*** (0.295 - 0.304)	0.300*** (0.295 - 0.304)	0.300*** (0.295 - 0.304)	0.300*** (0.295 - 0.304)	0.300*** (0.295 - 0.304)	0.300*** (0.295 - 0.304)
Marital status	1.960*** (1.953 - 1.967)	1.960*** (1.953 - 1.967)	1.960*** (1.953 - 1.967)	1.960*** (1.953 - 1.967)	1.960*** (1.953 - 1.967)	1.960*** (1.953 - 1.967)	1.960*** (1.953 - 1.967)	1.960*** (1.953 - 1.967)	1.960*** (1.953 - 1.967)
Highest qualification	3.616*** (3.599 - 3.632)	3.616*** (3.599 - 3.632)	3.616*** (3.599 - 3.632)	3.616*** (3.599 - 3.632)	3.616*** (3.599 - 3.632)	3.616*** (3.599 - 3.632)	3.616*** (3.599 - 3.632)	3.616*** (3.599 - 3.632)	3.616*** (3.599 - 3.632)
Health: Long-standing illness	1.657*** (1.652 - 1.661)	1.657*** (1.652 - 1.661)	1.657*** (1.652 - 1.661)	1.657*** (1.652 - 1.661)	1.657*** (1.652 - 1.661)	1.657*** (1.652 - 1.661)	1.657*** (1.652 - 1.661)	1.657*** (1.652 - 1.661)	1.657*** (1.652 - 1.661)
Variance terms									
var(e.c_a_swemwbs_dv)	0.904*** (0.890 - 0.918)								
var(e.c_reva_scghq_l_dv)		0.911*** (0.897 - 0.925)							
var(e.c_a_scwemwba)			0.933*** (0.918 - 0.947)						
var(e.c_a_scwemwbb)				0.916*** (0.902 - 0.930)					
var(e.c_a_scwemwbc)					0.923*** (0.908 - 0.937)				
var(e.c_a_scwemwbd)						0.939*** (0.924 - 0.953)			
var(e.c_a_scwemwbe)							0.934*** (0.919 - 0.948)		
var(e.c_a_scwemwbf)								0.929*** (0.915 - 0.943)	
var(e.c_a_scwemwbg)									0.965*** (0.951 - 0.980)
Observations	42,972	42,972	42,972	42,972	42,972	42,972	42,972	42,972	42,972
95% confidence interval in parentheses									
*** p<0.001, ** p<0.01, * p<0.05, + p<0.1									

⁴¹ FIML estimations can only be specified via the standard structural equational modelling commands in Stata. Accordingly, it was not possible to run a multilevel model, and predictors variables had to be operationalised as numeric variables rather than as factors.

3.4.1 Longitudinal analyses

A key strength of panel data is the analysis of transitions over time, and in this chapter, the focal transitions are neighbourhood changes between LSOAs as well as the implied changes of moving into a neighbourhood with more or neighbourhood with less deprivation as measured through the IMD.

Table 46 depicts the analytic sample as well as the number of neighbourhood transitions that are available in the data. There were 42,972 respondents in England at wave 1. 32,015 of those respondents also completed the self-completion questionnaire⁴², which is a requirement for information on levels of PMH and neighbourhood cohesion to be available.

As the UKHLS only started tracking respondents at wave 1, the earliest time a neighbourhood LSOA transition could be reported, was in wave 2. There were 1,815 neighbourhood transitions between waves 1-2, i.e., respondents moving into different LSOAs. Respondents who simply moved residence within the sample multifamily building or within very close proximity to their old residence, such as another flat or house on the same street, would not be captured by this metric. While this is a limitation, the focus of the chapter lies on changing living environments in terms of neighbourhood deprivation and not so much on the effect of moving houses per se. An advantage of using the official LSOAs as indicators of neighbourhood transitions is that this information is objective and arguably highly validated as it comes directly from the interviewer and sampling team and not even from the survey respondent.

⁴² The issue of the self-completion questionnaire and missing data on the mental health scales only applied to wave 1. In later waves, the questions were integrated in the main survey.

In total, there were 18,248 neighbourhood transition over the ten waves, with around 2,000 LSOA movements per wave on average. Out of the total number of observations ($N = 348,978$) this means that 5% of observations in the data represent neighbourhood movement. However, when counting the more relevant percentage of neighbourhood transitions per wave of data when non-missing information on the SWEMWBS was available, the percentage is higher at around 6.6%.⁴³ Since the SWEMWBS was only measured intermittently in four waves, the random and fixed effects regressions can only be based on the 111,648 pieces of information.

The transition probabilities in Table 47 portray the pattern of changes in IMD ranks and neighbourhood changes. The top panel shows the transition probabilities out of all available data points, and the lower panel shows the transition probabilities for the sample of respondents who moved between neighbourhoods at any point in the data set. As shown, there is around a 94% or 95% chance of remaining in the same neighbourhood (LSOA) at each wave. When people did move neighbourhoods, however, these movements were predominantly within similarly deprived neighbourhoods: For instance, for respondents who moved neighbourhoods that were in the most deprived IMD decile, they had a 35% chance of moving into an equally deprived neighbourhood, a 16% chance of moving into a neighbourhood in the second most deprived decile, a 12% chance of moving into a neighbourhood in the third most deprived decile, but only a 1% chance of moving into a neighbourhood in the least deprived decile. Respondents were likely to move into neighbourhoods that had similar levels of deprivation and “social neighbourhood mobility” was relatively rare.

⁴³ E.g., 1,674 transitions in wave 10 divided by 25,194 non-missing responses in wave 10; multiplied by 100 for the percentage = 6.6%

Table 46 Longitudinal sample characteristics and levels of missingness over 10 waves and neighbourhood transitions (UKHLS waves 1-10)

Wave 1	Total cases	Non-missing information on the SWEMWBS	Respondent did not move between LSOAs	Respondent moved between LSOAs
1	42,972	32,015	42,972	0
2	41,531		39,716	1,815
3	37,894		35,679	2,215
4	36,145	29,828	33,786	2,359
5	34,735		32,404	2,331
6	35,940		33,994	1,946
7	33,336	29,611	31,120	2,216
8	31,008		29,066	1,942
9	28,374		26,624	1,750
10	27,043	25,194	25,369	1,674
Total	348,978	111,648	330,730	18,248

Table 47 Transitions probabilities for LSOA residency movements by IMD decile rank (UKHLS waves 1-10).

IMD Decile	1	2	3	4	5	6	7	8	9	10	Total
Transition probabilities by IMD decile including respondents who did not move											
1	95.6	1.5	0.8	0.7	0.4	0.3	0.3	0.3	0.2	0.1	100.0
2	1.2	94.4	1.2	0.9	0.6	0.6	0.4	0.4	0.3	0.2	100.0
3	0.7	1.0	94.1	1.0	0.9	0.6	0.6	0.5	0.4	0.3	100.0
4	0.5	0.8	1.0	93.7	0.9	0.7	0.8	0.7	0.5	0.4	100.0
5	0.4	0.7	0.7	0.8	94.0	0.8	0.8	0.7	0.6	0.5	100.0
6	0.3	0.4	0.6	0.7	0.8	94.2	0.9	0.8	0.7	0.6	100.0
7	0.2	0.5	0.5	0.5	0.7	0.8	94.6	0.9	0.7	0.6	100.0
8	0.2	0.4	0.4	0.5	0.7	0.7	0.9	94.5	0.9	0.9	100.0
9	0.1	0.2	0.3	0.5	0.6	0.7	0.7	0.9	95.1	0.9	100.0
10	0.1	0.1	0.3	0.4	0.4	0.6	0.7	0.8	0.9	95.7	100.0
Total	10.7	11.0	9.8	9.8	9.4	10.2	10.0	9.9	9.8	9.5	100.0
Transition probabilities by IMD if respondents moved into a different LSOA											
1	34.9	20.0	11.1	8.6	6.4	3.2	5.1	5.4	2.9	2.5	100.0
2	16.0	18.4	18.7	9.5	10.9	9.2	4.8	7.5	4.1	1.0	100.0
3	12.0	13.6	17.2	16.2	10.4	7.1	9.4	6.8	4.2	2.9	100.0
4	9.4	12.5	13.0	11.6	12.7	7.2	10.8	8.6	6.7	7.5	100.0
5	7.9	8.5	13.9	11.5	10.0	14.2	10.6	10.0	6.7	7.0	100.0
6	6.3	9.2	9.6	12.6	12.2	13.3	12.2	8.5	10.3	5.9	100.0
7	3.0	6.3	8.5	13.0	15.6	11.5	14.1	11.5	8.5	8.2	100.0
8	4.7	8.8	6.2	7.3	14.6	8.8	13.1	10.2	18.6	7.7	100.0
9	3.5	4.7	5.9	4.7	9.5	12.6	15.4	15.0	16.9	11.8	100.0
10	1.4	4.1	5.9	5.4	7.2	9.5	14.9	16.7	15.4	19.5	100.0

Table 48 Models 7a to 7h: Linear random effects panel data regressions of the SWEMWBS and its domains on the IMD and neighbourhood cohesion while accounting for negative mental health in relation to the dual continua model (UKHLS waves 1-10).

	Model 7a	Model 7b feeling optimistic about the future	Model 7c feeling useful	Model 7d feeling relaxed	Model 7e dealing with problems well	Model 7f thinking clearly	Model 7g feeling close to others	Model 7h able to make up own mind
VARIABLES								
Focal variables								
Decile rank of IMD	0.07*** (0.06 - 0.08)	0.02*** (0.02 - 0.02)	0.01*** (0.01 - 0.02)	0.01*** (0.00 - 0.01)	0.01*** (0.01 - 0.01)	0.01*** (0.01 - 0.01)	0.01*** (0.01 - 0.01)	0.00** (0.00 - 0.01)
Negative mental health	-4.31*** (-4.37 - -4.26)	-0.51*** (-0.52 - -0.50)	-0.60*** (-0.61 - -0.59)	-0.79*** (-0.80 - -0.78)	-0.72*** (-0.73 - -0.71)	-0.72*** (-0.73 - -0.70)	-0.54*** (-0.55 - -0.53)	-0.56*** (-0.57 - -0.55)
Control variables								
Gender: Female	-0.02 (-0.08 - 0.04)	0.07*** (0.06 - 0.09)	0.03*** (0.02 - 0.04)	-0.10*** (-0.11 - -0.09)	-0.05*** (-0.06 - -0.04)	-0.05*** (-0.06 - -0.04)	0.12*** (0.11 - 0.13)	-0.02** (-0.03 - -0.01)
Age in years	0.02*** (0.02 - 0.02)	-0.00*** (-0.00 - -0.00)	0.00*** (0.00 - 0.00)	0.01*** (0.01 - 0.01)	0.01*** (0.00 - 0.01)	0.01*** (0.01 - 0.01)	0.00*** (0.00 - 0.00)	0.00*** (0.00 - 0.01)
Economic activity	-0.01 (-0.03 - 0.01)	0.00 (-0.00 - 0.01)	-0.03*** (-0.03 - -0.03)	0.01*** (0.01 - 0.01)	-0.00* (-0.01 - -0.00)	-0.00 (-0.01 - 0.00)	0.01*** (0.00 - 0.01)	-0.00 (-0.00 - 0.00)
White British	-0.43*** (-0.51 - -0.36)	-0.10*** (-0.12 - -0.09)	-0.12*** (-0.13 - -0.10)	-0.10*** (-0.12 - -0.09)	-0.05*** (-0.06 - -0.03)	-0.07*** (-0.09 - -0.06)	-0.02 (-0.03 - 0.00)	0.03*** (0.02 - 0.05)
Children in hhold	-0.30*** (-0.36 - -0.24)	-0.04*** (-0.05 - -0.02)	0.03*** (0.02 - 0.04)	-0.14*** (-0.16 - -0.13)	-0.04*** (-0.05 - -0.03)	-0.04*** (-0.05 - -0.03)	-0.03*** (-0.04 - -0.02)	-0.05*** (-0.06 - -0.04)
Marital status	-0.03 (-0.08 - 0.02)	0.01 (-0.00 - 0.02)	-0.02*** (-0.03 - -0.01)	-0.02*** (-0.03 - -0.01)	0.00 (-0.01 - 0.01)	-0.01 (-0.02 - 0.00)	0.01 (-0.00 - 0.02)	0.01 (-0.00 - 0.02)
Highest qualification	0.20*** (0.18 - 0.22)	0.07*** (0.06 - 0.07)	0.06*** (0.05 - 0.06)	0.01** (0.00 - 0.01)	0.02*** (0.02 - 0.02)	0.03*** (0.02 - 0.03)	0.02*** (0.01 - 0.02)	0.02*** (0.01 - 0.02)
Health: Long-standing illness	0.77*** (0.71 - 0.82)	0.12*** (0.10 - 0.13)	0.14*** (0.13 - 0.15)	0.14*** (0.13 - 0.15)	0.13*** (0.12 - 0.14)	0.12*** (0.11 - 0.13)	0.09*** (0.08 - 0.10)	0.08*** (0.07 - 0.09)
Constant	23.08*** (22.87 - 23.29)	2.98*** (2.93 - 3.03)	3.15*** (3.11 - 3.19)	3.26*** (3.22 - 3.30)	3.29*** (3.25 - 3.33)	3.37*** (3.33 - 3.41)	3.18*** (3.14 - 3.23)	3.68*** (3.64 - 3.72)
Observations	113,119	113,964	113,931	113,973	114,015	113,953	113,963	114,156
Number of pidp	51,769	52,153	52,110	52,137	52,157	52,112	52,125	52,225

95% confidence intervals in parentheses

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

As seen in Table 48, when conducting linear random effects regressions of the SWEMWBS (Model 7a) or its subdomains (Models 7b-7h), on the overall IMD and neighbourhood cohesion, and when controlling for sociodemographic and socio-economic conditions (age, marital status, the number of children, job status and long-standing health problem), a very clear pattern emerges: People who were resident in and who are moving into a less deprived neighbourhood (i.e., a higher IMD rank) from one wave to the next one, report higher PMH of 0.14 standard deviations (95% confidence interval: 0.05-0.22, $p < 0.01$). Importantly, those associations are robust even when controlling for negative mental health, which is longitudinal evidence of the dual continua model for neighbourhood deprivation. If NMH and PMH were not distinct, one would have expected controlling for NMH to render the coefficient of PMH insignificant, especially over a long time where short fluctuations in dimensions of mental health would cancel each other out. In summary, neighbourhood deprivations seem to have a distinct and unique association with PMH that goes above and beyond the effects on mental illness.

Given that random effects estimates employ both within-person and between-person data, these findings cannot be interpreted in a fully causal manner. A Hausman test for testing endogeneity was statistically significant at $p < 0.05$ between the random effects and fixed effects model with only the IMD added as predictor variables. This implies that there are person-specific unmeasured error terms, e.g., unmeasured reasons for moving between neighbourhood, that affect the results. This is to be expected given the multitude of factors that influence neighbourhood and residency movements, for instance with regards to employment opportunities and proximity to friends and family, that are not part of the IMD. While this is a limitation, the random effects model still makes use of the longitudinal pattern and provides useful information that would not be captured by only a cross-sectional model. The random effects model also allowed for

the inclusion of time-invariant control variables that cannot be included in fixed effects models.

When running fixed effects regressions, the coefficients for the IMD and its domains were mostly statistically insignificant, apart from the health deprivation score of the IMD which was associated with B 0.246 (95% confidence interval 0.032 -0.460, $p < 0.01$) higher PMH as respondents moved into a neighbourhood with lower health deprivation. While the UKHLS provided a large sample, the fact that the SWEMWBS was only measured intermittently might cause the fixed effects estimates to be less significant as short to medium-term changes in mental health might be lost or cancelled out.

3.5 Discussion

The study examined the extent to which objective neighbourhood deprivation and neighbourhood cohesion factors are associated with PMH. Most previous studies on the association of neighbourhoods with PMH only considered social neighbourhood factors. The only exception to this is the study by Gale et al. (2011), in which objective neighbourhood deprivation measured via the IMD was not statistically significantly related to PMH, but Gale's study was based on an exceedingly small regional sample.

First research question (“association of objective neighbourhood deprivation and neighbourhood cohesion factors with PMH”):

In line with most studies on established NMH and many physical health measures, this study has detected a very strong association between objective neighbourhood deprivation and PMH. The associations of objective neighbourhood deprivation persist when one is controlling for many socio-economic variables and, crucially, even when controlling for negative mental health (GHQ) as predicted by the dual continua model.

The effect size of objective neighbourhood deprivation is slightly smaller than the effect size of social neighbourhood factors. This study, therefore, does not confirm Yen et al.'s (2009) statement that individuals' perceptions of their neighbourhoods are vastly more predictive of mental health than objective ones. In fact, like Shields, Wheatley Price and Wooden (2007), the effects of objective neighbourhood deprivation are even more extensive than the ones of most of the individual-level variables. Furthermore, the significant coefficients on the control variables highlight the importance of controlling for individual-level covariates that are quite strongly related with mental health (Chuang et al. 2007; Cubbin et al. 2006; Dragano et al. 2007).

Only the barriers to housing and living environment dimensions of the IMD were not significantly associated with PMH. Whereas the SWEMWBS is responsive to the IMD in general and to most of its dimensions, it seems to be most responsive to the stratification and relative deprivation measures and not to the dimensions that account for physical living conditions, which represents an unexpected new insight. Similarly, the association of the crime dimension of the IMD with PMH was weaker than the association with economic deprivation.

All domains of the neighbourhood cohesion predictors were strongly associated with the SWEMWBS, even when controlling for negative mental health, suggesting that neighbourhood belonging, social capital, and trust tap into a similar mechanism for both dimensions of mental health.

Having the SWEMWBS available in major household surveys like the UKHLS is attractive because this allows for innovative and creative uses of the rich data infrastructure in the UK. While psychological studies are often based on small-scale university samples or other convenience samples, here, a fully representative and large data set that is representative of English respondents was employed, and respondents' relatively exact geographic information was available for each wave. Furthermore, this geographic information made it possible to create a linkage with objective information about neighbourhood deprivation.

Second research question (“domains of the SWEMWBS”):

According to the multilevel results (Models 3a to 3g), the IMD is not significantly associated with “able to make up own mind” and only comparatively weakly with “thinking clearly” or “feeling close to others”, but most strongly associated with “feeling optimistic”.

Again, the neighbourhood cohesion factors are significantly associated with all dimensions of the SWEMWBS and show large sizes across the social, hedonic (“feeling relaxed”), and optimism domains.

These important differences between the domains of the SWEMWBS point to differential effects of neighbourhood factors on mental health.

Third research question (“testing the dual continua model”):

As predicted by the dual continua model, NMH and PMH have proved to have distinct associations with objective neighbourhood factors in terms of the IMD and also with neighbourhood cohesion. The inclusion of NMH as a control variable and the joint accounting of PMH and NMH did not render the PMH coefficient insignificant and only mildly reduced the coefficient sizes.

Therefore, a new insight presented by this study is that the associations of objective neighbourhood deprivation and social neighbourhood factors with mental health are distinct for positive and negative mental health, which could be attributed to support the dual continua model of mental health.

Fourth research question (“longitudinal associations of neighbourhood factors with PMH”):

The third key finding of this study is the presented evidence for longitudinal patterns of neighbourhood conditions on PMH. The results show that people living in less deprived neighbourhoods reported better PMH over time. As such, moving into a less deprived neighbourhood seems to be linked with better PMH, and the results were again significant even when accounting for NMH. This confirms results from the Scottish Health Survey that living in a deprived neighbourhood is associated with PMH

(Bromley, Bradshaw and Given 2010). The results of this study contradict (Gale et al. 2011), who did not find an association between objective neighbourhood deprivation and PMH. The reasons for this could be that their study was based on an exceedingly small regional sample of respondents with a narrow range of neighbourhood deprivation scores and low statistical power.

Nonetheless, like earlier research, the social neighbourhood indicators (e.g., a clear sense of belonging to the neighbourhood) were quite strongly associated with higher PMH (Elliott et al. 2014; Gale et al. 2011; Jones et al. 2014; Toma et al. 2015). One could have expected that, in many ways, the PMH approach seems to be more suitable to the study of perceived/social factors than the GHQ, but the results show that objective neighbourhood characteristics are very strongly linked with PMH, especially on the optimism and “feeling useful” domains, as illustrated by the larger effect sizes and more significant associations. The present study did not have any data on social support (which might be an essential control variable), but on the other hand, it would be hard to distinguish between social support and the neighbourhood social environment (Gale et al. 2011).

Given that objective neighbourhood deprivation matters even when one controls for a residents’ feelings of neighbourhood belonging, one can infer that the two are distinct dimensions (Elliott et al. 2014). There could also be interaction effects between objective neighbourhood deprivation, social or perceived neighbourhood characteristics, and PMH: Haney (2007) studied the effects of neighbourhoods on self-esteem and found that objective neighbourhood deprivation and perceived ones were jointly significant: It is possible that the residents of deprived neighbourhood internalise the stigma and negativity that is caused by the deprivation of their neighbourhood, which in turn affects their perceptions of their neighbourhood.

Individual-level covariates are strongly related to PMH. However, it is likely that both objective neighbourhood deprivation (e.g., air pollution) and social neighbourhood characteristics (e.g., fear of crime) affect some people more than they do others. Given the increasing population ageing, there has been much focus on the mental health and normal ageing processes of old people (Elliott et al. 2014). Old people spend more time in their neighbourhood and immediate local environment than younger people (Michael, Green, and Farquhar 2006). Moreover, older adults are particularly vulnerable to neighbourhood stressors: For instance, older adults may be less mobile than middle-aged adults and, therefore, particularly dependent on having access to nearby services like GPs or shops. Old people derive a comparatively substantial extent of their social support or even their identity from their neighbourhood, and old people are particularly sensitive towards neighbourhood cohesion (Elliott et al. 2014). Overall, there is a U-shaped relation of NMH with age (Blanchflower and Oswald 2008), but PMH appears to increase more starkly in older age.

3.5.1 Limitations and further research

The linear multilevel (2-level) and longitudinal linear random and fixed effects design of this study are a step closer towards detecting the actual patterns and effects of neighbourhoods (rather than just compositional associations at one point in time), but they do not fully remove all alternative explanations. It is possible that people's latent disease incidence risk and health trajectories affect a person's likelihood of moving into different neighbourhoods (Jokela 2014). It is further possible that despite the longitudinal approach of this paper, the association of neighbourhoods with mental health might still be due to selective residential mobility.

Another potential limitation is that the length of residence in a neighbourhood might moderate the effect on PMH. One could expect more prolonged exposure to deprived or even unhealthy environments (e.g., to air pollution) to have a cumulative effect over time. Nonetheless, two studies on PMH that controlled for length of residence did not find such an effect (Jones et al. 2014; Toma et al. 2015). Similarly, it could be the case that there is a minimum length of residence before one can detect effects on PMH, but excluding people who moved just in the preceding wave before measurement of the SWEMWBS (i.e., waves 3, 6, and 9) did not change the presented results significantly.

For future research, it would be desirable to test the specific dimensions of objective deprivation that could influence PMH and to look at other objective neighbourhood measures (Toma et al. 2015). Ideally, one could carry out a social policy experiment and randomly provide improvement schemes in which the physical characteristics of certain neighbourhoods are a test of whether neighbourhood effects on mental health are causal. Alternatively, one may hope to find a suitable instrumental variable with which one could exploit existing occurrences of policy variations. Recent evidence points out that neighbourhood effects are particularly crucial for young children, which then cumulatively add up over the life course (Gustafsson et al. 2014), but so far, most studies only considered adults. Even though the LSOA are a unique dataset, it would also be desirable to have even more fine-grained data of small social groups of around 100 people.

It might be possible to use propensity score matching techniques to draw comparisons between people who chose to move neighbourhoods with similar or comparable people (e.g., in terms of age, income, education, marital status, and neighbourhood residency history) who chose not to move neighbourhoods. A difference-in-difference design across two waves or fixed effects modelling based on the propensity scores might tell an

even better causal story. Furthermore, it might be possible to model intentions to move neighbourhoods based on other available indicators in UKHLS, but it is not clear whether including them would yield substantively better results.

While the previous limitations have mostly addressed the micro-level, it might in the future be possible to consider external and macro-level data on changes in the neighbourhood. In a straightforward manner, new IMDs will be released in the future, and some neighbourhood might have improved or deteriorated – mostly independently of the respondents' actions. Google Street View data or other modern data sources could also be considered (Bader et al. 2017).

3.6 Conclusion

This empirical chapter has paid detailed attention to the associations of objective neighbourhood deprivation (IMD) and neighbourhood cohesion with PMH, with the domains of PMH, and has done so while jointly accounting for NMH and also while analysing neighbourhood transitions over time with a very large and representative sample design.

Highly significant associations of the IMD and neighbourhood cohesion on PMH are found which were not explained away when jointly accounting for NMH as part of the dual continua model. Regarding the domains of positive mental health, not all dimensions are equally associated with objective neighbourhood deprivation as measured through the IMD.

In terms of longitudinal neighbourhood transition and changes in positive mental health, which were assessed through descriptive statistics and random effects models, it is found that living in less deprived neighbourhoods (as ranked on the IMD) is associated with better PMH; again, this result is robust even when controlling for NMH. Apart

from the health deprivation domain, the fixed effects did not reach statistical significance. Even though a full causal assessment could not be provided, the results are still a major advancement in terms of the representative cross-sectional and longitudinal understanding of neighbourhood factors for PMH as distinct from NMH.

In summary, the results of this chapter suggest that positive mental health is a highly relevant and also distinct empirical measure and conceptual tool for understanding neighbourhood process from a sociological perspective when compared to a NMH scale. The GHQ, as a measure of depression, might not be able to capture all the effects of objective neighbourhood deprivation and longitudinal changes that can only be identified by a broader and multidimensional positive mental health construct.

3.7 References

- Aalto, A. M., Elovainio, M., Kivimäki, M., Uutela, A., & Pirkola, S. (2012). The Beck Depression Inventory and General Health Questionnaire as measures of depression in the general population: a validation study using the Composite International Diagnostic Interview as the gold standard. *Psychiatry research*, 197(1-2), 163-171.
- Airaksinen, Jaakko, Christian Hakulinen, Laura Pulkki-Råback, Terho Lehtimäki, Olli T Raitakari, Liisa Keltikangas-Järvinen, and Markus Jokela. 2015. "Neighbourhood effects in health behaviours: a test of social causation with repeat-measurement longitudinal data." *The European Journal of Public Health* 26(3):417-21.
- Baker, Emma, Rebecca Bentley, Laurence Lester, and Andrew Beer. 2016. "Housing affordability and residential mobility as drivers of locational inequality." *Applied geography* 72:65-75.
- Baum, Fran E, Anna M Ziersch, Guangyu Zhang, and Katy Osborne. 2009. "Do perceived neighbourhood cohesion and safety contribute to neighbourhood differences in health?" *Health & place* 15(4):925-34.
- Botteldooren, Dick, Luc Dekoninck, and Dominique Gillis. 2011. "The influence of traffic noise on appreciation of the living quality of a neighborhood." *International journal of environmental research and public health* 8(3):777-98.
- Buckner, John C. 1988. "The development of an instrument to measure neighborhood cohesion." *American journal of community psychology* 16(6):771-91.

- Curry, Aaron, Carl Latkin, and Melissa Davey-Rothwell. 2008. "Pathways to depression: The impact of neighborhood violent crime on inner-city residents in Baltimore, Maryland, USA." *Social Science & Medicine* 67(1):23-30.
- de Graaf, R., van Dorsselaer, S., Tuithof, M., & ten Have, M. (2013). Sociodemographic and psychiatric predictors of attrition in a prospective psychiatric epidemiological study among the general population. Result of the Netherlands Mental Health Survey and Incidence Study-2. *Comprehensive psychiatry*, 54(8), 1131-1139.
- Diener, Ed, Derrick Wirtz, William Tov, Chu Kim-Prieto, Dong-won Choi, Shigehiro Oishi, and Robert Biswas-Diener. 2010. "New well-being measures: Short scales to assess flourishing and positive and negative feelings." *Social Indicators Research* 97(2):143-56.
- Eid, Michael, and Randy J. Larsen. 2008. *The Science of Subjective Well-Being*: Guilford Press.
- Elliott, Jane, Catharine R Gale, Samantha Parsons, Diana Kuh, and HALCYON Study Team. 2014. "Neighbourhood cohesion and mental wellbeing among older adults: A mixed methods approach." *Social Science & Medicine* 107:44-51.
- Fone, David, Frank Dunstan, Keith Lloyd, Gareth Williams, John Watkins, and Stephen Palmer. 2007. "Does social cohesion modify the association between area income deprivation and mental health? A multilevel analysis." *International journal of epidemiology* 36(2):338-45.

- Fumagalli, L., Knies, G., & Buck, N. (2017). Understanding Society, The UK Household Longitudinal Study, Harmonised British Household Panel Survey (BHPS) User Guide.
- Gale, Catharine R, Elaine M Dennison, Cyrus Cooper, and Avan Aihie Sayer. 2011. "Neighbourhood environment and positive mental health in older people: the Hertfordshire Cohort Study." *Health & Place* 17(4):867-74.
- Goldstein, H., Browne, W., & Rasbash, J. (2002). Multilevel modelling of medical data. *Statistics in medicine*, 21(21), 3291-3315.
- Graaf, R. D., Bijl, R. V., Smit, F., Ravelli, A., & Vollebergh, W. A. (2000). Psychiatric and sociodemographic predictors of attrition in a longitudinal study The Netherlands Mental Health Survey and Incidence Study (NEMESIS). *American Journal of Epidemiology*, 152(11), 1039-1047
- Guite, HF, Charlotte Clark, and Gill Ackrill. 2006. "The impact of the physical and urban environment on mental well-being." *Public Health* 120(12):1117-26.
- Johnson, David Thomas, Bruce Headey, and Ben Jensen. 2006. "Communities, social capital and public policy: literature review." *FaHCSIA Research Paper* (26).
- Jokela, M. 2014. "Are neighborhood health associations causal? A 10-year prospective cohort study with repeated measurements." *Am J Epidemiol* 180(8):776-84.
- . 2015. "Does neighbourhood deprivation cause poor health? Within-individual analysis of movers in a prospective cohort study." *J Epidemiol Community Health* 69(9):899-904.

- Jones, R, D Heim, S Hunter, and A Ellaway. 2014. "The relative influence of neighbourhood incivilities, cognitive social capital, club membership and individual characteristics on positive mental health." *Health & Place*.
- Kahneman, Daniel, Edward Diener, and Norbert Schwarz. 1999. *Well-being: Foundations of hedonic psychology*: Russell Sage Foundation.
- Kawachi, Ichiro, and Lisa F Berkman. 2001. "Social ties and mental health." *Journal of Urban health* 78(3):458-67.
- Kearns, Ade, Elise Whitley, Lyndal Bond, Matt Egan, and Carol Tannahill. 2013. "The psychosocial pathway to mental well-being at the local level: investigating the effects of perceived relative position in a deprived area context." *J Epidemiol Community Health* 67(1):87-94.
- Keyes, Corey L. M. 2002. "The Mental Health Continuum: From Languishing to Flourishing in Life." *Journal of Health and Social Behavior* 43(2):207.
- Keyes, Corey LM. 2005. "Mental illness and/or mental health? Investigating axioms of the complete state model of health." *Journal of consulting and clinical psychology* 73(3):539.
- . 2007. "Promoting and protecting mental health as flourishing: A complementary strategy for improving national mental health." *American Psychologist* 62(2):95.
- Knies, G., & Menon, S. (2014). Understanding Society: Waves 1-3, 2009-2012: Special licence access, geographical accessibility: The UKHLS-accessibility data file user guide.

- Lynn, P., Nandi, A., Parutis, V., & Platt, L. (2018). Design and implementation of a high-quality probability sample of immigrants and ethnic minorities: Lessons learnt. *Demographic Research*, 38, 513-548.
- Maura, J., & Weisman de Mamani, A. (2017). Mental health disparities, treatment engagement, and attrition among racial/ethnic minorities with severe mental illness: A review. *Journal of clinical psychology in medical settings*, 24(3), 187-210.
- Lee Duckworth, Angela, Tracy A Steen, and Martin EP Seligman. 2005. "Positive psychology in clinical practice." *Annu. Rev. Clin. Psychol.* 1:629-51.
- Leventhal, Tama, and Jeanne Brooks-Gunn. 2003. "Moving to Opportunity: an Experimental Study of Neighborhood Effects on Mental Health." *American Journal of Public Health* 93(9):1576-82.
- Maheswaran, Hendramoorthy, Scott Weich, John Powell, and Sarah Stewart-Brown. 2012. "Evaluating the responsiveness of the Warwick Edinburgh Mental Well-Being Scale (WEMWBS): Group and individual level analysis." *Health and Quality of Life Outcomes* 10(1):156.
- Manley, David, Maarten Van Ham, Nick Bailey, Ludi Simpson, and Duncan Maclennan. 2013. "Neighbourhood effects or neighbourhood based problems? A policy context." Pp. 1-23 in *Neighbourhood Effects or Neighbourhood Based Problems*: Springer.
- Meijer, Mathias, Jeannette Röhl, Kim Bloomfield, and Ulrike Grittner. 2012. "Do neighborhoods affect individual mortality? A systematic review and meta-analysis of multilevel studies." *Social Science & Medicine* 74(8):1204-12.

- Noble, Michael, Gemma Wright, George Smith, and Chris Dibben. 2006. "Measuring multiple deprivation at the small-area level." *Environment and planning A* 38(1):169-85.
- O'campo, Patricia, Christina Salmon, and Jessica Burke. 2009. "Neighbourhoods and mental well-being: What are the pathways." *Health & place* 15(1):56-68.
- Oakes, JM, KE Andrade, IM Biyoow, and LT Cowan. 2015. "Twenty Years of Neighborhood Effect Research: An Assessment." *Curr Epidemiol Rep* 2(1):80-87.
- Perchoux, Camille, Basile Chaix, Steven Cummins, and Yan Kestens. 2013. "Conceptualization and measurement of environmental exposure in epidemiology: accounting for activity space related to daily mobility." *Health & Place* 21:86-93.
- Pickett, Kate E, and Michelle Pearl. 2001. "Multilevel analyses of neighbourhood socioeconomic context and health outcomes: a critical review." *Journal of Epidemiology & Community Health* 55(2):111-22.
- Platt, L., Knies, G., Luthra, R., Nandi, A., & Benzeval, M. (2020). Understanding society at 10 years. *European Sociological Review*, 36(6), 976-988.
- Propper, Carol, Kelvyn Jones, Anne Bolster, Simon Burgess, Ron Johnston, and Rebecca Sarker. 2005. "Local neighbourhood and mental health: evidence from the UK." *Social Science & Medicine* 61(10):2065-83.
- Romppel, M, E Braehler, M Roth, and H Glaesmer. 2013. "What is the General Health Questionnaire-12 assessing? Dimensionality and psychometric properties of the

General Health Questionnaire-12 in a large scale German population sample."

Compr Psychiatry 54(4):406-13.

Seligman, Martin EP. 2008. "Positive health." *Applied Psychology* 57:3-18.

Shields, Michael A, Stephen Wheatley Price, and Mark Wooden. 2009. "Life satisfaction and the economic and social characteristics of neighbourhoods." *Journal of Population Economics* 22(2):421-43.

Stewart-Brown, S, A Tennant, R Tennant, S Platt, J Parkinson, and S Weich. 2009. "Internal construct validity of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS): a Rasch analysis using data from the Scottish Health Education Population Survey." *Health Qual Life Outcomes* 7:15.

Tennant, R, L Hiller, R Fishwick, S Platt, S Joseph, S Weich, J Parkinson, J Secker, and S Stewart-Brown. 2007. "The Warwick-Edinburgh Mental Well-being Scale (WEMWBS): development and UK validation." *Health Qual Life Outcomes* 5:63.

Toma, Anna, Mark Hamer, and Aparna Shankar. 2015. "Associations between neighborhood perceptions and mental well-being among older adults." *Health & Place* 34:46-53.

University of Essex, Institute for Social and Economic Research, NatCen Social Research, and Kantar Public. 2018. "Understanding Society: Waves 1-7, 2009-2016 and Harmonised BHPS: Waves 1-18, 1991-2009. [data collection]. 10th Edition.": UK Data Service. SN: 6614.

van den Berg, Magdalena, Wanda Wendel-Vos, Mireille van Poppel, Han Kemper, Willem van Mechelen, and Jolanda Maas. 2015. "Health benefits of green

spaces in the living environment: A systematic review of epidemiological studies." *Urban Forestry & Urban Greening* 14(4):806-16.

Wen, Ming, Louise C Hawkey, and John T Cacioppo. 2006. "Objective and perceived neighborhood environment, individual SES and psychosocial factors, and self-rated health: An analysis of older adults in Cook County, Illinois." *Social Science & Medicine* 63(10):2575-90.

Winzer, R, F Lindblad, K Sorjonen, and L Lindberg. 2014. "Positive versus negative mental health in emerging adulthood: a national cross-sectional survey." *BMC Public Health* 14:1238.

Yen, IH, YL Michael, and L Perdue. 2009. "Neighborhood environment in studies of health of older adults: a systematic review." *Am J Prev Med* 37(5):455-63.

Young, R., & Johnson, D. R. (2015). Handling missing values in longitudinal panel data with multiple imputation. *Journal of Marriage and Family*, 77(1), 277-294.

4 POSITIVE MENTAL HEALTH AND RELIGIOSITY IN THE UNITED KINGDOM

It is a stylised empirical fact that religious people are happier than non-believers. Previous studies have linked single aspects of the positive mental health (PMH) framework with religiosity and found associations between gratitude, meaning in life and social well-being. However, this is one of the first studies to use a state-of-the-art indicator, the Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS), to analyse the general effect of religiosity on PMH on high-quality nationally representative household data in the United Kingdom (Understanding Society) while simultaneously controlling for the effect of religiosity on negative mental health (NMH). Using survey-weighted OLS and simultaneous quantile regressions, the study finds that religiosity, in terms of religious attendance and religious importance, has a consistently positive effect on PMH in the general population of the UK. Crucially, religiosity (especially religious importance) seems to be more strongly associated with PMH than with the other mental health variables. The longitudinal fixed effects analyses show that changes in religious importance correspond to changes in PMH, thereby pinpointing at a potentially causal relationship. Overall, this study finds that religiosity is strongly associated with PMH and that some domains of PMH are particularly suited for sociological research on religiosity.

4.1 Introduction

It is a stylised fact that religious⁴⁴ people tend to be happier than non-believers (Abdel-Khalek 2006; G. Koenig and Larson 2001; Koenig 2009; Koenig 2013; Lewis and Cruise 2006; Myers, Eid and Larsen 2008; Stark and Maier 2008). Religiosity is considered to be one of the primary factors influencing happiness and subjective well-being (Frey and Stutzer 2018a): As religiosity and PMH share inherently related concepts such as hope and optimism, it is hypothesised that they are very strongly related. As such, this paper extends this line of research and as one of the first studies ever, reports the association of religiosity with a state-of-the-art PMH indicator. The Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS) combines hedonic, eudaimonic and social well-being into an integrated PMH scale (Tennant et al. 2007c). The effect of religiosity on the SWEMWBS is modelled through cross-sectional survey-weighted OLS regressions, seemingly-unrelated and simultaneous quantile regressions, as well as longitudinal panel data regression techniques (fixed effects analyses).

Robust findings are reported that religiosity is indeed positively associated with PMH and that this relationship is stronger than the one of the competing mental health variables. Notably, it is the highest level of religiosity that has a very positive effect on mental well-being. Religiosity has a more substantial and more robust effect on mental well-being when measured in terms of the importance rather than the attendance of religious services. The effects of religiosity on well-being persist even when controlling for negative mental health, which is in support of the dual continua model of mental health.

⁴⁴ Religiosity and religiousness are used synonymously in this study.

4.2 Literature and theory

This paper follows the eminent definitions of religion as “beliefs, practices, and rituals related to the sacred” and of the sacred as “that which related to the numinous or God” (Koenig 2009).

Over 3,000 empirical papers and 100 systematic reviews exist that find a positive relationship between religion and health. Two hundred twenty-four of those include psychological well-being indicators and, out of these, 70% have identified a positive association with religiosity (Koenig et al. 2012). For people who frequently attend religious services, compared to those who rarely attend religious events, mortality hazard rates were up to one fifth lower (Chida, Steptoe and Powell 2009). Similarly, experiments have been carried out to introduce religious elements into psychotherapy and the outcomes these interventions have been relatively positive (Davis et al. 2016; Wade et al. 2014). Even in the history of the development of clinical psychology, mental illnesses such as hysteria and religiosity were originally closely aligned, and treatment was often only offered by monasteries (Koenig 09). Likewise, moral discourses remained prominent in the psychological and public understanding of mental health illnesses (Didi-Huberman and Hartz 2003).

Even though the complete scope of PMH has only rarely been analysed as an outcome of religiosity, many of the constituent theories of the positive have been studied before. It is widely acknowledged that religion and “meaning of life” are closely related (Emmons 2005; Ivtzan et al. 2013; Krause and Hayward 2012; Moreira-Almeida and Koenig 2006; Park 2005a; Park 2005b; Park, Edmondson and Hale-Smith 2013; Steger and Frazier 2005). This is to say that religion may give believers a sense of purpose and direction in their life.

Another aspect in which religion may have a positive influence on well-being is through its focus on forgiveness and gratitude (Carlisle and Tsang 2013; Dwiwardani et al. 2014; Emmons and Crumpler 2000; Emmons and Paloutzian 2003; McCullough, Pargament and Thoresen 2001; Neto 2007; Toussaint and Friedman 2009; Tsang, Schulwitz and Carlisle 2012). Religious people may find ways of being more grateful for their life circumstances, and a concomitant reduction in dissatisfaction could be linked with lower levels of well-being. Another related pathway that has been reported is the one of self-knowledge (Masters and Spielmans 2007). Finally, religious transcendence has also been stated to relate to well-being (Jones 1991; Pyysiäinen 2001).

Other “spill-over” effects of religiosity on well-being have been found with regards to social activities, volunteering and community life (Ebstyne King 2003; Ebstyne King and Furrow 2008; Evans et al. 1996; Ferriss 2002; Koenig 2004; Lam 2002; Lim and Putnam 2010; Wilcox 2002). Indeed, one of the founders of sociology, Emil Durkheim, already noted social connections to be one of the key beneficial outcomes of religion (Durkheim 1976).

Some large studies also suggest a direct physical link of religiosity on physical health and health behaviours (Chatters 2000; Ellison and Levin 1998; Kim 2007; Powell, Shahabi and Thoresen 2003; Underwood and Powell 2006).

Moreover, these characteristics of religion have a strong similarity with the core concepts of positive psychology. The importance of meaning in life is directly reflected in the notions of intrinsic motivation, especially the famous “broaden-and-build” theory (Fredrickson 1998; Fredrickson 2001; Fredrickson 2004; Fredrickson 2013). Optimism is another major concept of positive psychology (Diener and Seligman 2004; Gillham et al. 2001), and is indeed one of the indicators of the WEMWBS in this study. The

religious benefit of self-knowledge corresponds to the psychological one of self-growth and self-actualisation (Bohart and Greening 2001; Fitts 1971). Likewise, forgiveness and moral values resemble the psychological notion of fostering persons' character strengths (Park and Peterson 2009; Peterson and Seligman 2004; Schueller et al. 2015). Finally, it is not implausible that intense prayer and meditation show overlapping mechanisms, both of which are frequently found to bring health benefits (Chu 2010; Grossman et al. 2004; Monk-Turner 2003; Oman, Hedberg and Thoresen 2006).

Analytically, researchers usually separate external and internal religiosity. While internal religiosity refers to the psychological and spiritual relationship with God in terms of acceptance, faith, belief, hopes and acceptance, external religiosity relates to actual behaviour and activities such as going to church or social events (Frey and Stutzer 2018a). An abundance of measures of religiosity is in existence, and this complicates the systematic comparison of religiousness on PMH (Hood Jr, Hill and Spilka 2018).

Psychological characteristics are likely to be important control variables when studying religiosity and mental health. Concerning the Big5, conscientiousness and agreeableness were consistently positively associated with religiosity in a meta-study (Lodi-Smith and Roberts 2007; Saroglou, Delpierre and Dernelle 2004), while the associations with neuroticism were not as consistent but suggestive of a negative effect.

Of course, it is important to consider the possibility of reverse causation, namely that changes in PMH results in changes in mental well-being. For instance, episodes of NMH and depression have been associated with religious struggles or periods of strong doubt (McConnell et al. 2006). Likewise, it is plausible that people who are very dissatisfied with their lives or people who are looking for a new direction might be more

likely to become more religious. While both trends are likely to be present at the same time, this paper will focus on religiosity predicting PMH.

Drawing on the literature, the following three main research questions and various relating sub-questions are derived:

1. Is religiosity associated with PMH in the overall UK population?

The UK is a highly secularised country, and although the literature suggests that there is an association, it might be relatively weak.

- a. If so, is religious attendance (as an active and social process) or the more eudaimonic measure of religious importance more strongly associated with PMH?
- b. Does religiosity mainly boost high levels of PMH, or does it buffer further drops at low levels of PMH?
- c. Is the association of religiosity with PMH unique, or is it nearly identical to the one of NMH as measured through the GHQ?
- d. How does religiosity interact with socio-economic and socio-demographic factors that shape PMH?

2. Which domains of SWEMWBS are most strongly associated with religiosity?

As PMH is a tripartite construct and as it is inherently multidimensional, it is likely that some domains of the SWEMWBS are more strongly associated with religiosity than others. Because of the theoretical overlap between religious aspects such as prayer and faith, one might expect to find a more significant relationship with the eudaimonic indicators than the psychological functioning ones.

3. Do the association of religiosity with PMH hold up longitudinally?

As cross-sectional associations do not give causal evidence, it is important to

test whether changes in religiosity within people over time are associated with changing levels of PMH. Does an increase in religiosity lead to an increase in PMH?

Methodology

4.2.1 Data

Data from the United Kingdom Household Longitudinal Survey (Understanding Society) waves one to ten are employed in this paper (University of Essex et al. 2018). Understanding Society is a uniquely rich data set that offers detailed information on both mental health variables and religiosity, as well as an extensive range of control variables.

4.2.2 Sampling and missing data

Survey weights are used for the cross-sectional analyses of religiosity with PMH as they account for the differential sampling propensities and the likelihood of completing the self-completion questionnaire. Respondents living in Northern Ireland are included in the analyses to maximize representative even though the special historical situation in Northern Ireland in terms of religion likely mattered in the results; included are also members of the ethnic minority boost.

For the longitudinal analysis, a dynamic person-period file of respondents was compiled in which no exclusion criteria were applied. Respondents could join the panel at waves later than wave 1.

The mental health variables in wave one are collected in a self-completion survey component. Possibly because of this, there is a non-negligible amount of missing data

on most of the mental health variables (five to 18 per cent). The patterns of missingness do not vary much between the sub-indicators, and there were only a few missing values on the main demographic variables. Logistic regression of missing data on a broad range of variables (exceeding the variables used in the analysis) was carried out, suggesting that listwise deletion can be applied.

4.2.3 Variables

Two categorical indicators are employed to measure religiousness. The first one is a measure of the importance of religion (“religion makes a difference to my life”), coded from “a great difference”, “some difference”, “a little difference” to “or no difference?” The second one is a measure of attendance of religious services, coded from “once a week or more”, “less often but at least once a month”, “less often but at least once a year”, “never or practically never” to “only at weddings, funerals etc.” For this scale, the two categories of least frequent attendance were collapsed so that both scales consist of four categories. The values were reverse coded on both indicators so that a higher value (one to four) responds to increasing levels of religiosity (the distributions of which are presented in Table 49).

PMH is measured via the SWEMWBS which combines eudaimonic, hedonic and social well-being into an overall multidimensional well-being score. The SWEMWBS consists of seven sub-indicators, each of which is coded from one to five (“none of the time”, “rarely”, “some of the time”, “often” and “all of the time”). Uniquely, all the sub-indicators are positively worded, and this might minimise the problem of ceiling effects and allow us to capture the highest levels of well-being of respondents as it pertains to religiosity. In total, the SWEMWBS is scored from seven to 35, with higher values representing higher levels of PMH.

The other mental health variables that we employ for comparison purposes are the General Health Questionnaire (GHQ) in caseness scoring (from zero to 12). The GHQ was designed as a measure of psychological distress and includes concepts such as depression and anxiety. A binary indicator for the presence of negative mental health has been created for scores >2 , as this is a validated cut-off score.

In terms of control variables, we include gender (0: male, 1: female), age (continuous), educational status via six categories (0: “highest educational qualification”: 1: “no qualifications”, 2: “other qualifications”, 3: “GCSE or equivalent”, 4: “A Level or equivalent”, 5: “other higher qualification”, 6: “degree”), marital status (1: “in partnership”, 2: “single”, 3: “separated”, 4: “widowed”), an indicator for whether any children live in the household, and job status (1 “employed”, 2: “unemployed”, 3: “retired”, 4: “home/maternity”, 5: “student”, 6: “long-term sick”, 7: “other”), and long-standing health condition (0: “none”, 1: “having a long-standing health condition”).

4.2.4 Modelling strategy

Several modelling phases are used to test whether PMH is associated with religiosity. Separate OLS regression models are compiled for religious attendance (e.g., models 1a to 1c) and religious importance (e.g., models 2a to 2c).

OLS regression of cross-sectional associations of religiosity with PMH in wave 1

For the baseline models (Models 1a to 1c for religious attendance and models 2a to 2c for religious importance), three survey-weighted⁴⁵ OLS models of the standardised SWEMWBS on religiosity and the control variables are each calculated, with

⁴⁵ Survey weights in the cross-sectional analyses are operationalised via the Stata command: `svyset a_psu [pweight = a_indscus_xw], strata(a_strata)`

interaction effects between religiosity and gender added in models b and religiosity and NMH added in models c.

Models 3a to 3g and Models 4a to 4g now apply unweighted simultaneous OLS regressions of the seven subdomains of the SWEMWBS on religious attendance and religious importance, respectively, while controlling for the main covariates (age, gender, education, marital status, job status, number of children in the household, and health). Simultaneous equations are used so that one can statistically conduct the multiple regressions at the same time and have the standard errors adjusted for the multiple testing, thereby facilitating the comparison of associations across SWEMWBS domains.

As articulated previously, one notion of PMH is that the positive and top aspects of the scale should be theoretically relevant and empirically distinct, i.e., the flourishing aspect, from moderate or low levels, which might already be captured by NMH or other mental health scales. Accordingly, Models 5a to 5e (religious attendance) and Models 6a to 6e (religious importance) compute simultaneous-quantile regressions⁴⁶ of the SWEMWBS at the 20th, 30th, 50th, 70th, and 90th quantiles (given the distribution of the SWEMWBS, there were not enough cases at the 10th quantile). This allows for comparisons of the associations of religiosity at the lower and at higher levels of PMH.

Models 7a and 7b provide a comparison of the effects of religiosity on the GHQ, the measure of negative mental health.

⁴⁶ This model can mathematically be represented as: $Q_Y(\tau|x) = \beta_0(\tau) + x'\beta(\tau)$

Longitudinal linear fixed effects regressions of changes in religiosity on changes in PMH

Finally, in the longitudinal set-up, within-person linear fixed effects regressions are used (Models 8a to c for religious attendance and Models 9a to c for religious importance). This makes it possible to investigate to what extent the effect of religiosity on well-being stems from intra-individual changes in religiosity (i.e., a respondent becoming more or less religious than in previous years and associated changes in PMH) and allows for a comparison with the cross-sectional between-person results presented before.

Descriptive statistics of the SWEMWBS and religiosity indicators are available in Table 49 and Table 50, and the distribution of the subdomains of the SWEMWBS with the two religiosity measures is visualised in Figure 17 and Figure 18.

4.3 Results

Table 49 Descriptive statistics of categorical variables including religiosity in terms of attendance and religiosity in terms of importance (UKHLS wave 1)

	Mean/Prop.	Freq.	Min.	Max.	SD	n
<u>Religiosity (attendance)</u>						47674
never/special occ.	.61	29068				
infrequent	.15	7270				
> once a month	.08	3726				
> once a week	.16	7610				
<u>Religiosity (importance)</u>						47583
no difference	.39	18740				
little difference	.18	8377				
some difference	.21	9887				
great difference	.22	10579				
Gender: Female	.54					50992
Age	45.64		15.0	101.0	18.2	50994
<u>Highest qualification</u>						50902
No qual	.18	9069				
Other qual	.10	5225				
GCSE etc	.21	10526				
A level etc	.19	9591				
Other higher	.11	5537				
Degree	.22	10954				
<u>Marital status</u>						50961
Single	.24	11993				
In partnership	.62	31641				
Separated	.08	4320				
Widowed	.06	3007				
Children in household	.30					50994
<u>Economic activitiy</u>						50982
Employed	.53	27103				
Unemployed	.07	3379				
Retired	.20	10171				
Home/maternity	.08	4059				
Student	.08	3824				
Long-term sick	.04	1990				
other	.01	456				
White British	.75					49111
Health: Long-standing illness	.65					50866
Negative mental health	.24					39700

Table 50 Descriptive statistics of continuous variables including the SWEMWBS and its domains (UKHLS wave 1)

	Mean/Prop.	Min.	Max.	SD	n
SWEMWBS	25.2	7.0	35.0	4.5	38395
Domains of the SWEMWBS					
feel optimistic	3.3	1.0	5.0	1.0	39349
feel useful	3.5	1.0	5.0	.9	39240
feel relaxed	3.3	1.0	5.0	.9	39249
deal with problems well	3.6	1.0	5.0	.8	39300
think clearly	3.7	1.0	5.0	.8	39227
feel close to others	3.7	1.0	5.0	.9	39267
able to make up own mind	4.0	1.0	5.0	.8	39483
GHQ (rev. + standardized)	.0	-4.7	2.1	1.0	39700

Reflecting the extent of secularisation in the United Kingdom, the majority of respondents, namely 61%, never or only on special occasions attend religious services, 15% of respondents infrequently attend religious services, 8% attend religious services more frequently than once per month, and 16% attend at least once a week (Table 49). This distribution suggests that whereas most respondents have a very low level of religious affiliation in terms of attendance, there is a small section of the population who are very committed to their religious faith.

A similar picture can be drawn for religious importance, but the relative religious percentages are slightly higher. 39% of respondents say that religion makes no difference in their life, 39% of respondents say that it makes little difference in their life, 21% say that it makes some difference in their life, and 22% say that it makes a great difference in their life. It might be the case that respondents still have some sense of spirituality or religious importance, even if they do not have the time or the commitment to attend religious services. This is often termed as “spiritual, but not religious” in the religion literature (Fuller, 2001).

92% of survey respondents are Christians, 4% are Muslims, and another 4% are classified as belonging to another religion. Within the group of Christians, there are, of course, denominational differences and congregation-type differences, for instance, between Roman Catholics and the Church of England; these differences are not explicitly analysed in this paper.

As seen in Figure 17 and Figure 18, there is a gradient in the association of religious attendance and importance with the domains of PMH. Whereas there is a flat association between religious attendance and being able to make up one’s own mind, there is a relatively strong pattern with regard to “feeling optimistic” and “feeling useful”.

Sociological Applications of Positive Mental Health

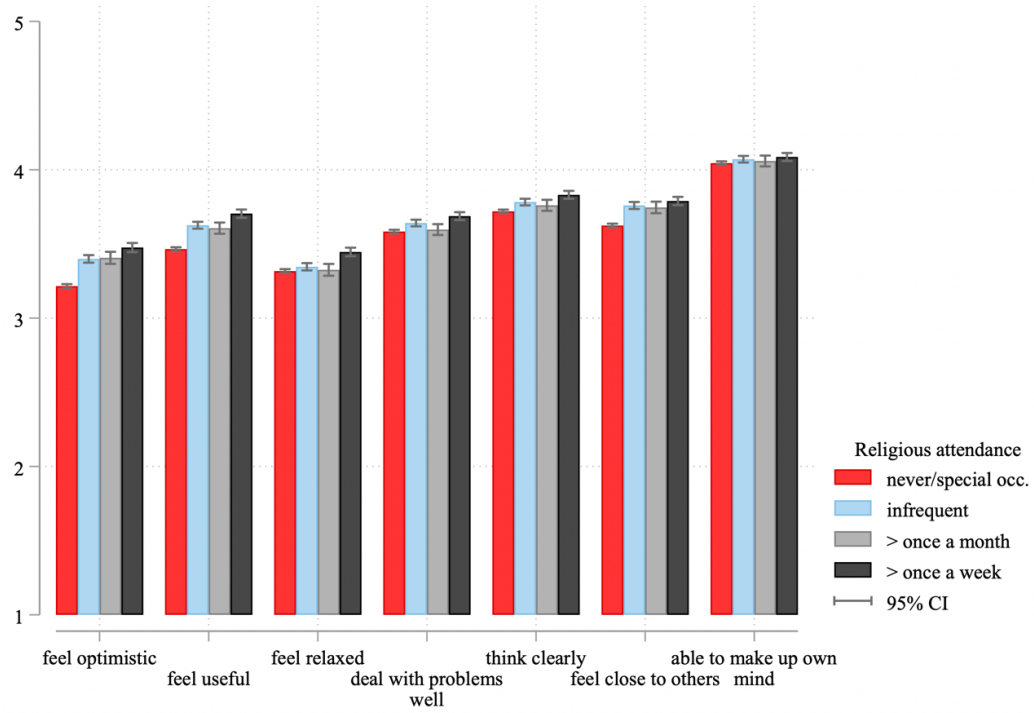


Figure 17 Graphs of SWEMWBS domain by religious attendance (UKHLS wave 1).

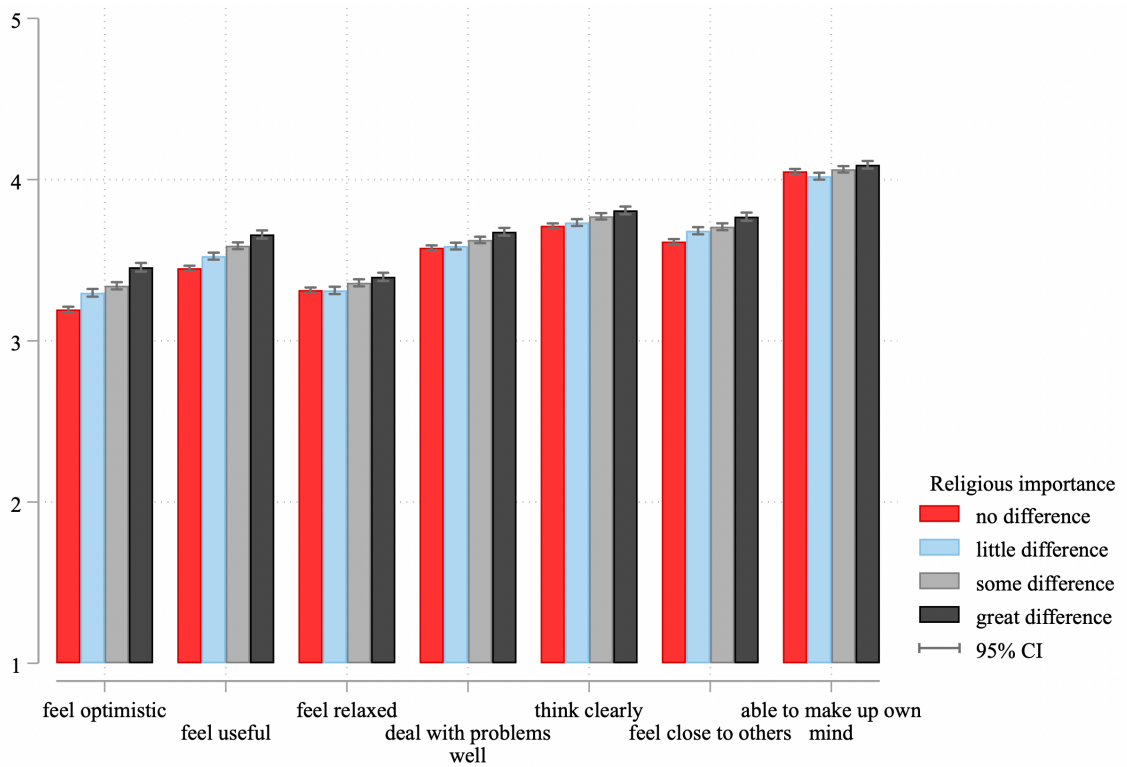


Figure 18 Graphs of SWEMWBS domains by religious importance (UKHLS wave 1).

Results of Models 1a to 1c (Table 51) and Models 2a to 2c (Table 52) demonstrate that religious attendance and religious importance, respectively, are strongly associated with PMH and that it is especially the most frequent attenders of religious services that show the most pronounced positive associations with PMH (b 0.14 for attending once per week or more often, 95% confidence intervals 0.11 – 0.18, $p < 0.001$).⁴⁷

Model 1b finds an interaction effect between religious attendance and gender, namely that the “effect” of religious attendance is larger for women than for men when women are attending at the highest frequency compared to almost never attending (b 0.09, 95% confidence interval 0.03 – 0.15, $p < .01$).

Crucially, as a test of the dual continua model of mental health, which related to the independence of positive and negative mental health, Model 1c adds the binary GHQ indicator as a control for NMH: This reduced the association of religious attendance from 0.14 standard deviation to 0.09 standard deviations (95% confidence interval 0.04–0.14, $p < 0.001$), but the associations remained highly significant. As one might have expected, the associations of NMH with PMH is strong at -0.97 (95% confidence interval -1.00 – -.95, $p < 0.001$) standard deviations.

⁴⁷ b represents the standardised regression coefficient

Table 51 Models 1a to 1c: Survey-weighted OLS regression of the SWEMWBS on religious attendance (UKHLS wave 1)

	M1a SWEMWBS	M1b SWEMWBS	M1c SWEMWBS
<u>Religiosity (attendance) (ref. Never)</u>			
Religiosity (attendance) = 2, infrequent	0.08*** (0.05 - 0.11)	0.04 (-0.01 - 0.08)	0.03 (-0.01 - 0.07)
Religiosity (attendance) = 3, > once a month	0.07** (0.02 - 0.11)	0.03 (-0.04 - 0.10)	0.07* (0.00 - 0.14)
Religiosity (attendance) = 4, > once a week	0.14*** (0.11 - 0.18)	0.10*** (0.05 - 0.15)	0.09*** (0.04 - 0.14)
Gender: Female (binary)	-0.02* (-0.04 - -0.00)	-0.05*** (-0.07 - -0.02)	0.00 (-0.02 - 0.03)
Age	0.00*** (0.00 - 0.00)	0.00*** (0.00 - 0.00)	0.00** (0.00 - 0.00)
<u>Education (ref. No qualifications)</u>			
Highest qualification = 2, Other qual	0.11*** (0.06 - 0.16)	0.11*** (0.06 - 0.16)	0.10*** (0.06 - 0.14)
Highest qualification = 3, GCSE etc	0.07** (0.03 - 0.11)	0.07** (0.03 - 0.11)	0.05** (0.02 - 0.09)
Highest qualification = 4, A level etc	0.15*** (0.11 - 0.19)	0.15*** (0.11 - 0.19)	0.15*** (0.11 - 0.19)
Highest qualification = 5, Other higher	0.19*** (0.14 - 0.23)	0.19*** (0.14 - 0.23)	0.18*** (0.14 - 0.23)
Highest qualification = 6, Degree	0.28*** (0.24 - 0.32)	0.28*** (0.24 - 0.32)	0.27*** (0.24 - 0.31)
<u>Marital status (ref. single)</u>			
Marital status = 2, In partnership	0.16*** (0.13 - 0.20)	0.16*** (0.13 - 0.20)	0.14*** (0.11 - 0.17)
Marital status = 3, Separated	-0.02 (-0.07 - 0.02)	-0.02 (-0.07 - 0.02)	0.02 (-0.02 - 0.07)
Marital status = 4, Widowed	0.02 (-0.04 - 0.09)	0.02 (-0.04 - 0.08)	0.06* (0.00 - 0.12)
Children in hhold = 1, 1 or more	-0.14*** (-0.17 - -0.11)	-0.14*** (-0.17 - -0.11)	-0.12*** (-0.15 - -0.10)
<u>Job status (ref. Employed)</u>			
Job status= 2, Unemployed	-0.29*** (-0.35 - -0.24)	-0.30*** (-0.35 - -0.24)	-0.16*** (-0.20 - -0.11)
Job status = 3, Retired	0.14*** (0.10 - 0.18)	0.14*** (0.10 - 0.18)	0.13*** (0.09 - 0.17)
Job status= 4, Home/maternity	-0.09*** (-0.13 - -0.04)	-0.09*** (-0.13 - -0.04)	-0.04* (-0.08 - -0.00)
Job status = 5, Student	0.11*** (0.06 - 0.17)	0.11*** (0.06 - 0.17)	0.14*** (0.09 - 0.19)
Job status = 6, Long-term sick	-0.75*** (-0.82 - -0.67)	-0.74*** (-0.82 - -0.67)	-0.43*** (-0.49 - -0.37)
Job status = 7, other	-0.20** (-0.32 - -0.07)	-0.19** (-0.32 - -0.07)	-0.09 (-0.19 - 0.02)
White British (ref. Other)	0.03 (-0.01 - 0.06)	0.02 (-0.01 - 0.06)	-0.02 (-0.06 - 0.01)
Health: No long-standing illness (ref. Illness)	0.30*** (0.28 - 0.33)	0.30*** (0.28 - 0.33)	0.17*** (0.15 - 0.20)
Negative mental health			-0.97*** (-1.00 - -0.95)
Rel. attendance (1) X Male		0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Rel. attendance (1) X Female		0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Rel. attendance (2) X Male		0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Rel. attendance (2) X Female		0.07* (0.02 - 0.13)	0.08** (0.03 - 0.13)
Rel. attendance (3) X Male		0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Rel. attendance (3) X Female		0.07 (-0.01 - 0.15)	0.02 (-0.06 - 0.10)
Rel. attendance (4) X Male		0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Rel. attendance (4) X Female		0.09** (0.03 - 0.15)	0.05 (-0.01 - 0.11)
Constant	-0.56*** (-0.63 - -0.48)	-0.54*** (-0.62 - -0.47)	-0.18*** (-0.25 - -0.11)
Population	48,714	48,714	48,161
Observations	38,286	38,286	37,728
R-squared	0.09	0.09	0.25

OLS regression coefficients of the standardized SWEMWBS with 95% percent confidence intervals in parentheses.

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Data: UKHLS wave 1. Survey-weighted results

Table 52 Survey-weighted OLS regression of the SWEMWBS on religious importance (UKHLS wave 1)

	M2a SWEMWBS	M2b SWEMWBS	M2c SWEMWBS
<u>Religiosity (importance) (ref. No difference)</u>			
Religiosity (importance) = 2, little difference	-0.00 (-0.03 - 0.02)	-0.00 (-0.04 - 0.04)	0.02 (-0.02 - 0.06)
Religiosity (importance) = 3, some difference	0.03* (0.00 - 0.06)	0.02 (-0.02 - 0.06)	0.05** (0.01 - 0.09)
Religiosity (importance) = 4, great difference	0.12*** (0.09 - 0.16)	0.10*** (0.05 - 0.15)	0.15*** (0.10 - 0.19)
Gender: Female (binary)	-0.02* (-0.04 - -0.00)	-0.03 (-0.06 - 0.00)	0.02 (-0.01 - 0.05)
Age	0.00*** (0.00 - 0.00)	0.00*** (0.00 - 0.00)	0.00** (0.00 - 0.00)
<u>Education (ref. No qualifications)</u>			
Highest qualification = 2, Other qual	0.11*** (0.06 - 0.16)	0.11*** (0.06 - 0.16)	0.10*** (0.06 - 0.14)
Highest qualification = 3, GCSE etc	0.07*** (0.03 - 0.11)	0.07*** (0.03 - 0.11)	0.05** (0.02 - 0.09)
Highest qualification = 4, A level etc	0.15*** (0.11 - 0.20)	0.15*** (0.11 - 0.20)	0.15*** (0.11 - 0.19)
Highest qualification = 5, Other higher	0.20*** (0.15 - 0.24)	0.19*** (0.15 - 0.24)	0.18*** (0.14 - 0.23)
Highest qualification = 6, Degree	0.29*** (0.24 - 0.33)	0.29*** (0.24 - 0.33)	0.28*** (0.24 - 0.31)
<u>Marital status (ref. single)</u>			
Marital status = 2, In partnership	0.16*** (0.13 - 0.20)	0.16*** (0.13 - 0.20)	0.14*** (0.11 - 0.17)
Marital status = 3, Separated	-0.03 (-0.07 - 0.02)	-0.03 (-0.07 - 0.02)	0.02 (-0.02 - 0.07)
Marital status = 4, Widowed	0.02 (-0.04 - 0.09)	0.02 (-0.04 - 0.08)	0.06* (0.00 - 0.12)
Children in hhold = 1, 1 or more	-0.14*** (-0.16 - -0.11)	-0.14*** (-0.16 - -0.11)	-0.12*** (-0.14 - -0.09)
<u>Job status (ref. Employed)</u>			
Job status= 2, Unemployed	-0.30*** (-0.35 - -0.24)	-0.30*** (-0.35 - -0.24)	-0.16*** (-0.20 - -0.11)
Job status = 3, Retired	0.14*** (0.10 - 0.18)	0.14*** (0.10 - 0.18)	0.13*** (0.09 - 0.16)
Job status= 4, Home/maternity	-0.09*** (-0.13 - -0.04)	-0.09*** (-0.13 - -0.04)	-0.05* (-0.09 - 0.00)
Job status = 5, Student	0.12*** (0.06 - 0.17)	0.12*** (0.07 - 0.17)	0.14*** (0.09 - 0.19)
Job status = 6, Long-term sick	-0.75*** (-0.82 - -0.68)	-0.75*** (-0.82 - -0.68)	-0.43*** (-0.50 - -0.37)
Job status = 7, other	-0.20** (-0.32 - -0.08)	-0.20** (-0.32 - -0.08)	-0.09 (-0.20 - 0.02)
White British (ref. Other)	0.03 (-0.01 - 0.06)	0.02 (-0.01 - 0.06)	-0.01 (-0.04 - 0.03)
Health: No long-standing illness (ref. Illness)	0.31*** (0.28 - 0.33)	0.31*** (0.28 - 0.33)	0.18*** (0.16 - 0.20)
Negative menal health			-0.98*** (-1.00 - -0.95)
Rel. importance (1) X Male		0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Rel. importance (1) X Female		0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Rel. importance (2) X Male		0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Rel. importance (2) X Female		-0.01 (-0.07 - 0.05)	-0.00 (-0.06 - 0.05)
Rel. importance (3) X Male		0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Rel. importance (3) X Female		0.02 (-0.03 - 0.07)	0.01 (-0.04 - 0.06)
Rel. importance (4) X Male		0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Rel. importance (4) X Female		0.04 (-0.02 - 0.10)	0.01 (-0.04 - 0.07)
Constant	-0.56*** (-0.63 - -0.48)	-0.56*** (-0.63 - -0.48)	-0.20*** (-0.27 - -0.13)
Population	48,714	48,714	48,161
Observations	38,286	38,286	37,728
R-squared	0.11	0.11	0.27

OLS regression coefficients of the standardized SWEMWBS with 95% percent confidence intervals in parentheses.

*** p<0.001, ** p<0.01, * p<0.05, + p<0.01

Data: UKHLS wave 1. Survey-weighted results.

Results of Models 2a to 2c for religious importance essentially mirror the previous results. One could note that the association is slightly larger at 0.15 (95% confidence interval 0.10 – 0.19, $p < 0.001$) standard deviations in model 2c than in 1c and that the significance level of the third ordinal response of “some difference” is now more significant (b 0.05, 95% confidence interval 0.01 – 0.09, $p < 0.01$). Strikingly, however, the associations for religious importance became larger when controlling for NMH, possibly pointing to a suppressing effect of NMH on the path of religiosity to positive mental health. As religion is often a means of coping with stress in life (Cowden, 2022), religiosity might buffer worsening NMH, but boost PMH. The interaction effect between religious importance and gender does not reach statistical significance.

Evaluating the individual subdomain of the SWEMWBS in Models 3a to 3g (Table 53) – based on simultaneous regressions – the top category of religious importance has very large associations with “feeling optimistic” and “feeling useful” at 0.20 standard deviations (95% confidence interval 0.016-0.23, $p < 0.001$) and 0.18 (95% confidence interval 0.16-0.22; $p < 0.001$) respectively. Interestingly, there is no association between religious attendance on “able to make up one’s own mind”, and only partial ones for the level of attendance in terms of “feeling relaxed”, “dealing with problems well”, and “thinking clearly” (for the latter, only the top response of attendance has a significant association when compared with those who never attend).

The results of Models 4a to 4g (Table 54) of the subdomains of the SWEMWBS and religious importance follow the ones from Models 3a to 4g. Interestingly, there are weak negative associations between “being able to make up own mind” and “feeling relaxed” with religious importance, and the lower category of religious importance of at least making “a little difference” already reached statistical significance.

Table 53 Models 3a to 3g: Survey-weighted OLS regressions of SWEMWBS domains on religiosity (attendance) (UKHLS wave 1).

	M3a	M3b	M3c	M3d	M3e	M3f	M3g
	feel optimistic	feel useful	feel relaxed	deal with problems well	think clearly	feel close to others	able to make up own mind
<u>Religiosity (attendance) (ref. Never)</u>							
Religiosity (attendance) = 2, infrequent	0.11*** (0.08 - 0.14)	0.09*** (0.07 - 0.12)	0.02 (-0.01 - 0.04)	0.01 (-0.01 - 0.04)	0.01 (-0.01 - 0.04)	0.08*** (0.06 - 0.11)	0.00 (-0.03 - 0.03)
Religiosity (attendance) = 3, > once a month	0.12*** (0.08 - 0.16)	0.09*** (0.06 - 0.13)	0.01 (-0.03 - 0.05)	-0.01 (-0.05 - 0.02)	0.00 (-0.03 - 0.04)	0.10*** (0.06 - 0.14)	-0.02 (-0.06 - 0.02)
Religiosity (attendance) = 4, > once a week	0.19*** (0.15 - 0.22)	0.19*** (0.15 - 0.22)	0.08*** (0.05 - 0.11)	0.05** (0.02 - 0.08)	0.04** (0.01 - 0.07)	0.13*** (0.10 - 0.16)	-0.00 (-0.03 - 0.03)
Gender: Female (binary)	0.06*** (0.04 - 0.08)	0.02* (0.00 - 0.04)	-0.13*** (-0.15 - -0.11)	-0.07*** (-0.08 - -0.05)	-0.07*** (-0.08 - -0.05)	0.15*** (0.13 - 0.17)	-0.05*** (-0.07 - -0.03)
Age	-0.00*** (-0.01 - -0.00)	0.00 (-0.00 - 0.00)	0.00*** (0.00 - 0.01)	0.00*** (0.00 - 0.01)	0.01*** (0.01 - 0.01)	-0.00*** (-0.00 - -0.00)	0.00*** (0.00 - 0.00)
<u>Education (ref. No qualifications)</u>							
Highest qualification = 2, Other qual	0.09*** (0.05 - 0.13)	0.09*** (0.05 - 0.13)	0.06** (0.01 - 0.10)	0.08*** (0.04 - 0.12)	0.09*** (0.05 - 0.13)	0.04 (-0.00 - 0.08)	0.08*** (0.04 - 0.12)
Highest qualification = 3, GCSE etc	0.09*** (0.05 - 0.13)	0.07*** (0.03 - 0.10)	0.04* (0.01 - 0.08)	0.03 (-0.01 - 0.06)	0.05* (0.01 - 0.08)	0.00 (-0.03 - 0.04)	0.06** (0.02 - 0.09)
Highest qualification = 4, A level etc	0.21*** (0.17 - 0.25)	0.14*** (0.11 - 0.18)	0.05* (0.01 - 0.09)	0.09*** (0.05 - 0.13)	0.08*** (0.05 - 0.12)	0.06** (0.02 - 0.09)	0.08*** (0.04 - 0.12)
Highest qualification = 5, Other higher	0.26*** (0.22 - 0.31)	0.20*** (0.16 - 0.23)	0.08*** (0.04 - 0.12)	0.09*** (0.06 - 0.13)	0.10*** (0.06 - 0.14)	0.06** (0.02 - 0.10)	0.08*** (0.04 - 0.12)
Highest qualification = 6, Degree	0.40*** (0.36 - 0.44)	0.27*** (0.24 - 0.31)	0.07*** (0.03 - 0.11)	0.14*** (0.10 - 0.17)	0.18*** (0.14 - 0.21)	0.11*** (0.08 - 0.15)	0.12*** (0.08 - 0.16)
<u>Marital status (ref. single)</u>							
Marital status = 2, In partnership	0.12*** (0.08 - 0.15)	0.17*** (0.14 - 0.20)	0.01 (-0.02 - 0.04)	0.09*** (0.06 - 0.12)	0.08*** (0.05 - 0.11)	0.24*** (0.21 - 0.27)	0.04** (0.01 - 0.07)
Marital status = 3, Separated	0.01 (-0.03 - 0.06)	0.05* (0.01 - 0.09)	-0.10*** (-0.14 - -0.06)	0.00 (-0.04 - 0.04)	-0.05* (-0.09 - -0.01)	-0.01 (-0.06 - 0.03)	0.01 (-0.04 - 0.05)
Marital status = 4, Widowed	0.05 (-0.01 - 0.11)	-0.07* (-0.13 - -0.02)	-0.02 (-0.08 - 0.03)	0.03 (-0.03 - 0.08)	-0.06* (-0.11 - -0.00)	0.18*** (0.13 - 0.24)	0.01 (-0.04 - 0.07)
Children in hhold = 1, 1 or more	-0.10*** (-0.13 - -0.07)	-0.07*** (-0.09 - -0.04)	-0.17*** (-0.20 - -0.15)	-0.08*** (-0.11 - -0.06)	-0.07*** (-0.09 - -0.05)	-0.10*** (-0.13 - -0.08)	-0.04*** (-0.07 - -0.02)
<u>Job status (ref. Employed)</u>							
Job status= 2, Unemployed	-0.20*** (-0.25 - -0.15)	-0.33*** (-0.37 - -0.28)	-0.08*** (-0.13 - -0.04)	-0.25*** (-0.29 - -0.20)	-0.19*** (-0.24 - -0.14)	-0.17*** (-0.21 - -0.12)	-0.12*** (-0.17 - -0.08)
Job status = 3, Retired	0.09*** (0.05 - 0.13)	-0.07*** (-0.11 - -0.04)	0.21*** (0.17 - 0.24)	0.07*** (0.04 - 0.11)	0.08*** (0.05 - 0.12)	0.12*** (0.09 - 0.16)	0.10*** (0.06 - 0.13)
Job status= 4, Home/maternity	-0.06** (-0.11 - -0.02)	-0.11*** (-0.14 - -0.07)	-0.00 (-0.04 - 0.04)	-0.04 (-0.07 - 0.00)	-0.06** (-0.10 - -0.02)	-0.08*** (-0.12 - -0.04)	-0.07** (-0.11 - -0.03)
Job status = 5, Student	0.16*** (0.11 - 0.21)	-0.05* (-0.09 - -0.00)	0.09*** (0.05 - 0.14)	0.02 (-0.03 - 0.06)	0.06** (0.01 - 0.11)	0.18*** (0.13 - 0.23)	0.07** (0.02 - 0.11)
Job status = 6, Long-term sick	-0.40*** (-0.46 - -0.33)	-0.68*** (-0.74 - -0.62)	-0.43*** (-0.50 - -0.37)	-0.56*** (-0.62 - -0.50)	-0.53*** (-0.59 - -0.46)	-0.34*** (-0.41 - -0.28)	-0.45*** (-0.51 - -0.38)
Job status = 7, other	-0.06 (-0.18 - 0.05)	-0.16** (-0.26 - -0.05)	-0.17** (-0.29 - -0.06)	-0.14* (-0.25 - -0.02)	-0.12* (-0.22 - -0.02)	-0.15** (-0.27 - -0.04)	-0.16** (-0.27 - -0.05)
White British (ref. Other)	0.00 (-0.03 - 0.03)	-0.01 (-0.04 - 0.02)	0.00 (-0.03 - 0.04)	0.00 (-0.02 - 0.03)	-0.04* (-0.07 - -0.00)	0.11*** (0.08 - 0.14)	0.06*** (0.03 - 0.09)
Health: No long-standing illness (ref. Illness)	0.20*** (0.18 - 0.23)	0.21*** (0.19 - 0.23)	0.27*** (0.25 - 0.29)	0.22*** (0.20 - 0.24)	0.20*** (0.18 - 0.22)	0.14*** (0.12 - 0.16)	0.13*** (0.11 - 0.15)
Constant	3.06*** (2.99 - 3.14)	3.14*** (3.07 - 3.20)	2.97*** (2.90 - 3.04)	3.19*** (3.12 - 3.25)	3.25*** (3.18 - 3.31)	3.28*** (3.22 - 3.35)	3.70*** (3.64 - 3.76)
Population	49,654	49,550	49,559	49,609	49,536	49,578	49,788
Observations	39349	39240	39249	39300	39227	39267	39483
R-squared	0.08	0.10	0.09	0.08	0.09	0.06	0.04

OLS regression coefficients of the SWEMWBS domains (1-5 scales) with 95% percent confidence intervals in parentheses.

*** p<0.001, ** p<0.01, * p<0.05, + p<0.01

Data: UKHLS wave 1. Survey weighted statistics.

Table 54 Models 4a to 4g: Survey-weighted OLS regressions of SWEMWBS domains on religiosity (importance) (UKHLS wave 1)

	M4a	M4b	M4c	M4d	M4e	M4f	M4g
	feel optimistic	feel useful	feel relaxed	deal with problems well	think clearly	feel close to others	able to make up own mind
<u>Religiosity (importance) (ref. No difference)</u>							
Religiosity (importance) = 2, little difference	0.06*** (0.04 - 0.09)	0.03* (0.00 - 0.05)	-0.05*** (-0.07 - -0.02)	-0.03* (-0.05 - -0.00)	-0.02 (-0.04 - 0.00)	0.04** (0.01 - 0.06)	-0.05*** (-0.08 - -0.03)
Religiosity (importance) = 3, some difference	0.11*** (0.08 - 0.13)	0.08*** (0.06 - 0.11)	-0.02 (-0.04 - 0.01)	-0.01 (-0.04 - 0.01)	-0.02 (-0.05 - 0.00)	0.05*** (0.03 - 0.08)	-0.04** (-0.07 - -0.01)
Religiosity (importance) = 4, great difference	0.20*** (0.17 - 0.23)	0.17*** (0.14 - 0.20)	0.03 (-0.00 - 0.06)	0.04** (0.01 - 0.07)	0.02 (-0.00 - 0.05)	0.13*** (0.10 - 0.16)	-0.01 (-0.03 - 0.02)
Gender: Female (binary)	0.06*** (0.04 - 0.08)	0.02 (-0.00 - 0.04)	-0.13*** (-0.15 - -0.11)	-0.07*** (-0.08 - -0.05)	-0.07*** (-0.08 - -0.05)	0.15*** (0.13 - 0.17)	-0.05*** (-0.07 - -0.03)
Age	-0.00*** (-0.01 - -0.00)	0.00 (-0.00 - 0.00)	0.00*** (0.00 - 0.01)	0.00*** (0.00 - 0.01)	0.01*** (0.01 - 0.01)	-0.00*** (-0.00 - -0.00)	0.00*** (0.00 - 0.00)
<u>Education (ref. No qualifications)</u>							
Highest qualification = 2, Other qual	0.09*** (0.05 - 0.13)	0.09*** (0.05 - 0.13)	0.06** (0.02 - 0.10)	0.09*** (0.04 - 0.13)	0.09*** (0.05 - 0.13)	0.04 (-0.00 - 0.08)	0.08*** (0.04 - 0.12)
Highest qualification = 3, GCSE etc	0.09*** (0.05 - 0.13)	0.07*** (0.03 - 0.10)	0.05* (0.01 - 0.08)	0.03 (-0.01 - 0.07)	0.05** (0.01 - 0.08)	0.01 (-0.03 - 0.04)	0.06** (0.02 - 0.10)
Highest qualification = 4, A level etc	0.20*** (0.16 - 0.24)	0.14*** (0.11 - 0.18)	0.05** (0.01 - 0.09)	0.09*** (0.05 - 0.13)	0.09*** (0.05 - 0.12)	0.06** (0.02 - 0.09)	0.08*** (0.05 - 0.12)
Highest qualification = 5, Other higher	0.26*** (0.22 - 0.31)	0.20*** (0.16 - 0.24)	0.09*** (0.05 - 0.13)	0.10*** (0.06 - 0.13)	0.10*** (0.06 - 0.14)	0.06** (0.02 - 0.10)	0.09*** (0.05 - 0.13)
Highest qualification = 6, Degree	0.40*** (0.36 - 0.44)	0.28*** (0.24 - 0.31)	0.08*** (0.04 - 0.12)	0.14*** (0.10 - 0.18)	0.18*** (0.15 - 0.22)	0.12*** (0.08 - 0.15)	0.12*** (0.09 - 0.16)
<u>Marital status (ref. Single)</u>							
Marital status = 2, In partnership	0.12*** (0.08 - 0.15)	0.17*** (0.14 - 0.20)	0.01 (-0.02 - 0.04)	0.09*** (0.07 - 0.12)	0.08*** (0.05 - 0.11)	0.24*** (0.21 - 0.27)	0.04** (0.01 - 0.07)
Marital status = 3, Separated	0.01 (-0.03 - 0.06)	0.04* (0.00 - 0.09)	-0.10*** (-0.15 - -0.06)	-0.00 (-0.04 - 0.04)	-0.05* (-0.09 - -0.01)	-0.02 (-0.06 - 0.03)	0.00 (-0.04 - 0.05)
Marital status = 4, Widowed	0.05 (-0.01 - 0.11)	-0.07* (-0.13 - -0.01)	-0.02 (-0.08 - 0.03)	0.02 (-0.03 - 0.08)	-0.06* (-0.11 - -0.00)	0.18*** (0.13 - 0.24)	0.01 (-0.05 - 0.07)
Children in hhold = 1, 1 or more	-0.09*** (-0.12 - -0.07)	-0.06*** (-0.08 - -0.03)	-0.17*** (-0.20 - -0.15)	-0.08*** (-0.11 - -0.06)	-0.07*** (-0.09 - -0.05)	-0.09*** (-0.12 - -0.07)	-0.04*** (-0.07 - -0.02)
<u>Job status (ref. Employed)</u>							
Job status = 2, Unemployed	-0.20*** (-0.25 - -0.15)	-0.33*** (-0.37 - -0.28)	-0.09*** (-0.13 - -0.04)	-0.25*** (-0.29 - -0.20)	-0.19*** (-0.24 - -0.14)	-0.17*** (-0.22 - -0.12)	-0.13*** (-0.17 - -0.08)
Job status = 3, Retired	0.09*** (0.05 - 0.13)	-0.07*** (-0.11 - -0.04)	0.21*** (0.17 - 0.25)	0.07*** (0.04 - 0.11)	0.09*** (0.05 - 0.12)	0.12*** (0.09 - 0.16)	0.10*** (0.06 - 0.13)
Job status = 4, Home/maternity	-0.07** (-0.11 - -0.02)	-0.11*** (-0.15 - -0.07)	-0.00 (-0.04 - 0.04)	-0.04* (-0.07 - -0.00)	-0.06** (-0.10 - -0.02)	-0.09*** (-0.13 - -0.05)	-0.07** (-0.10 - -0.03)
Job status = 5, Student	0.17*** (0.11 - 0.22)	-0.04 (-0.09 - 0.00)	0.10*** (0.05 - 0.15)	0.02 (-0.03 - 0.07)	0.06** (0.02 - 0.11)	0.19*** (0.13 - 0.24)	0.07** (0.02 - 0.11)
Job status = 6, Long-term sick	-0.40*** (-0.46 - -0.34)	-0.68*** (-0.74 - -0.62)	-0.44*** (-0.50 - -0.38)	-0.56*** (-0.62 - -0.50)	-0.53*** (-0.59 - -0.46)	-0.35*** (-0.41 - -0.28)	-0.45*** (-0.52 - -0.38)
Job status = 7, other	-0.07 (-0.19 - 0.05)	-0.16** (-0.27 - -0.05)	-0.17** (-0.29 - -0.06)	-0.14* (-0.26 - -0.02)	-0.12* (-0.22 - -0.02)	-0.16** (-0.27 - -0.05)	-0.16** (-0.27 - -0.06)
White British (ref. Other)	0.01 (-0.03 - 0.04)	-0.01 (-0.04 - 0.02)	-0.00 (-0.04 - 0.03)	0.01 (-0.02 - 0.04)	-0.04* (-0.07 - -0.01)	0.11*** (0.08 - 0.14)	0.06*** (0.03 - 0.09)
Health: No long-standing illness (ref. Illness)	0.21*** (0.19 - 0.23)	0.22*** (0.20 - 0.24)	0.27*** (0.25 - 0.30)	0.22*** (0.20 - 0.24)	0.20*** (0.18 - 0.22)	0.15*** (0.12 - 0.17)	0.13*** (0.11 - 0.15)
	3.05*** (2.97 - 3.12)	3.13*** (3.06 - 3.19)	2.98*** (2.91 - 3.05)	3.19*** (3.12 - 3.25)	3.25*** (3.19 - 3.32)	3.27*** (3.21 - 3.34)	3.71*** (3.64 - 3.77)
Population	49,614	49,510	49,518	49,569	49,495	49,538	49,745
Observations	39349	39240	39249	39300	39227	39267	39483
R-squared	0.08	0.09	0.07	0.06	0.07	0.05	0.03

OLS regression coefficients of the SWEMWBS domains (1-5 scales) with 95% percent confidence intervals in parentheses.

*** p<0.001, ** p<0.01, * p<0.05, + p<0.01

Data: UKHLS wave 1. Survey weighted statistics.

Table 55 Models 5a to 5e: Simultaneous-quantile regressions of the SWEMWBS on religiosity (attendance) (UKHLS wave 1)

	M5a q20	M5b q30	M5c q50	M5d q70	M5e q90
<u>Religiosity (attendance) (ref. Never)</u>					
Religiosity (attendance) = 2, infrequent	0.12*** (0.09 - 0.15)	0.09*** (0.06 - 0.12)	0.09*** (0.05 - 0.12)	0.04*** (0.02 - 0.06)	0.03 (-0.01 - 0.08)
Religiosity (attendance) = 3, > once a month	0.08* (0.01 - 0.15)	0.08** (0.02 - 0.14)	0.04 (-0.00 - 0.08)	0.04* (0.00 - 0.08)	0.05 (-0.09 - 0.19)
Religiosity (attendance) = 4, > once a week	0.16*** (0.12 - 0.21)	0.16*** (0.12 - 0.19)	0.15*** (0.11 - 0.18)	0.10*** (0.07 - 0.13)	0.21*** (0.18 - 0.23)
Gender: Female (binary)	-0.04*** (-0.06 - -0.02)	-0.04*** (-0.05 - -0.02)	-0.01 (-0.03 - 0.01)	0.02* (0.00 - 0.04)	-0.01 (-0.04 - 0.02)
Age	0.00*** (0.00 - 0.01)	0.01*** (0.00 - 0.01)	0.00*** (0.00 - 0.00)	0.00*** (0.00 - 0.00)	0.00 (-0.00 - 0.01)
<u>Education (ref. No qualifications)</u>					
Highest qualification = 2, Other qual	0.17*** (0.11 - 0.23)	0.16*** (0.09 - 0.23)	0.10*** (0.06 - 0.14)	0.06** (0.02 - 0.10)	0.04 (-0.12 - 0.20)
Highest qualification = 3, GCSE etc	0.14*** (0.09 - 0.20)	0.13*** (0.08 - 0.18)	0.07*** (0.04 - 0.11)	0.02 (-0.01 - 0.04)	-0.03 (-0.09 - 0.03)
Highest qualification = 4, A level etc	0.23*** (0.17 - 0.28)	0.24*** (0.17 - 0.30)	0.17*** (0.11 - 0.22)	0.11*** (0.07 - 0.14)	-0.01 (-0.05 - 0.04)
Highest qualification = 5, Other higher	0.30*** (0.25 - 0.35)	0.29*** (0.23 - 0.35)	0.22*** (0.18 - 0.25)	0.10*** (0.06 - 0.14)	-0.00 (-0.06 - 0.06)
Highest qualification = 6, Degree	0.45*** (0.39 - 0.50)	0.45*** (0.38 - 0.52)	0.32*** (0.27 - 0.36)	0.15*** (0.10 - 0.19)	0.02 (-0.03 - 0.07)
<u>Marital status (ref. single)</u>					
Marital status = 2, In partnership	0.19*** (0.15 - 0.23)	0.19*** (0.16 - 0.21)	0.16*** (0.14 - 0.19)	0.09*** (0.07 - 0.11)	0.10 (-0.08 - 0.28)
Marital status = 3, Separated	-0.03 (-0.07 - 0.02)	-0.07 (-0.14 - 0.00)	-0.03 (-0.10 - 0.04)	-0.01 (-0.07 - 0.04)	-0.06 (-0.28 - 0.16)
Marital status = 4, Widowed	-0.01 (-0.09 - 0.07)	-0.01 (-0.08 - 0.06)	0.06* (0.01 - 0.12)	0.04 (-0.03 - 0.10)	0.09 (-0.13 - 0.30)
Children in hhold = 1, 1 or more	-0.16*** (-0.19 - -0.13)	-0.15*** (-0.17 - -0.13)	-0.13*** (-0.16 - -0.10)	-0.07*** (-0.09 - -0.05)	-0.14* (-0.26 - -0.02)
<u>Job status (ref. Employed)</u>					
Job status= 2, Unemployed	-0.38*** (-0.45 - -0.31)	-0.34*** (-0.41 - -0.28)	-0.33*** (-0.38 - -0.28)	-0.22*** (-0.28 - -0.15)	-0.15 (-0.30 - 0.00)
Job status = 3, Retired	0.11*** (0.06 - 0.16)	0.10*** (0.06 - 0.14)	0.13*** (0.08 - 0.17)	0.13*** (0.10 - 0.16)	0.21*** (0.14 - 0.27)
Job status= 4, Home/maternity	-0.10** (-0.16 - -0.04)	-0.10** (-0.17 - -0.04)	-0.09** (-0.14 - -0.03)	-0.06* (-0.11 - -0.01)	0.01 (-0.05 - 0.07)
Job status = 5, Student	0.10** (0.04 - 0.16)	0.18*** (0.12 - 0.24)	0.15*** (0.10 - 0.21)	0.11*** (0.07 - 0.15)	0.06 (-0.05 - 0.17)
Job status = 6, Long-term sick	-0.87*** (-0.96 - -0.79)	-0.79*** (-0.88 - -0.71)	-0.74*** (-0.80 - -0.68)	-0.71*** (-0.81 - -0.62)	-0.43*** (-0.49 - -0.37)
Job status = 7, other	-0.23*** (-0.36 - -0.10)	-0.25*** (-0.38 - -0.12)	-0.20* (-0.36 - -0.05)	-0.08 (-0.19 - 0.03)	-0.01 (-0.24 - 0.22)
White British (ref. Other)	0.12*** (0.07 - 0.17)	0.10*** (0.04 - 0.16)	0.03 (-0.01 - 0.06)	-0.02 (-0.04 - 0.00)	-0.17** (-0.28 - -0.07)
Health: No long-standing illness (ref. Illness)	0.35*** (0.33 - 0.37)	0.36*** (0.32 - 0.39)	0.31*** (0.29 - 0.34)	0.21*** (0.19 - 0.24)	0.26*** (0.20 - 0.31)
Constant	-1.58*** (-1.66 - -1.50)	-1.29*** (-1.34 - -1.24)	-0.55*** (-0.62 - -0.49)	0.11*** (0.05 - 0.17)	0.91*** (0.68 - 1.13)
Observations	38,286	38,286	38,286	38,286	38,286

Simultaneous quantile regression coefficients of the standardized SWEMWBS with 95% percent confidence intervals in parentheses.

*** p<0.001, ** p<0.01, * p<0.05, + p<0.01

Data: UKHLS wave 1. Unweighted regressions.

Table 56 Models 6a to 6e: Simultaneous quantile regressions of the SWEMWBS on religiosity (importance) (UKHLS wave 1).

	M6a q20	M6b q30	M6c q50	M6d q70	M6e q90
<u>Religiosity (importance) (ref. No difference)</u>					
Religiosity (importance) = 2, little difference	0.01 (-0.05 - 0.07)	0.00 (-0.04 - 0.05)	-0.03 (-0.07 - 0.01)	-0.01 (-0.05 - 0.02)	-0.03 (-0.09 - 0.03)
Religiosity (importance) = 3, some difference	0.03 (-0.01 - 0.07)	0.05*** (0.02 - 0.07)	0.03 (-0.00 - 0.05)	0.02 (-0.01 - 0.05)	0.02 (-0.01 - 0.04)
Religiosity (importance) = 4, great difference	0.11*** (0.05 - 0.18)	0.13*** (0.08 - 0.17)	0.13*** (0.09 - 0.17)	0.12*** (0.08 - 0.15)	0.23*** (0.17 - 0.30)
Gender: Female (binary)	-0.04*** (-0.06 - -0.02)	-0.04** (-0.06 - -0.01)	-0.00 (-0.03 - 0.02)	0.02 (-0.01 - 0.04)	-0.01 (-0.05 - 0.03)
Age	0.00*** (0.00 - 0.01)	0.00*** (0.00 - 0.01)	0.00*** (0.00 - 0.00)	0.00** (0.00 - 0.00)	0.00** (0.00 - 0.01)
<u>Education (ref. No qualifications)</u>					
Highest qualification = 2, Other qual	0.17*** (0.08 - 0.25)	0.16*** (0.10 - 0.22)	0.08** (0.03 - 0.14)	0.05 (-0.00 - 0.11)	0.07* (0.00 - 0.13)
Highest qualification = 3, GCSE etc	0.14*** (0.09 - 0.18)	0.13*** (0.08 - 0.18)	0.06* (0.00 - 0.11)	0.02 (-0.03 - 0.08)	-0.04 (-0.10 - 0.03)
Highest qualification = 4, A level etc	0.23*** (0.18 - 0.28)	0.24*** (0.18 - 0.30)	0.16*** (0.11 - 0.21)	0.12*** (0.07 - 0.16)	-0.01 (-0.08 - 0.05)
Highest qualification = 5, Other higher	0.30*** (0.25 - 0.36)	0.30*** (0.25 - 0.34)	0.20*** (0.14 - 0.26)	0.12*** (0.07 - 0.16)	0.00 (-0.05 - 0.05)
Highest qualification = 6, Degree	0.46*** (0.40 - 0.51)	0.45*** (0.40 - 0.50)	0.31*** (0.25 - 0.36)	0.16*** (0.10 - 0.22)	0.03 (-0.04 - 0.10)
<u>Marital status (ref. single)</u>					
Marital status = 2, In partnership	0.19*** (0.15 - 0.23)	0.19*** (0.15 - 0.22)	0.17*** (0.14 - 0.20)	0.10*** (0.06 - 0.14)	0.08** (0.03 - 0.13)
Marital status = 3, Separated	-0.03 (-0.08 - 0.02)	-0.06** (-0.11 - -0.02)	-0.03 (-0.07 - 0.01)	-0.01 (-0.04 - 0.02)	-0.07 (-0.17 - 0.03)
Marital status = 4, Widowed	0.02 (-0.06 - 0.09)	-0.01 (-0.11 - 0.09)	0.06 (-0.00 - 0.12)	0.04 (-0.02 - 0.09)	0.07 (-0.03 - 0.18)
Children in hhold = 1, 1 or more	-0.15*** (-0.20 - -0.10)	-0.14*** (-0.17 - -0.11)	-0.13*** (-0.17 - -0.09)	-0.06* (-0.10 - -0.01)	-0.13*** (-0.18 - -0.07)
<u>Job status (ref. Employed)</u>					
Job status= 2, Unemployed	-0.39*** (-0.46 - -0.32)	-0.35*** (-0.40 - -0.31)	-0.32*** (-0.37 - -0.26)	-0.22*** (-0.25 - -0.18)	-0.14*** (-0.20 - -0.09)
Job status = 3, Retired	0.11** (0.03 - 0.19)	0.11*** (0.05 - 0.18)	0.13*** (0.09 - 0.17)	0.13*** (0.06 - 0.20)	0.20*** (0.12 - 0.29)
Job status= 4, Home/maternity	-0.10*** (-0.15 - -0.05)	-0.11*** (-0.17 - -0.06)	-0.09* (-0.15 - -0.02)	-0.07** (-0.12 - -0.02)	0.00 (-0.05 - 0.05)
Job status = 5, Student	0.10** (0.04 - 0.17)	0.17*** (0.13 - 0.21)	0.16*** (0.11 - 0.21)	0.12*** (0.07 - 0.17)	0.08* (0.00 - 0.16)
Job status = 6, Long-term sick	-0.89*** (-1.04 - -0.75)	-0.80*** (-0.87 - -0.73)	-0.76*** (-0.82 - -0.70)	-0.71*** (-0.78 - -0.63)	-0.42*** (-0.50 - -0.35)
Job status = 7, other	-0.23*** (-0.33 - -0.14)	-0.25*** (-0.34 - -0.16)	-0.21** (-0.35 - -0.07)	-0.09 (-0.19 - 0.01)	-0.02 (-0.24 - 0.19)
White British (ref. Other)	0.11*** (0.09 - 0.14)	0.09*** (0.06 - 0.11)	0.03* (0.01 - 0.06)	-0.00 (-0.02 - 0.02)	-0.13*** (-0.18 - -0.09)
Health: No long-standing illness (ref. Illness)	0.35*** (0.32 - 0.38)	0.36*** (0.32 - 0.39)	0.31*** (0.28 - 0.35)	0.21*** (0.19 - 0.24)	0.27*** (0.24 - 0.30)
Constant	-1.57*** (-1.67 - -1.47)	-1.27*** (-1.37 - -1.16)	-0.54*** (-0.63 - -0.46)	0.09 (-0.01 - 0.19)	0.87*** (0.76 - 0.98)
Observations	38,246	38,246	38,246	38,246	38,246

Simultaneous quantile regression coefficients of the standardized SWEMWBS with 95% percent confidence intervals in parentheses.

*** p<0.001, ** p<0.01, * p<0.05, + p<0.01

Data: UKHLS wave 1. Unweighted regressions.

Table 57 Models 7a to 7b: OLS regressions of the GHQ on both types of religiosity (UKHLS wave 1).

	M7a	M7b
	GHQ	GHQ
<u>Religiosity (attendance) (ref. Never)</u>		
Religiosity (attendance) = 2, infrequent	-0.01 (-0.04 - 0.02)	
Religiosity (attendance) = 3, > once a month	-0.01 (-0.05 - 0.03)	
Religiosity (attendance) = 4, > once a week	0.11*** (0.07 - 0.14)	
<u>Religiosity (importance) (ref. No difference)</u>		
Religiosity (importance) = 2, little difference		-0.06*** (-0.09 - -0.04)
Religiosity (importance) = 3, some difference		-0.06*** (-0.09 - -0.03)
Religiosity (importance) = 4, great difference		-0.01 (-0.04 - 0.02)
Gender: Female (binary)	-0.16*** (-0.18 - -0.14)	-0.15*** (-0.18 - -0.13)
Age	0.00 (-0.00 - 0.00)	0.00 (-0.00 - 0.00)
<u>Education (ref. No qualifications)</u>		
Highest qualification = 2, Other qual	0.04 (-0.00 - 0.09)	0.05* (0.00 - 0.09)
Highest qualification = 3, GCSE etc	0.02 (-0.02 - 0.06)	0.03 (-0.01 - 0.07)
Highest qualification = 4, A level etc	-0.01 (-0.05 - 0.03)	0.00 (-0.04 - 0.04)
Highest qualification = 5, Other higher	0.00 (-0.04 - 0.05)	0.02 (-0.02 - 0.06)
Highest qualification = 6, Degree	0.03 (-0.00 - 0.07)	0.05* (0.01 - 0.09)
<u>Marital status (ref. single)</u>		
Marital status = 2, In partnership	0.04* (0.00 - 0.07)	0.04* (0.00 - 0.07)
Marital status = 3, Separated	-0.14*** (-0.19 - -0.09)	-0.15*** (-0.20 - -0.10)
Marital status = 4, Widowed	-0.06 (-0.12 - 0.01)	-0.06 (-0.12 - 0.01)
Children in hhold = 1, 1 or more	-0.06*** (-0.09 - -0.04)	-0.06*** (-0.09 - -0.04)
<u>Job status (ref. Employed)</u>		
Job status= 2, Unemployed	-0.39*** (-0.45 - -0.34)	-0.39*** (-0.45 - -0.34)
Job status = 3, Retired	0.12*** (0.09 - 0.16)	0.13*** (0.09 - 0.17)
Job status= 4, Home/maternity	-0.14*** (-0.19 - -0.10)	-0.14*** (-0.18 - -0.10)
Job status = 5, Student	0.05 (-0.00 - 0.10)	0.06* (0.01 - 0.11)
Job status = 6, Long-term sick	-1.02*** (-1.10 - -0.93)	-1.01*** (-1.10 - -0.92)
Job status = 7, other	-0.27*** (-0.40 - -0.15)	-0.27*** (-0.40 - -0.14)
White British (ref. Other)	0.06*** (0.03 - 0.09)	0.04* (0.00 - 0.07)
Health: No long-standing illness (ref. Illness)	0.40*** (0.38 - 0.42)	0.40*** (0.38 - 0.42)
Population	50,005	49,959
Observations	38,756	38,710
R-squared	0.12	0.11

OLS regression coefficients of the standardized GHQ (a positive regression coefficients describes worse mental health) with 95% percent confidence intervals in parentheses.

Now moving to the simultaneous quantile regressions (Models 5a to 5e in Table 55), religious attendance appears to have a relatively uniform effect across the quantiles of PMH, apparently with weaker associations in the middle quantiles but strongest associations in the worst and especially the top quantiles of PMH. This might be a result of religious coping or various stressors for which religion is sought as a response in the low quantiles, i.e., buffering, and boosting of PMH in the top quantiles where religiosity could be associated with very high optimism and meaning in life, for instance. Throughout the analyses, it is the top category of most frequent attendance that dominates the associations with PMH and some more mixed findings in the middle categories.

Speaking to religious importance (Models 6a to 6e in Table 56) and the simultaneous-quantile regressions, there is evidence that this dimension of religiosity has a particularly boosting effect on PMH at the top level: Respondents for whom religiosity makes a great difference, compared to those for whom it makes no difference, have 0.23 standard deviation (95% confidence interval 0.17 – 0.30; $p < 0.01$) higher PMH at the 90th quantile but only 0.11 standard deviation higher (95% confidence interval 0.015 – 0.18.30; $p < 0.001$) PMH at the 10th quantile.

Comparing the results of the regressions of SWEMWBS on religiosity with those of the GHQ on religiosity (Models 7a to 7b in Table 57), the results show a somewhat similar pattern. Nonetheless, the size of the associations is markedly smaller at only -0.06 standard deviations (95% confidence interval -0.09 – -0.04; $p < 0.001$) for religious importance (“little difference” compared with “no difference”) than for PMH.

Interestingly, the associations are not strongest at the top response categories of religious importance and turn insignificant ($p > 0.05$), suggesting a notable difference for the importance domain (but not for attendance) and a differential association of

lower mental illness with religious attendance, but more mental illness at top and lowest levels of religious importance.

Longitudinal analysis

One potential criticism of the results that were presented up to this point is that other unmeasured variables might be affecting both levels of religiosity and levels of well-being. To address this concern, results of changes in religiosity on SWEMWBS were modelled from a longitudinal perspective (Table 61 and Table 62). For both measures of religiosity, the within linear fixed effect coefficients are shown.

Table 58 depicts the panel data set on which longitudinal trends in the associations and causal effects of religiosity on mental health are analysed. In wave 1 there were 50,994 sample members, in wave 2 there were 54,569, and in wave 10 there were 34,318. The panel is dynamic, which means that respondents could join and leave it any of the 10 waves. In total 64,900 individuals are analysed as part of 148,052 panel observations.

Table 59 presents the longitudinal statistics of the domains of the SWEMWBS across the 10 survey waves by presenting both averages of within-person transitions and between-person transitions.

Table 58 Longitudinal sample (UKHLS waves 1 to 10).

Wave	Observations	Percentage	Cumulative percentage
1	50994	11.5	11.5
2	54569	12.3	23.8
3	49692	11.2	35.0
4	47071	10.6	45.6
5	44833	10.1	55.6
6	45188	10.2	65.8
7	42168	9.5	75.3
8	39293	8.9	84.2
9	36055	8.1	92.3
10	34318	7.7	100.0
Total	444181	100.0	

Table 59 Longitudinal trends on the domains of the SWEMWB (UKHLS waves 1 to 10)

Variable	obs	mean	sd	xtn	xttbar	xtmaxw	xtminw	xtmaxb	xtminb	xtsdw	xtsdb
scwemwba	148052	3.2	1	67961	2.2	6.2	0.2	5	1	0.6	0.9
scwemwbb	147993	3.5	1	67900	2.2	6.5	0.5	5	1	0.5	0.8
scwemwbc	148048	3.3	1	67935	2.2	6.3	0.3	5	1	0.5	0.8
scwemwbd	148090	3.6	1	67962	2.2	6.6	0.6	5	1	0.5	0.8
scwemwbe	148024	3.7	1	67911	2.2	6.4	0.7	5	1	0.5	0.8
scwemwbf	148036	3.6	1	67934	2.2	6.6	0.6	5	1	0.5	0.8
scwemwbg	148286	4	1	68056	2.2	7	1	5	1	0.5	0.8

obs=person years

mean=grand mean

sd=grand standard deviation

xtn=number of panels (person)

xttbar=average number of years observed in a state

xtmaxw=within-maximum change

xtminw=within-minimum change

xtmaxb=between-maximum change

xtminb=within-minimum change

xtsdw=within-standard deviation

xtsdb=between-standard deviation

Table 60 Longitudinal transition probabilities (UKHLS waves 1 to 10).**Panel data: Tabulation of religiosity**

<u>Religiosity (attendance)</u>	Freq.	Percent	Freq.	Percent	Percent
never/special occ.	80071	62.41	47859	67.89	91.56
infrequent	18899	14.73	14673	20.82	69.28
> once a month	9768	7.61	7969	11.3	68.98
> once a week	19559	15.25	12650	17.95	87.04
Total	128297	100	83151	117.96	84.78

<u>Religiosity (importance)</u>	Freq.	Percent	Freq.	Percent	Percent
no difference	54236	42.36	34619	49.18	85.35
little difference	22553	17.61	18176	25.82	67.2
some difference	24656	19.26	19011	27.01	70.76
great difference	26588	20.77	17790	25.27	85.35
Total	128033	100	89596	127.27	78.57

Panel data: Transition probabilities

<u>Religiosity (attendance)</u>	never/special occ.	infrequent	> once a month	> once a week	Total
never/special occ.	85.6	8.3	5.0	1.1	100.0
infrequent	53.6	35.7	5.4	5.4	100.0
> once a month	20.0	16.0	28.0	36.0	100.0
> once a week	6.9	3.5	12.1	77.6	100.0
Total	60.5	12.9	8.2	18.5	100.0

<u>Religiosity (importance)</u>	no difference	little difference	some difference	great difference	Total
no difference	83.1	12.7	4.2	0.0	100.0
little difference	25.0	50.0	15.4	9.6	100.0
some difference	18.3	20.0	40.0	21.7	100.0
great difference	3.5	8.1	12.6	75.9	100.0
Total	39.4	18.9	15.1	26.5	100.0

Table 60 (lower panel) shows the transition probabilities for the two religiosity indicators based on the changes in the religiosity of respondents over the 10 waves. On average, there is stability in religiosity, which means that respondents with a certain level of religiosity are likely to continue having the same level of religiosity over time: In simple terms, people don't really change their religious attendance or importance all that much. For instance, respondents who are never attending religious services have a 86% chance of not transitioning out of this group. Only 1% of respondents transition from never attending religious services to attending religious services at least weekly or more frequently. While more variation might, in one sense, be useful, the actual number of cases is still sufficient because of the large sample and one might argue that moderately stable religiosity is a good predictor of mental health.

The results of the linear fixed effects regression on the SWEMWBS and the GHQ are presented in Models 8a to 8c for changes in religious attendance, Models 9a to 9c for changes in religious importance, and Models 10a to 10g (religious attendance) and Models 11a to 11g (religious importance) for the subdomains of the SWEMWBS. In each of those models, the two types of religiosity are now treated as continuous variables as this facilitates the specification of changes as opposed to a categorical one.

In terms of changes in religious attendance (Table 61), there is no significant associations with PMH over time. The fixed effects regressions for religious attendance, therefore, contradict the survey-weighted cross-sectional results, which did report significant associations.

Table 61 Models 8a to 8c: Fixed effects regressions of the SWEMWBS and GHQ on within-person changes in religious attendance (UKHLS waves 1-10).

	M8a	M8b
	SWEMWBS	GHQ
Religiosity (attendance)	1.01 (1.00 - 1.03)	1.02 (1.00 - 1.04)
Constant	0.97 (0.94 - 1.00)	0.98 (0.96 - 1.00)
Controls	YES	YES
Observations	77,424	114,333
Number of pidp	55,519	64,475

Fixed effects regressions of the standardized SWEMWBS and GHQ scales. Religiosity has been coded continuously (with a higher score corresponding to more religious attendance) as this facilitates the panel data analyses of changes in religion.

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, + $p < 0.01$

Controls: Age, number of children, health, survey wave.

Data: UKHLS waves 1-10.

Table 62 Models 9a to 9c: Fixed effects regressions of the SWEMWBS and GHQ on within-person changes in religious importance (UKHLS waves 1-10)

	M9a	M9b
	SWEMWBS	GHQ
Religiosity (importance)	1.04*** (1.03 - 1.06)	1.00 (0.99 - 1.01)
Constant	0.92*** (0.89 - 0.94)	1.01 (0.98 - 1.03)
Controls	YES	YES
Observations	77,341	114,139
Number of pidp	55,477	64,407

Fixed effects regressions of the standardized SWEMWBS and GHQ scales. Religiosity has been coded continuously (with a higher score corresponding to more religious importance) as this facilitates the panel data analyses of changes in religion.

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, + $p < 0.01$

Controls: Age, number of children, health, survey wave.

Data: UKHLS waves 1-10.

Table 63 Models 10a to 10g: Fixed effects regressions of the SWEMWBS and its domains on within-person changes in religious attendance (UKHLS waves 1-10).

	M10a feeling optimistic about the future	M10b feeling useful	M10c feeling relaxed	M10d dealing with problems well	M10e thinking clearly	M10f feeling close to others	M10g able to make up own mind
Religiosity (attendance)	1.01 (1.00 - 1.03)	1.01 (1.00 - 1.03)	0.99 (0.98 - 1.01)	1.00 (0.99 - 1.02)	0.99 (0.98 - 1.01)	1.02 (1.00 - 1.03)	1.00 (0.99 - 1.02)
Controls	YES	YES	YES	YES	YES	YES	YES
Observations	24,427	24,427	24,427	24,427	24,427	24,427	24,427
Number of pidp	13,309	13,309	13,313	13,309	13,309	13,309	13,309

Fixed effects regressions of the SWEMWBS domains (1-5 scales). Religiosity has been coded continuously (with a higher score corresponding to more religious attendance) as this facilitates the panel data analyses of changes in religion.

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Controls: Age, marital status, number of children, job status, health.

Data: UKHLS waves 1-10.

Table 64 Models 11a to 11g: Fixed effects regressions of the SWEMWBS and its domains on within-person changes in religious importance (UKHLS waves 1-10)

	M11a	M11b	M11c	M11d	M11e	M11f	M11g
VARIABLES	feeling optimistic about the future	feeling useful	feeling relaxed	dealing with problems well	thinking clearly	feeling close to others	able to make up own mind
Religiosity (importance)	1.05*** (1.02 - 1.07)	1.05*** (1.03 - 1.07)	1.02 (1.00 - 1.04)	1.01 (0.99 - 1.03)	1.01 (0.99 - 1.03)	1.04*** (1.02 - 1.06)	1.03** (1.01 - 1.05)
Controls	YES	YES	YES	YES	YES	YES	YES
Observations	24,401	24,401	24,401	24,401	24,401	24,401	24,401
Number of pidp	13,305	13,305	13,305	13,305	13,305	13,305	13,305

Fixed effects regressions of the SWEMWBS domains (1-5 scales). Religiosity has been coded continuously (with a higher score corresponding to more religious importance) as this facilitates the panel data analyses of changes in religion.

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Controls: Age, marital status, number of children, job status, health.

Data: UKHLS waves 1-10.

In contrast, for religious importance (Models 9a to 9c in Table 62), the coefficients are highly significant and large, suggesting that as people become religious, there is an increase of PMH (b 1.04 standard deviations on the SWEMWBS, 95% confidence interval 1.03-1.06, $p < 0.001$). Importantly, there is no such statistically significant association with the GHQ, implying that changes in religious importance do not affect the GHQ over time and that the weak but significant associations cross-sectionally could be an artefact of other factors. This is further evidence of the need to distinguish PMH and NMH.

Finally, Models 11a to 10g (Table 63) and Models 11a to 11g (Table 63) show the linear fixed effects results of changes in religiosity (attendance and importance) on the subdomains of the SWEMWBS. As in the cross-sectional results, there are significant associations with the more eudaimonic subdimensions, less so for the ones of “dealing with problems well”.

4.4 Discussion and conclusion

The results of the analysis have demonstrated that PMH, as measured through the Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS), is consistently associated with religiosity: Higher levels of religiosity are associated with higher levels of well-being.

First research question (“associations of religiosity with PMH”)

Both types of religiosity, attendance and importance, are significantly associated with positive mental health in the Great Britain population.

Religious importance was more predictive of differences in mental health than religious attendance and indeed, the effect of importance was pronounced when controlling for negative mental health at the same time. The strong linkage between religious importance and positive mental health might be explained by the conceptual overlap between the two constructs.

Relating to part “b” of the first research question, religious importance mainly seems to boost a high level of positive mental health, whereas religious attendance seems to operate at all layers of mental health and also potentially buffering negative health. This might be explained by the fact that the social aspect of religious attendance is generally considered to be helpful in avoiding depression.

Relating to part “c” of the first research question, differences emerged with regard to the GHQ. Top levels of religious importance and not associated with the GHQ, while most strongly associated with positive mental health. There might be differential pathways or mechanisms in which respondents who were suffering from depression turn to religion

as means of finding spiritual or theological answers for their struggles, while for positive mental health, top levels of importance might be more associated with optimism, joy, prayer, and deep faith.

Despite strong trends of secularisation in the UK and in many other developed countries, atheism remains relatively rare on a global scale. The pathways between religion and happiness have moderated human history for thousands of years, offering resolve to suffering, foundations to social interactions and social order, and human behaviour overall (Koenig 2009). The results of this study are in line with the a notion that religiosity is engrained into the human psyche and that it offers favourable mental health consequences.

The present study also confirms the reported findings in the literature that state that older people are more religious and happier than non-believers. Indeed, religious people have higher PMH in all age groups. It has been reported that people with low socio-economic status have a lower opportunity cost of going to church and that they can easily accumulate religious capital (Frey and Stutzer 2018a). However, the findings of this study suggest that higher levels of education are robustly associated with PMH and that the interaction effect of education and religiosity further boosts this positive effect. An interesting exception with regards to the group of people with “other qualifications” was found, but this may be due to data limitations or a cohort effect.

The positive association of religiosity and PMH was stronger and more robust for the measure of the importance of religion than for the measure of attendance of religious events. It is possible that the measure of attendance of religious services is not refined enough and too vague, but the robustness of the associations implies that the importance of religiosity genuinely relates quite strongly to religiosity. Even though one might have expected actual behaviour to have a more pronounced effect, this makes sense when

considering that PMH is primarily concerned with intrinsic motivations and a sense of optimism. The insight that the importance of religion is a more predictive measure than attendance has been made in other fields, such as market research as well (Mokhlis 2009). It might be the case that the question on the importance of religiosity seems more palatable to survey respondents who are simply spiritual but not religious. Frequent religious attendance, in contrast, implies membership in specific churches and religious groups.

The study ignored denominational differences in the association of PMH and religiosity. For instance, some studies find that protestants have higher reported well-being than Catholics as they may have higher autonomy (Frey and Stutzer 2018a). It is possible to analyse this effect on the present data set in the future, but the sample sizes are not sufficient for very extensive modelling of all the denominations.

Second research question (“differences by PMH domain”)

Important differences across the debates of positive mental have arisen in relation to religiosity. Religious attendance is strongly associated with “feeling optimistic” and “feeling useful”, as well as “feeling close to others” but not associated with “feeling relaxed”, “thinking clearly”, “dealing with problems well”, or “being able to make up own mind”.

The domain differences were even more pronounced for religious importance. For “feeling relaxed”, “dealing with problems”, “thinking clearly” and “able to make up own mind” there were negative associations with religious importance for those who report relatively low importance in contrast to substantive and robust effects for “feeling optimistic” and “feeling useful” again reported for religious importance just like for religious attendance before.

Third research question (“do the results hold up longitudinally”)

A major problem in the field of religious research is the fact that the majority of studies are conducted cross-sectionally. With cross-sectional data, it is hard, if not impossible, to say whether changes in mental health or changes in religiosity preceded. It is possible that both changes are happening at the same time, and it would be hard, if not impossible, to differentiate them empirically.

Because of the 10 waves of data, this third research question can test whether the results hold up longitudinally. As mentioned previously, because of the more complicated data panel data design, continuous coding of religiosity has been chosen instead of the categorical one.

The results strongly show that religiosity in terms of attendance has no effect longitudinally on negative mental health, positive mental health, or life satisfaction. In contrast, the results for religious importance show that an increase in importance is associated with better positive mental health. Strikingly, it is found that an increase in religious importance has no association with negative mental health. The previously shown results on the negative mental health associations are, therefore, likely to be an artefact of cross-sectional associations. By implication, one might argue that the positive mental health scale is a better measure when trying to understand the association of religiosity with mental health.

Further, changes in religiosity in terms of attendance are also sociative with changes in life satisfaction, but the effect size is smaller than the one on positive mental health. The positive mental health scale has better psychometric properties and because of its multidimensional nature, it allows for more detailed fine-grained analysis.

Now moving to the final models again only in terms of religious importance, it is found that increases in religiosity in terms of importance are associated with higher levels of “feeling optimistic”, “feeling useful”, and “feeling close to others” as well as “being able to make up own mind”. However, increases and religiosity in terms of importance are not associated with differences or changes in “feeling relaxed”, “dealing with problems well” or “thinking clearly”. What is interesting about those findings is that all of the dimensions of positive mental health, namely the eudaemonic, the hedonic, and the life satisfaction (evaluative), are associated with religiosity.

While the initial analysis maybe would have suggested only looking at the eudaimonic dimensions, the longitudinal analyses now show that all three tripartite domains of positive mental health have a significant association with religiosity over time.

Nonetheless, researchers might still be advised to only select those domains that are most interested in most specific for the specific research needs, as the inclusion of domains that are not statistically significant are likely to undermine the actual statistical power and blur the results.

4.4.1 Limitations and future research

Even though the data did not hint at this directly, it would be fruitful to expand upon the NMH and PMH dimensions in relation to religiosity. For instance, religiosity may foster a sense of hope and optimism (PMH) while simultaneously fostering a sense of guilt (NMH). Do people equally weigh these two opposing feelings, or do they tend to ignore the negative aspects when making evaluations of their mental health? Relatedly, people who are extremely or “obsessively” religious might not report high levels of PMH, but the data did not allow for such a nuanced level of detail. What would be possible, however, is to analyse the levels of well-being of people who experienced terrible life

events such as a cancer diagnosis, disability onset, job loss etc., and to investigate how/whether religiosity corresponds to changes in PMH under these conditions.

Apart from this, it may be beneficial to consider other indicators of religiosity in future research. Religiosity is a complex, multidimensional concept, and studies that focus on its effects on mental health typically focus on one or more of three dimensions: organisational participation (e.g., religious service attendance); private practice (e.g., prayer or meditation); and subjective perceptions (e.g., identification as a religious person or professing religion to be important in daily life) (Schieman et al., 2003; Nguyen, 2020).

An extension of the longitudinal analysis would be the inclusion of more frequent measures of PMH that would help the analysis of more frequent within-transitions: This would make it possible to isolate the “causal” effect of religiosity on PMH. It would also be interesting to include measures on the frequency of scripture reading or the frequency of prayer.

To conclude, this study has carried out foundational yet detailed work on the association of religiosity with PMH and found a highly positive effect that is even more pronounced than the one of religiosity on the competing mental health variables.

One general limitation of this research field is the fact that subjective mental health is regressed on further subjective variables, namely religiosity. In a sense, religiosity might simply be a dimension of mental health or of positive mental health. However, as the results show, religiosity is not associated with all dimensions of positive mental health. Outcome-wide research design and longitudinal analyses are thus needed to avoid the starkest statistical limitations.

4.5 Conclusion

The study has demonstrated that religiosity is significantly associated with positive mental health. The finding suggests that religious importance is a more significant predictor of positive mental health than religious attendance. The effect of religiosity on positive mental health persisted even when jointly controlling for negative mental health.

However, not all domains of the positive mental health indicator are significantly associated with religiosity. Religious importance is particularly strongly associated with “feeling optimistic” and “feeling useful”, i.e., the eudaimonic domains, and it is here that religiosity in terms of importance appears to boost the top level of mental health and to be associated with longitudinal changes over the 10-year follow-up period. In contrast, the hedonic and effective measures of “feeling relaxed” or “dealing with problems well” were not associated with religiosity cross-sectionally, but aspects of all tripartite domains were significant longitudinally.

4.6 References

- Abdel-Khalek, Ahmed M. 2006. "Happiness, health, and religiosity: Significant relations." *Mental Health, Religion & Culture* 9(1):85-97.
- Bohart, Arthur C, and Thomas Greening. 2001. "Humanistic psychology and positive psychology."
- Carlisle, Robert D, and Jo-Ann Tsang. 2013. "The virtues: Gratitude and forgiveness."
- Chatters, Linda M. 2000. "Religion and health: Public health research and practice." *Annual review of public health* 21(1):335-67.
- Chida, Yoichi, Andrew Steptoe, and Lynda H Powell. 2009. "Religiosity/spirituality and mortality." *Psychotherapy and psychosomatics* 78(2):81-90.
- Chu, Li-Chuan. 2010. "The benefits of meditation vis-à-vis emotional intelligence, perceived stress and negative mental health." *Stress and Health: Journal of the International Society for the Investigation of Stress* 26(2):169-80.
- Davis, Don E, Elise Choe, Joel Meyers, Nathaniel Wade, Kristen Varjas, Allison Gifford, Amy Quinn, Joshua N Hook, Daryl R Van Tongeren, and Brandon J Griffin. 2016. "Thankful for the little things: A meta-analysis of gratitude interventions." *Journal of Counseling Psychology* 63(1):20.
- Didi-Huberman, Georges, and Alisa Trans Hartz. 2003. *Invention of hysteria: Charcot and the photographic iconography of the Salpêtrière*: MIT Press.
- Diener, E, and ME Seligman. 2004. "Beyond Money: Toward an Economy of Well-Being." *Psychol Sci Public Interest* 5(1):1-31.

Durkheim, Emile. 1976. *Elementary Forms of the Religious Life*: Allen & Unwin.

Dwiwardani, Carissa, Peter C Hill, Richard A Bollinger, Lashley E Marks, Justin R

Steele, Holly N Doolin, Sara L Wood, Joshua N Hook, and Don E Davis. 2014.

"Virtues develop from a secure base: Attachment and resilience as predictors of humility, gratitude, and forgiveness." *Journal of Psychology and Theology* 42(1):83-90.

Ebstyne King, Pamela. 2003. "Religion and identity: The role of ideological, social, and spiritual contexts." *Applied Developmental Science* 7(3):197-204.

Ebstyne King, Pamela, and James L Furrow. 2008. "Religion as a resource for positive youth development: Religion, social capital, and moral outcomes." Pp. 34: Educational Publishing Foundation.

Ellison, Christopher G, and Jeffrey S Levin. 1998. "The religion-health connection: Evidence, theory, and future directions." *Health Education & Behavior* 25(6):700-20.

Emmons, Robert A. 2005. "Striving for the sacred: Personal goals, life meaning, and religion." *Journal of Social Issues* 61(4):731-45.

Emmons, Robert A, and Cheryl A Crumpler. 2000. "Gratitude as a human strength: Appraising the evidence." *Journal of social and clinical psychology* 19(1):56-69.

Emmons, Robert A, and Raymond F Paloutzian. 2003. "The psychology of religion." *Annual review of psychology* 54(1):377-402.

- Evans, T David, Francis T Cullen, Velmer S Burton Jr, R Gregory Dunaway, Gary L Payne, and Sesha R Kethineni. 1996. "Religion, social bonds, and delinquency." *Deviant Behavior* 17(1):43-70.
- Ferriss, Abbott L. 2002. "Religion and the quality of life." *Journal of Happiness Studies* 3:199-215.
- Fitts, William H. 1971. "The self-concept and self-actualization." *Studies on the Self Concept*.
- Fredrickson, Barbara L. 1998. "What good are positive emotions." *Review of general psychology* 2(3):300-19.
- . 2001. "The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions." *American Psychologist* 56(3):218.
- . 2004. "The broaden-and-build theory of positive emotions." *Philosophical Transactions of the Royal Society B: Biological Sciences* 359(1449):1367.
- . 2013. "Positive emotions broaden and build." Pp. 1-53 in *Advances in experimental social psychology* 47: Elsevier.
- Frey, Bruno S, and Alois Stutzer. 2018. *Economics of happiness*: Springer.
- Fuller, R. C. (2001). *Spiritual, but not religious: Understanding unchurched America*. Oxford University Press.
- G. Koenig, Harold, and David B Larson. 2001. "Religion and mental health: Evidence for an association." *International review of psychiatry* 13(2):67-78.

- Gillham, Jane E, Andrew J Shatté, Karen J Reivich, and Martin EP Seligman. 2001. "Optimism, pessimism, and explanatory style." *Optimism and pessimism: Implications for theory, research, and practice*:53-75.
- Grossman, Paul, Ludger Niemann, Stefan Schmidt, and Harald Walach. 2004. "Mindfulness-based stress reduction and health benefits: A meta-analysis." *Journal of psychosomatic research* 57(1):35-43.
- Hood Jr, Ralph W, Peter C Hill, and Bernard Spilka. 2018. *The psychology of religion: An empirical approach*: Guilford Publications.
- Ivtzan, Itai, Christine PL Chan, Hannah E Gardner, and Kiran Prashar. 2013. "Linking religion and spirituality with psychological well-being: Examining self-actualisation, meaning in life, and personal growth initiative." *Journal of Religion and Health* 52(3):915-29.
- Jones, James W. 1991. *Contemporary psychoanalysis and religion: Transference and transcendence*: yale university Press.
- Kim, Karen Hye-cheon. 2007. "Religion, weight perception, and weight control behavior." *Eating Behaviors* 8(1):121-31.
- Koenig, Harold G. 2004. "Religion, spirituality, and medicine: research findings and implications for clinical practice." *South Med J* 97(12):1194-200.
- . 2009. "Research on religion, spirituality, and mental health: A review." *The Canadian Journal of Psychiatry* 54(5):283-91.
- . 2013. "Religion and mental health." Pp. 63-90 in *Is Religion Good for Your Health*: Routledge.

Koenig, Harold, Harold George Koenig, Dana King, and Verna B Carson. 2012.

Handbook of religion and health: Oup Usa.

Krause, Neal, and R David Hayward. 2012. "Religion, meaning in life, and change in physical functioning during late adulthood." *Journal of Adult Development* 19(3):158-69.

Lam, Pui-Yan. 2002. "As the flocks gather: How religion affects voluntary association participation." *Journal for the Scientific Study of Religion* 41(3):405-22.

Lewis, Christopher Alan, and Sharon Mary Cruise. 2006. "Religion and happiness: Consensus, contradictions, comments and concerns." *Mental health, religion and culture* 9(03):213-25.

Lim, Chaeyoon, and Robert D Putnam. 2010. "Religion, social networks, and life satisfaction." *American Sociological Review* 75(6):914-33.

Lodi-Smith, Jennifer, and Brent W Roberts. 2007. "Social investment and personality: A meta-analysis of the relationship of personality traits to investment in work, family, religion, and volunteerism." *Personality and social psychology review* 11(1):68-86.

Masters, Kevin S, and Glen I Spielmans. 2007. "Prayer and health: Review, meta-analysis, and research agenda." *Journal of behavioral medicine* 30(4):329-38.

McConnell, Kelly M, Kenneth I Pargament, Christopher G Ellison, and Kevin J Flannelly. 2006. "Examining the links between spiritual struggles and symptoms of psychopathology in a national sample." *Journal of clinical psychology* 62(12):1469-84.

- McCullough, Michael E, Kenneth I Pargament, and Carl E Thoresen. 2001. *Forgiveness: Theory, research, and practice*: Guilford Press.
- Mokhlis, Safiek. 2009. "Relevancy and measurement of religiosity in consumer behavior research." *International Business Research* 2(3):75-84.
- Monk-Turner, Elizabeth. 2003. "The benefits of meditation: experimental findings." *The Social Science Journal* 40(3):465-70.
- Moreira-Almeida, Alexander, and Harold G Koenig. 2006. "Retaining the meaning of the words religiousness and spirituality: A commentary on the WHOQOL SRPB group's "A cross-cultural study of spirituality, religion, and personal beliefs as components of quality of life"(62: 6, 2005, 1486–1497)." *Social Science & Medicine* 63(4):843-45.
- Myers, David G, M Eid, and R Larsen. 2008. "Religion and human flourishing." *The science of subjective well-being*:323-43.
- Neto, Félix. 2007. "Forgiveness, personality and gratitude." *Personality and Individual Differences* 43(8):2313-23.
- Oman, Doug, John Hedberg, and Carl E Thoresen. 2006. "Passage meditation reduces perceived stress in health professionals: a randomized, controlled trial." *Journal of consulting and clinical psychology* 74(4):714.
- Park, Crystal L. 2005a. "Religion and meaning." *Handbook of the psychology of religion and spirituality* 2:357-79.
- . 2005b. "Religion as a meaning-making framework in coping with life stress." *Journal of Social Issues* 61(4):707-29.

- Park, Crystal L, Donald Edmondson, and Amy Hale-Smith. 2013. "Why religion? Meaning as motivation.".
- Park, Nansook, and Christopher Peterson. 2009. "Character strengths: Research and practice." *Journal of College and Character* 10(4).
- Peterson, Christopher, and Martin EP Seligman. 2004. *Character strengths and virtues: A handbook and classification*: Oxford University Press.
- Powell, Lynda H, Leila Shahabi, and Carl E Thoresen. 2003. "Religion and spirituality: Linkages to physical health." *American Psychologist* 58(1):36.
- Pyysiäinen, Ilkka. 2001. "How religion works." Towards a New Cognitive Science of Religion, Brill.
- Saroglou, Vassilis, Vanessa Delpierre, and Rebecca Dernelle. 2004. "Values and religiosity: A meta-analysis of studies using Schwartz's model." *Personality and Individual Differences* 37(4):721-34.
- Schueller, Stephen M, Eranda Jayawickreme, Laura ER Blackie, Marie JC Forgeard, and Ann Marie Roepke. 2015. "Finding character strengths through loss: An extension of Peterson and Seligman (2003)." *The Journal of Positive Psychology* 10(1):53-63.
- Stark, Rodney, and Jared Maier. 2008. "Faith and happiness." *Review of Religious Research*:120-25.
- Steger, Michael F, and Patricia Frazier. 2005. "Meaning in life: One link in the chain from religiousness to well-being." *Journal of Counseling Psychology* 52(4):574.

- Tennant, R., L. Hiller, R. Fishwick, S. Platt, S. Joseph, S. Weich, J. Parkinson, J. Secker, and S. Stewart-Brown. 2007. "The Warwick-Edinburgh Mental Well-being Scale (WEMWBS): development and UK validation." *Health Qual Life Outcomes* 5:63.
- Toussaint, Loren, and Philip Friedman. 2009. "Forgiveness, gratitude, and well-being: The mediating role of affect and beliefs." *Journal of Happiness Studies* 10(6):635.
- Tsang, Jo-Ann, Ashleigh Schulwitz, and Robert D Carlisle. 2012. "An experimental test of the relationship between religion and gratitude." *Psychology of religion and spirituality* 4(1):40.
- Underwood, Sandra Millon, and Rhonda L Powell. 2006. "Religion and spirituality: influence on health/risk behavior and cancer screening behavior of African Americans." *ABNF Journal* 17(1).
- University of Essex, Institute for Social and Economic Research, NatCen Social Research, and Kantar Public. 2018. "Understanding Society: Waves 1-7, 2009-2016 and Harmonised BHPS: Waves 1-18, 1991-2009. [data collection]. 10th Edition." UK Data Service. SN: 6614.
- Wade, Nathaniel G, William T Hoyt, Julia EM Kidwell, and Everett L Worthington Jr. 2014. "Efficacy of psychotherapeutic interventions to promote forgiveness: A meta-analysis." *Journal of consulting and clinical psychology* 82(1):154.
- Wilcox, W Bradford. 2002. "Religion, convention, and paternal involvement." *Journal of Marriage and Family* 64(3):780-92.

5 POSITIVE MENTAL HEALTH AND MORTALITY IN THE USA

This study examines the long-term association between positive mental health (PMH) and all-cause mortality in the United States over a 21-year follow-up period. Keyes' (2012a; 2012b) Mental Health Continuum Short Form scale combines emotional, psychological, and social well-being into an integrated PMH measure. The empirical relevance of this approach is tested by comparing it to an established indicator of NMH, depression, and the full range of competing mental health and psychometric variables. Cox proportional hazard survival analyses are used to model the effect sizes of PMH on mortality risk when adjusting for chronic health conditions, health behaviour, psychological traits, and common sociodemographic factor (N = 3,030). The results show that the absence of PMH increases mortality risk (HR: 1.45) and that this effect cannot be explained away by the mentioned covariates. A significant new finding of this study is that the languishing dimension and lowest tertiles of mental health, and not the high scores, on the PMH variables account for the association between PMH and mortality. The study also suggests that there are significant differences between the specific dimensions and indicators of mental health and psychological functioning. Further research is needed to specify the exact pathways between the different dimensions of PMH and mortality.

5.1 Introduction

Do happy people live longer? There is rich evidence that negative mental health (NMH) – psychopathology – is associated with higher mortality, morbidity and a range of physical illnesses (Blazer 2003; Cuijpers et al. 2014; Osborn et al. 2007). Most notably, psychopathology is related to cancer survival and mortality (Pinquart and Duberstein 2010), coronary heart disease (Hemingway and Marmot 1999), and the development of diabetes (Mezuk et al. 2008). There is also, however, increasingly much interest in the relationship between PMH (mental well-being) and physical health. The proposition is that, despite being related, positive and NMH can have independent influences on physical health (Chida and Steptoe 2008; Diener and Chan 2011; Howell, Kern and Lyubomirsky 2007; Keyes, Dhingra and Simoes 2010; Lamers 2012; Veenhoven 2008).

The present study extends Keyes' (2012a; 2012b) article that found a strong association of PMH with mortality at a 10-year follow-up period to a 20-year follow-up period in this study. In addition, the PMH approach is tested by considering the holistic range of competing psychometric variables in a complete form. This paper addresses the questions: Does PMH have an independent long-term effect on mortality risk compared to NMH (depression) or competing mental health measures like life-satisfaction? Is this effect due to stable psychological traits? Are there interactions and especially level effects that shape the association between PMH and mortality?

5.2 Literature and theory

PMH has been found to be associated with physical health and mortality: In meta-analyses of longitudinal research studies, it is reported that there is a robust protective effect of affective and cognitive mental well-being from mortality, both in initially healthy and diseased populations (Chida and Steptoe 2008; Pressman and Cohen 2005). This protective effect of PMH seems to persist even after controlling for NMH. In

another large meta-analysis of prospective and retrospective studies and even experiments (in which participants at different baseline levels of happiness were exposed to a virus), PMH was consistently associated with reduced illness (Veenhoven 2008).

The dual continua model treats negative and PMH as distinct dimensions that are not directly opposite ends of the same scale (Keyes 2002; Keyes, Shmotkin and Ryff 2002; Lamers 2012; Ryff and Keyes 1995; Westerhof and Keyes 2010). According to this model, PMH and NMH could each have unique pathways and mechanisms for influencing physical health and mortality. It has been suggested that NMH may be more closely related to short-term effects on health, while PMH may be more strongly associated with long-term outcomes (Howell, Kern and Lyubomirsky 2007). This shows how distinguishing between the effects of PMH and NMH might allow for more nuanced insights than one would otherwise have gained if just looking at a single part of mental health at a time. Another example that illustrates the rationale behind the dual continua model is that people with more positive self-efficacy are less likely to suffer from diabetes than those with less PMH, even if both groups of people report strongly negative emotions and similar levels of NMH (Richman et al. 2005).

The three most frequently stated ways in which PMH is likely to affect mortality are (a) via direct physiological responses such as lowered blood pressure, (b) resilience (e.g. capacity to cope with stress) and (c) health behaviour (e.g. less drinking and smoking, an active lifestyle and better sleep quality) (Fredrickson 1998). Mental well-being influences the way in which the autonomic nervous system affects health (Carney, Freedland and Veith 2005; Rozanski, Blumenthal and Kaplan 1999; Waldstein et al. 2000). Specifically, more frequent hedonic well-being has been linked to lower levels of inflammatory markers, cortisol output and C-reactive protein and interleukin-6, thus

suggesting a precise physiobiological mechanism (Steptoe, Dockray and Wardle 2009). A recent meta-study found that mental well-being is associated with better immune functioning and resilience, i.e. the ability to moderate the effects of stress on health (Howell, Kern and Lyubomirsky 2007). Likewise, mental well-being can buffer the potentially adverse symptomatic and physiological effects of life events like divorce or unemployment (Sabatini 2014). In terms of health behaviour, happier people are more likely to have an active lifestyle and to engage in physical activities (Frey 2011; Humphreys, McLeod and Ruseski 2014; Rasciute and Downward 2010). People who report high well-being are, on average, drinking and smoking less than people with lower well-being.

The sub-dimensions (emotional, psychological, and social) of an integrated PMH approach are, of course, related, but their associations with health outcomes have often only been studied in isolation. In a 20-year prospective study, life satisfaction was found to be associated with lower all-cause mortality (Koivumaa-Honkanen et al. 2000) and lower suicide rates in particular (Koivumaa-Honkanen et al. 2001). Both cognitive and affective experiences were found to build resilience through better social relationships, confidence, and health behaviour (Collins, Goldman and Rodríguez 2008). There have only been a few longitudinal studies on the role of eudaimonic measures as vital factors in predicting health, but it is considered to be a promising direction (Friedman and Kern 2014): Compared to those with low levels of PMH, people who feel more useful (Gruenewald et al. 2007), people who find more purpose in life (Boyle et al. 2009), and people who report their lives to be more meaningful had a lower overall mortality risk (Surtees et al. 2003). It is possible that high PMH, i.e., high scores on all dimensions, will have a more pronounced effect on physical health than well-being on a single dimension.

Many of the factors that shape a person's physical health and mortality risk differ in how they are associated with PMH and NMH. For instance, the association of personality traits (e.g. Big Five) with mental health is different from the association of personality traits with psychopathology (Lamers et al. 2012): Whereas agreeableness is related to all three dimensions (emotional, psychological and social) of mental well-being, extraversion was only related to psychological and social well-being. Moreover, neuroticism is more intricately linked to NMH than PMH (Keyes et al. 2015). This is important because the different Big Five personality traits relate to health outcomes and the ability to cope with stress (Penley and Tomaka 2002). In a different study, only old age was associated with a decrease in personal growth and purpose, but there were age differences at younger ages for autonomy and environmental mastery (Ryff 1989). As suggested before, the reason that the battery of covariates shows differing, often conflicting, findings might be due to the specific nature of the well-being concept under study.

A large share of the variance in mental health and illness is hereditary (Huppert 2009). There is evidence for the dual continua model of NMH and PMH both at the phenotype level and at the genetic level (Baselmans and Bartels 2018b). For instance, a genetic risk towards mental disease does not make it impossible for people to score high on PMH, and, in turn, not being at risk of NMH does not very strongly predict PMH (Kendler et al. 2011).

Keyes (2005) developed the flourishing and languishing framework as an extension of the dual continua model. As such, people can flourish if they have high PMH and languish if they have low PMH, but they may independently be affected by mental illness in both states. Furthermore, the many distinctions between

flourishing/languishing and mental illness were independently predictive of cardiovascular disease (Westerhof and Keyes 2010).

Nonetheless, a recent paper that used prospective data of the large Million Women Study ($N = 719,671$) did not find a direct effect of happiness on mortality once one controlled for subjective health and health behaviour (Liu et al. 2016). Even though this is convincing evidence for caution, one must note that happiness was measured through a single “emotional well-being” item. The authors of the study also included other psychological variables like self-control, which we try to imitate in this study.

Following the discussion in the literature, one can derive the following overall research questions:

The overall research question: Is PMH predictive of mortality risk in the USA over a long follow-up period of 21 years?

1. Do Keyes’ original findings of a protective effect of PMH on mortality, based on a 10-year follow-up period, hold up on a much longer 21-year period?
 - a. Can the original results be replicated with the original methods and also with more appropriate Cox-proportional hazards survival models?
 - b. Does the protective effect of PMH on mortality risks persist even when controlling for NMH? Based on the dual continua model of mental health, one would expect to see unique pathways and independence of the two continua of mental health.
2. Is the effect of PMH on mortality risk mainly driven by flourishing or by languishing?
3. Does the effect of PMH on mortality risk differ by gender and education?

PMH is typically understood as a psychological resource, but it is important to

investigate the social antecedents and interactions with key sociological variables. PMH or some of its domains might be understood differently in different social classes.

5.3 Methodology

Data for this study are taken from the National Survey of Midlife Development in the United States (MIDUS) which is sponsored by the MacArthur Foundation. The MIDUS study was collected in three waves (1994/95, 2004 and 2019/20) and supplies 21 years of data depending on the original interview month and year which can precede the year of the wave. The survey follows 7,108 respondents.

5.3.1 Variables

Decedent information was gathered through the National Death Index, which is considered to be a generally reliable source of data (Buck and McFall 2011). As such, the original dataset of MIDUS wave one was matched with the data set for decedent status. The longitudinal panel that results from this setup is a balanced one. While it might be desirable to consider health behaviour at waves two or three, the inclusion of this information would introduce the problem of attrition, among others. As the decedent information was provided externally, this implies that attrition was not a concern in this study which is a major strength.

PMH is measured via the Mental Health Continuum Scale that was developed by Keyes (2002). This is a joint scale of emotions and psychological functioning. Positive affect was measured via indicators of emotional states like being “cheerful, in good spirits, happy, calm or peaceful, satisfied, and full of life during the past 30 years”. The other emotional mental health indicator is general life-satisfaction on a 1-10 scale. The main eudaimonic measures are Ryff's (1989) 6 scale items of psychological well-being. These dimensions are personal growth (“I think it is important to have new experiences that

challenge how I think about myself and the world.”), positive relations with others (“People would describe me as a giving person, willing to share my time with others”), purpose in life (“Some people wander aimlessly through life, but I am not one of them”), environmental mastery (“In general, I feel I am in charge of the situation in which I live”), autonomy (“I have confidence in my own opinions, even if they are different from the way most other people think”) and self-acceptance (“When I look at the story of my life, I am pleased with how things have turned out so far”). For each of these items, people responded on a Likert scale from strongly agreeing to strongly disagreeing.

Social well-being is another construct that was developed by Keyes (2005) and consisted of societal meaningfulness, social integration (“I feel close to other people in my community”), social acceptance (“People do not care about other peoples’ problems”), social contribution and social actualization. The standardised score (split into tertiles) from all scales were used when composing the flourishing-languishing scale: To be flourishing, a respondent would need to report 6/11 of the top tertiles of psychological and social well-being, and at least one of the lowest tertiles of the two emotional indicators. To be languishing, a respondent would need to report 6/11 of the lowest tertiles of psychological and social well-being, and at least one of the lowest tertiles of the two emotional indicators. People who do not fall into one of these categories are considered to have moderate PMH and are assigned a middle value on the ordinal flourishing-languishing scale.

Control variables at baseline

Gender, age (continuous from age 30 to 75 at baseline in 1995/96), education (1: no qualifications, 2: GED or high school, 3: some college or vocational, 4: college degree, 5: graduate school or professional education), marital status (1: never married, 2:

married, 3: divorced/widowed/separated), race (1: white, 2: black, 3: other minority) and retirement status are included as the baseline sociodemographic factors. A binary indicator for smoking, and a continuous indicator of the weighted average of the amount of summer and winter outdoor physical activity are used to measure health behaviour. Psychological traits are measured through the popular Big Five measures of agreeableness, extraversion, conscientiousness, openness, and neuroticism.

We control for a range of health conditions with binary indicators of disability, an earlier cancer diagnosis and NMH or depression. The MIDUS employs the Composite International Diagnostic Interview Short-Form scale of depressive symptoms (Keyes, Shmotkin and Ryff 2002). People over the cut-off are classified as falling into the depression category. AIDS was not included because of a low sample size. Physical health is also measured through the self-reported physical health scale. We include a categorical measure of body mass index BMI (which was calculated on the respondents' self-reported body measurements).

Based on a careful investigation of the distribution of all psychological variables and guided by theory, the standardised values were split into categorical indicators of low, medium, and high tertiles.⁴⁸

⁴⁸ Various other quartile combinations (up to 6) are also tested, but for reasons of data efficiency and compatibility tertiles were chosen. The results from these modelling exercises resulted in almost identical results.

5.3.2 Analytical approach

Mortality risk is analysed via the standard procedure of Cox-proportional hazard survival analyses.⁴⁹ The proportional hazard assumption is tested statistically as well as visually. Stata 16.1 SE was used for data management and all estimations.

Based on the stated hypotheses, we employ nested survival analysis models to separate the baseline effects of PMH on the hazard ratio of mortality from the covariates. The dual continua approach suggests that PMH is distinct from NMH, and we need to control for physical health conditions, so these variables are also included.

Models 1a to 1i directly replicate the method (logistic regression) and selection of variables of Keyes' original paper, but with the now much larger follow-up period of 21 years instead of 10 years.

Models 2a to 2i mirror the analysis of Models 1a to 1i, but instead of logistic regression of decedent status, Cox-proportional hazards models are used that model the time to the event (time to death). This technique is much better suited when such long-follow up data are available and the analysis of time is more detailed than the aggregated chances of death overall.

Further Cox proportional-hazards models

Models 3a to 3i mirror the analysis of models 2a to 2i. However, now we control for NMH. This is, therefore, a direct test of the dual continua framework and allows isolation of the truly distinct aspect of PMH.

⁴⁹ A hazard function is the probability that the event (mortality) occurs during an infinitesimally small interval, given that the event has not previously occurred: $h(t) = h_0(t) \times \exp(b_1x_1 + b_2x_2 + \dots + b_px_p)$. Hazard ratios can simply be explained as percentage differences of the covariates on the baseline hazard.

Models 4a to 4i add the author's further extensions by not just differentiating between flourishing and "not flourishing" as was done by Keyes, but by employing the full details of the MHC-SF: By theoretical accounts of the dual continua model, the flourishing dimension should be particularly pertinent and distinct, but in order to be able to tell this the moderate PMH dimension needs to be differentiated from languishing.

Models 5a to 5e build on the previous insight and contribute to more fine-grained analysis by controlling for religiosity, the BIG5, self-rated health and previous cancer diagnosis.

Finally, Models 6a to 6d analyse interaction effects between sociodemographic variables (gender, education, and mother's education) and PMH with mortality risk. By employing interaction effects, positive mental health becomes a moderator of mortality risk over time, and the sociological relevance and usefulness of the concept are highlighted.

All models employ statistical weight to ensure the representativeness of the results to the general population under study. Levels of missingness were not large; the potential reduction in the same size results because of the design of the MIDUS study and aspects of the data, such as the twin data, that were not of relevance here.

5.4 Results

Descriptive statistics are offered in Table 65 and in Table 66. As in Keyes' study, the analytical sample consists of 3,030 respondents at the initial wave of the MIDUS in 1995/96.

59% of the sample are women, 85% of the sample are White Americans, 11% are Blacks/African Americans, and the remainder of 4% of the sample are classified as "other race". The demographic distributions seem to be representative of the US general population in 1995, although the shares of higher education are moderately low at only 27% with a college degree or higher. The average age of respondents is 45 years.

Based on the definitions of Keyes' original study, 17% of respondents are languishing, 60% are in moderate mental health (neither flourishing nor languishing), and 24% of respondents are flourishing.

Table 65 Descriptive statistics of categorical variables at baseline levels including the PMH measure (MIDUS 1995/96)

	Svy. Proportion
<u><i>Mental health status</i></u>	
Languishing	.17
Moderate	.60
Flourishing	.24
Gender: Female	.59
<u><i>Educational attainment</i></u>	
Less than high school	.15
GED or high school	.36
College, no degree	.22
College, degree	.18
Grad school to professional	.09
<u><i>Race</i></u>	
Whites	.85
Blacks	.11
Other race	.04
Smoking	.26
CVD	.03
Aids	.00
<u><i>Marital status</i></u>	
Never married	.11
Married	.70
Separated/Divorced/Widowed	.19
Income (log.)	10.68
Religious attendance	3.73
NMH	.17
Cancer diagnosis (ever)	.09

Note: Survey weights have been applied

Data: MIDUS 1995/96 (N=3030)

Table 66 Descriptive statistics of continuous variables at baseline levels (MIDUS 1995/96)⁵⁰

	Svy. Mean	Min.	Max.	SD
Chronological age	44.92	20.00	74.00	13.13
PF Autonomy	16.44	3.00	21.00	3.31
PF Environmental mastery	16.17	3.00	21.00	3.44
PF Personal growth	17.97	3.00	21.00	3.18
PF Positive relations	16.34	3.00	21.00	4.11
PF Purpose	16.16	3.00	21.00	3.67
PF Self-acceptance	16.66	3.00	21.00	3.50
SW Meaningfulness of society	8.88	2.00	14.00	3.29
SW Social integration	13.96	3.00	21.00	4.36
SW Acceptance of others	12.80	3.00	21.00	3.55
SW Social contribution	15.06	3.00	21.00	3.81
SW Social actualization	11.77	3.00	21.00	4.18
Life satisfacton	7.67	.00	10.00	1.34
Positive affect	3.40	1.00	5.00	.74
Negative affect	1.56	1.00	5.00	.64
BIG5 Agreeableness	3.45	1.00	4.00	.49
BIG5 Extraversion	3.26	1.00	4.00	.57
BIG5 Neuroticism	2.25	1.00	4.00	.66
BIG5 Conscientiousness	3.43	1.00	4.00	.45
BIG5 Openness	3.06	1.14	4.00	.52
BMI	27.01	9.44	64.02	5.51
Self-rated health	2.45	1.00	4.00	.93
Physical activity	4.60	1.00	6.00	1.25

Note: Survey weigths have been applied. The scales are later standardized in the analys
 Data: MIDUS 1995/96 (N=3030)

⁵⁰ PF=positive functioning. SW=social well-being.

The distributions of the continuous variables, ranging from positive functioning domains, social well-being domains, life satisfaction, positive and negative affect, the BIG5 items, self-rated (physical) health and physical activity, are shown in Table 66. Because of the varying ranges, e.g., from 1 to 4 in the case of the BIG5 or 3 to 21 in the case of the positive functioning items, all scales are standardised in the following analyses.

Figure 19 provides box-whisker plots of all the mental health and psychological variables that were deemed to be relevant and comparable in evaluating the PMH framework. Self-rated physical health is also included as an important comparison point.

All the indicators have similar interquartile ranges, which suggests that they are similarly distributed. However, it is striking that all these items express more variation at the negative ends of their scales: Most of the outliers are found here and larger distances from the IQR boxes are seen.⁵¹ Outliers were checked for unusual data patterns, but there was no evidence of coding errors or unusable responses.

Despite the similar distribution of the scales, it is noteworthy that the correlations are moderately low in the 0.2 to 0.4 range as seen in Table 67.⁵²

⁵¹ This is not visually the case for the BIG5 Neuroticism indicators of the BIG5 personality traits. However, neuroticism is the only negatively scored item (i.e. a higher score of neuroticism is unfavourable).

⁵² In contrast, factor analyses suggested loadings on only two dimensions with unclear meaning.

Sociological Applications of Positive Mental Health

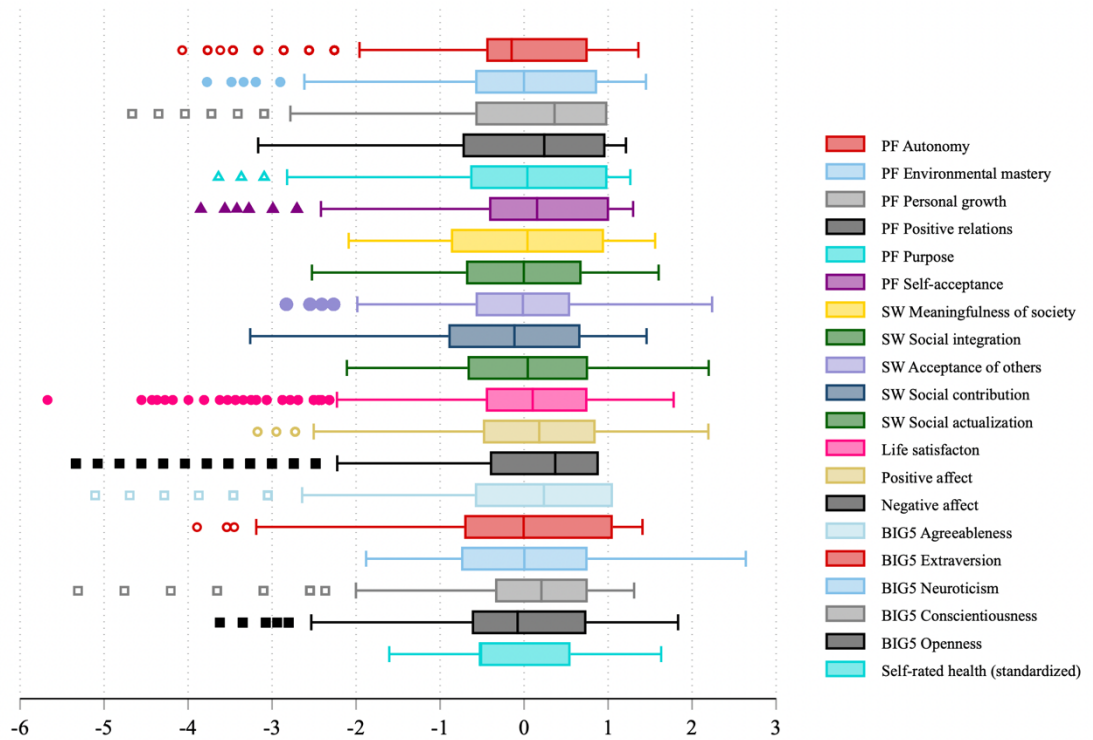


Figure 19 Box plots of the psychological or mental health variables: standardised (MIDUS 1995/96)

Table 67 Correlation matrix of the main psychological and mental health variables (MIDUS 1995/96)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1) Autonomy	1.00															
(2) Environmental mastery	0.32	1.00														
(3) Personal growth	0.25	0.37	1.00													
(4) Positive relations	0.21	0.36	0.38	1.00												
(5) Purpose in life	0.14	0.24	0.39	0.37	1.00											
(6) Self-acceptance	0.30	0.57	0.41	0.48	0.34	1.00										
(7) Positive affect	0.21	0.51	0.32	0.38	0.19	0.52	1.00									
(8) Negative affect	-0.22	-0.49	-0.29	-0.36	-0.27	-0.49	-0.64	1.00								
(9) Life satisfaction	0.18	0.47	0.29	0.37	0.24	0.49	0.56	-0.49	1.00							
(10) Personal mastery	0.30	0.43	0.39	0.23	0.18	0.38	0.34	-0.28	0.31	1.00						
(11) Physical health	0.06	0.22	0.23	0.19	0.23	0.24	0.27	-0.27	0.39	0.16	1.00					
(12) Societal meaning	0.19	0.31	0.29	0.21	0.30	0.32	0.24	-0.28	0.18	0.21	0.18	1.00				
(13) Social integration	0.09	0.27	0.24	0.38	0.19	0.33	0.33	-0.28	0.36	0.17	0.12	0.23	1.00			
(14) Social acceptance	0.06	0.23	0.17	0.24	0.15	0.24	0.22	-0.21	0.24	0.13	0.12	0.25	0.38	1.00		
(15) Social contribution	0.18	0.25	0.42	0.32	0.33	0.34	0.22	-0.22	0.25	0.24	0.21	0.36	0.42	0.26	1.00	
(16) Social actualization	0.08	0.24	0.23	0.22	0.20	0.27	0.22	-0.22	0.22	0.20	0.15	0.43	0.32	0.48	0.32	1.00

We carefully executed Keyes guidelines on composing the flourishing-languishing scale of PMH. In support of the notion that mental illness and mental well-being are distinct, we find only moderate overlap between depression and the three dimensions of PMH (Figure 20). As one would expect, people who are affected by depression have a lower chance of being categorised into the flourishing scale (9.5% vs 26.8%) but a more than doubled chance of being in the languishing group (35.2% vs 12.2%). The size of the moderate-PMH category is similar between depressed (55.3%) and non-depressed people (26.8%).

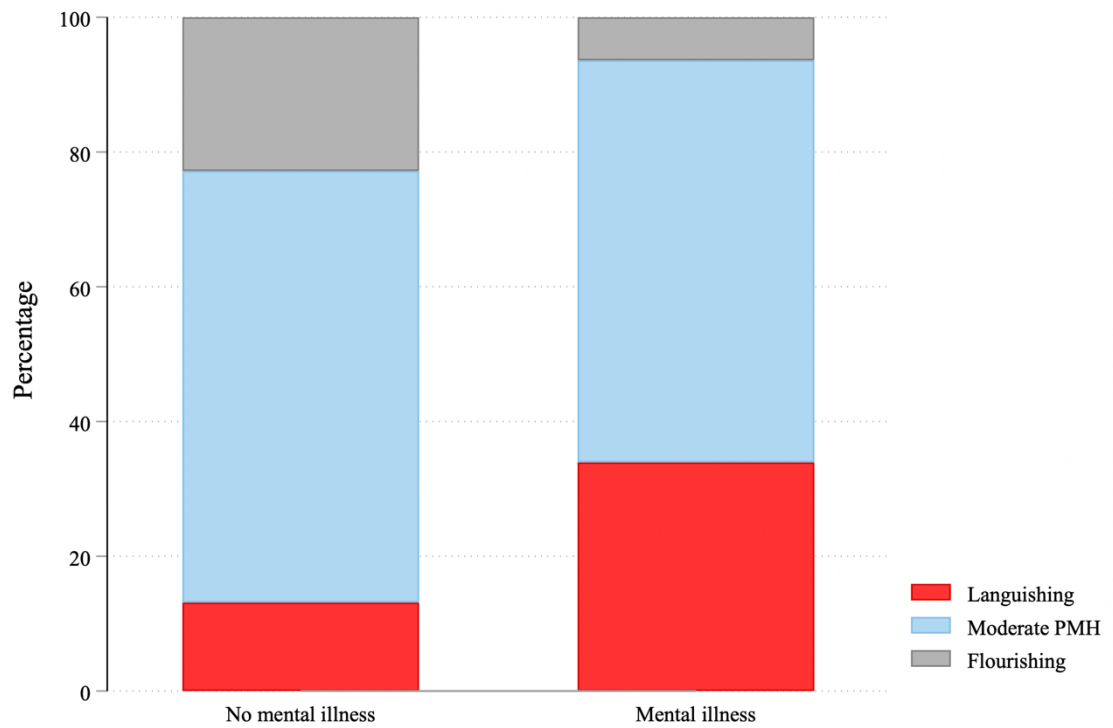


Figure 20 Stacked bar charts of PMH categories (languishing, moderate PMH, and flourishing) by NMH (MIDUS 1995/96)

The logistic regression results of mortality risk in Models 1a to 1i confirm the original findings on the short follow-up period (Table 68): Compared to those who are flourishing, not flourishing is associated with 1.63 the odds (95% confidence interval 1.09-2.71, $p < 0.05$) as seen in Model 1c.

Event history techniques such as survival analyses allow for an analysis of time: Figure 21 shows the cumulative hazard estimate of mortality by PMH status over time, and demonstrates that whereas nearly 25% of respondents who are not flourishing are predicted to have died by the end of the follow-up period, only 15% of respondents who were flourishing at baseline are predicted to do so.

The survival regressions shown in Models 2a to 2i (Table 69) hence provide the hazard ratios instead of odds ratios that were used in the logistic regressions.

Table 68 Models 1a to 1i: Replication models: Nested Logistic regressions of mortality risk over a 21-year period (MIDUS 1995/96 and mortality information)

	M1a	M1b	M1c	M1d	M1e	M1f	M1g	M1h	M1i
PMH = 0, Not flourishing (ref. Flourishing)	1.63*	1.75*	1.76**	1.72*	1.71*	1.90*	1.87*	1.83*	1.83*
	(1.00 - 2.64)	(1.14 - 2.70)	(1.18 - 2.64)	(1.09 - 2.71)	(1.11 - 2.64)	(1.11 - 3.24)	(1.09 - 3.21)	(1.07 - 3.13)	(1.06 - 3.18)
Chronological age		1.13***	1.14***	1.13***	1.14***	1.15***	1.15***	1.15***	1.15***
		(1.12 - 1.15)	(1.12 - 1.15)	(1.12 - 1.15)	(1.12 - 1.15)	(1.14 - 1.17)	(1.13 - 1.17)	(1.13 - 1.17)	(1.13 - 1.17)
Gender: Female = 1, Women (binary)			0.66**	0.64***	0.61***	0.62**	0.65**	0.64**	0.63**
			(0.51 - 0.86)	(0.49 - 0.83)	(0.47 - 0.81)	(0.46 - 0.84)	(0.48 - 0.87)	(0.48 - 0.86)	(0.47 - 0.84)
Educational attainment (continuous)				0.88*	0.89	0.98	0.99	1.00	1.01
				(0.78 - 0.99)	(0.79 - 1.01)	(0.86 - 1.11)	(0.87 - 1.13)	(0.87 - 1.14)	(0.88 - 1.15)
Race = 1, Blacks (ref. Whites)					2.21**	2.44**	2.42***	2.17**	2.11**
					(1.33 - 3.66)	(1.43 - 4.17)	(1.43 - 4.09)	(1.28 - 3.69)	(1.23 - 3.61)
Race = 2, Other race (ref. Whites)					1.01	1.10	1.05	1.06	1.06
					(0.48 - 2.09)	(0.52 - 2.30)	(0.48 - 2.27)	(0.49 - 2.31)	(0.48 - 2.32)
Smoking = 1, Cigarette smoker (binary)						2.86***	2.92***	2.93***	2.86***
						(1.99 - 4.09)	(2.04 - 4.19)	(2.04 - 4.21)	(1.98 - 4.12)
CVD = 1, CVD (binary)							3.66***	3.72***	3.61***
							(1.74 - 7.71)	(1.75 - 7.92)	(1.70 - 7.66)
Aids = 1, AIDS/HIV (binary)								4.78	4.35
								(0.58 - 39.51)	(0.44 - 42.51)
Physical activity (continuous)									0.94
									(0.84 - 1.05)
Constant	0.17***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
	(0.10 - 0.27)	(0.00 - 0.00)	(0.00 - 0.00)	(0.00 - 0.00)	(0.00 - 0.00)	(0.00 - 0.00)	(0.00 - 0.00)	(0.00 - 0.00)	(0.00 - 0.00)
Observations	2,910	2,910	2,910	2,910	2,910	2,910	2,910	2,910	2,910

Exponentiated coefficients representing odds ratios of the logistic regression models. 95% percent confidence intervals in parentheses.

*** p<0.001, ** p<0.01, * p<0.05, + p<0.01

Data: MIDUS 1995/96 and mortality information.

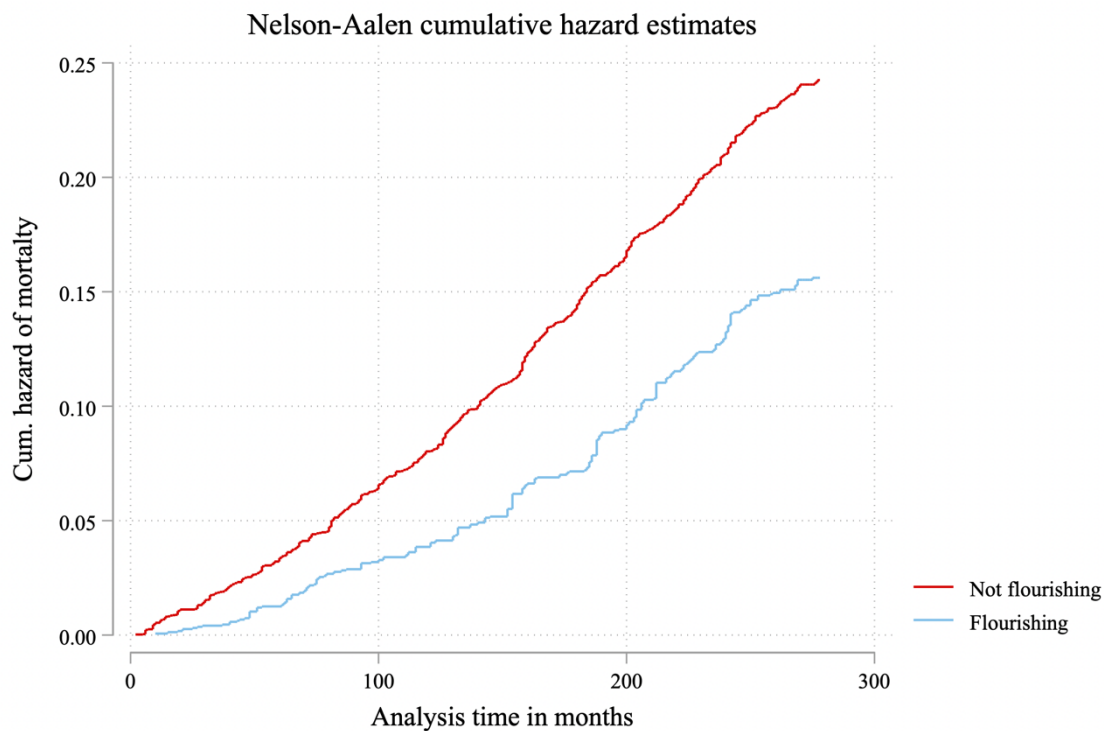


Figure 21 Cumulative hazard estimates of mortality risk by PMH status (not flourishing vs flourishing) (MIDUS 1995/96 and mortality information)

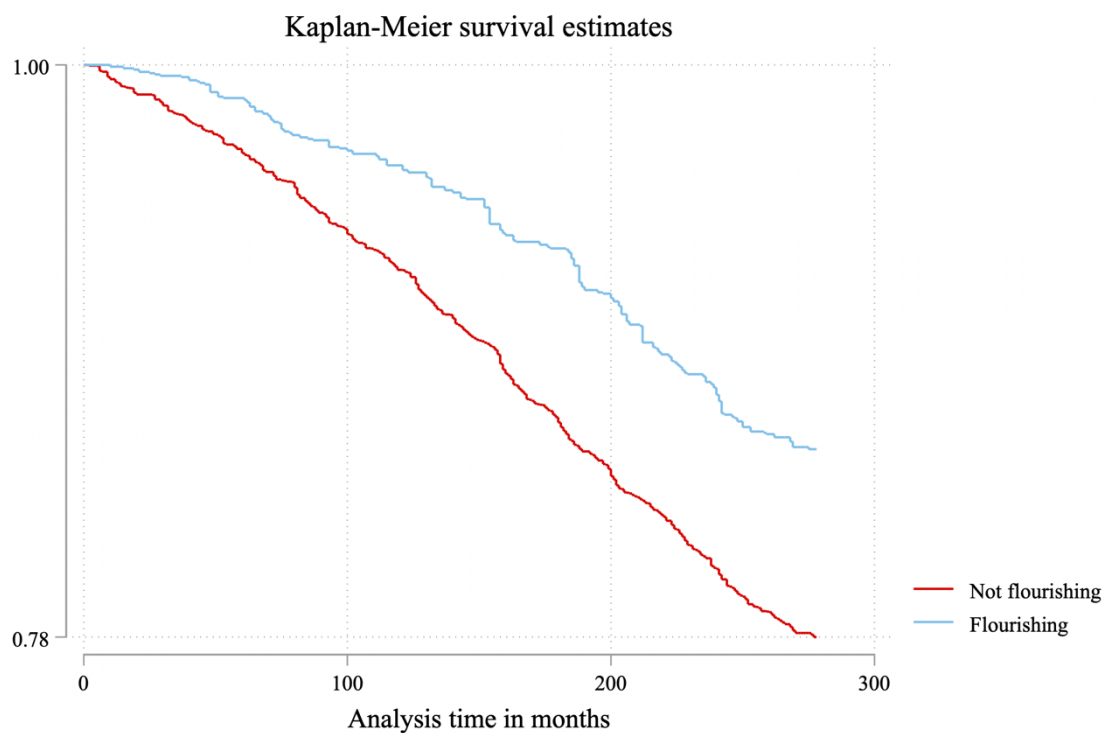


Figure 22 Kaplan-Meier survival estimates of longevity by PMH status (flourishing vs not flourishing) (MIDUS 1995/96 and mortality information)

Table 69 Models 2a to 2i: Replication models of mortality risk with nested Cox-proportional hazards survival models as extensions (MIDUS 1995/96 and mortality information)

	M2a	M2b	M2c	M2d	M2e	M2f	M2g	M2h	M2i
PMH = 0, Not flourishing (ref. Flourishing)	1.57*	1.50**	1.51**	1.47*	1.46*	1.54*	1.51*	1.48*	1.48*
	(1.01 - 2.43)	(1.12 - 2.02)	(1.14 - 2.00)	(1.07 - 2.01)	(1.08 - 1.97)	(1.06 - 2.25)	(1.03 - 2.20)	(1.02 - 2.16)	(1.00 - 2.19)
Chronological age		1.11***	1.11***	1.11***	1.11***	1.12***	1.12***	1.12***	1.12***
		(1.10 - 1.12)	(1.10 - 1.12)	(1.10 - 1.12)	(1.10 - 1.12)	(1.11 - 1.13)	(1.11 - 1.13)	(1.11 - 1.13)	(1.11 - 1.13)
Gender: Female = 1, Women (binary)			0.76**	0.74**	0.72***	0.73**	0.76**	0.75**	0.72**
			(0.64 - 0.92)	(0.61 - 0.89)	(0.60 - 0.87)	(0.60 - 0.89)	(0.62 - 0.92)	(0.61 - 0.91)	(0.59 - 0.88)
Educational attainment (continuous)				0.90*	0.91*	0.97	0.98	0.99	1.00
				(0.83 - 0.98)	(0.84 - 0.99)	(0.89 - 1.07)	(0.90 - 1.08)	(0.90 - 1.08)	(0.91 - 1.09)
Race = 1, Blacks (ref. Whites)					1.69***	1.78***	1.86***	1.74***	1.65**
					(1.24 - 2.31)	(1.30 - 2.45)	(1.35 - 2.55)	(1.26 - 2.40)	(1.18 - 2.31)
Race = 2, Other race (ref. Whites)					0.93	1.03	0.97	0.98	0.96
					(0.55 - 1.57)	(0.61 - 1.74)	(0.56 - 1.68)	(0.56 - 1.70)	(0.55 - 1.68)
Smoking = 1, Cigarette smoker (binary)						2.56***	2.63***	2.67***	2.58***
						(2.00 - 3.27)	(2.06 - 3.36)	(2.09 - 3.41)	(2.00 - 3.32)
CVD = 1, CVD (binary)							2.06***	2.06***	1.99***
							(1.44 - 2.95)	(1.44 - 2.96)	(1.37 - 2.88)
Aids = 1, AIDS/HIV (binary)								4.82	4.00
								(0.92 - 25.24)	(0.63 - 25.52)
Physical activity (continuous)									0.93*
Observations	2,910	2,910	2,910	2,910	2,910	2,910	2,910	2,910	2,910

Exponentiated coefficients representing hazard ratios of the Cox proportional hazards models. 95% percent confidence intervals in parentheses.

*** p<0.001, ** p<0.01, * p<0.05, + p<0.01

Data: MIDUS 1995/96 and mortality information.

Table 70 Models 3a to 3i Replication models of mortality risk with nested Cox-proportional hazards survival models as extensions and NMH (MIDUS 1995/96 and mortality information)

	M3a	M3b	M3c	M3d	M3e	M3f	M3g	M3h	M3i
PMH = 0, Not flourishing (ref. Flourishing)	1.62*	1.46*	1.46**	1.42*	1.40*	1.49*	1.44*	1.42	1.41
	(1.04 - 2.52)	(1.09 - 1.95)	(1.11 - 1.92)	(1.04 - 1.92)	(1.04 - 1.87)	(1.03 - 2.13)	(1.01 - 2.07)	(0.99 - 2.03)	(0.98 - 2.04)
Chronological age		1.11***	1.11***	1.11***	1.11***	1.12***	1.12***	1.12***	1.12***
		(1.10 - 1.12)	(1.10 - 1.12)	(1.10 - 1.12)	(1.10 - 1.12)	(1.11 - 1.13)	(1.11 - 1.13)	(1.11 - 1.13)	(1.11 - 1.13)
Gender: Female = 1, Women (binary)			0.74**	0.72***	0.70***	0.72**	0.74**	0.73**	0.70***
			(0.62 - 0.90)	(0.60 - 0.87)	(0.58 - 0.85)	(0.59 - 0.88)	(0.60 - 0.90)	(0.59 - 0.89)	(0.57 - 0.86)
Educational attainment (continuous)				0.90*	0.91*	0.97	0.98	0.99	0.99
				(0.83 - 0.98)	(0.84 - 0.99)	(0.89 - 1.06)	(0.90 - 1.08)	(0.90 - 1.08)	(0.91 - 1.09)
Race = 1, Blacks (ref. Whites)					1.76***	1.83***	1.91***	1.80***	1.70**
					(1.29 - 2.40)	(1.33 - 2.51)	(1.39 - 2.62)	(1.30 - 2.48)	(1.21 - 2.39)
Race = 2, Other race (ref. Whites)					0.91	1.01	0.95	0.96	0.94
					(0.54 - 1.52)	(0.60 - 1.69)	(0.55 - 1.63)	(0.56 - 1.65)	(0.54 - 1.63)
Smoking = 1, Cigarette smoker (binary)						2.50***	2.57***	2.60***	2.51***
						(1.95 - 3.22)	(2.01 - 3.30)	(2.03 - 3.34)	(1.94 - 3.24)
CVD = 1, CVD (binary)							2.11***	2.11***	2.04***
							(1.48 - 3.02)	(1.47 - 3.03)	(1.41 - 2.95)
Aids = 1, AIDS/HIV (binary)								4.49	3.73
								(0.88 - 22.88)	(0.61 - 22.95)
Physical activity (continuous)									0.93*
									(0.86 - 1.00)
NMH = 1, Mental illness (ref. No mental illness)	0.82	1.26	1.33*	1.32*	1.41*	1.28	1.32	1.33	1.36*
	(0.64 - 1.04)	(0.97 - 1.63)	(1.02 - 1.73)	(1.01 - 1.73)	(1.07 - 1.87)	(0.96 - 1.70)	(0.99 - 1.76)	(1.00 - 1.78)	(1.02 - 1.80)
Observations	2,910	2,910	2,910	2,910	2,910	2,910	2,910	2,910	2,910

Exponentiated coefficients representing hazard ratios of the Cox proportional hazards models. 95% percent confidence intervals in parentheses.

*** p<0.001, ** p<0.01, * p<0.05, + p<0.01

Data: MIDUS 1995/96 and mortality information.

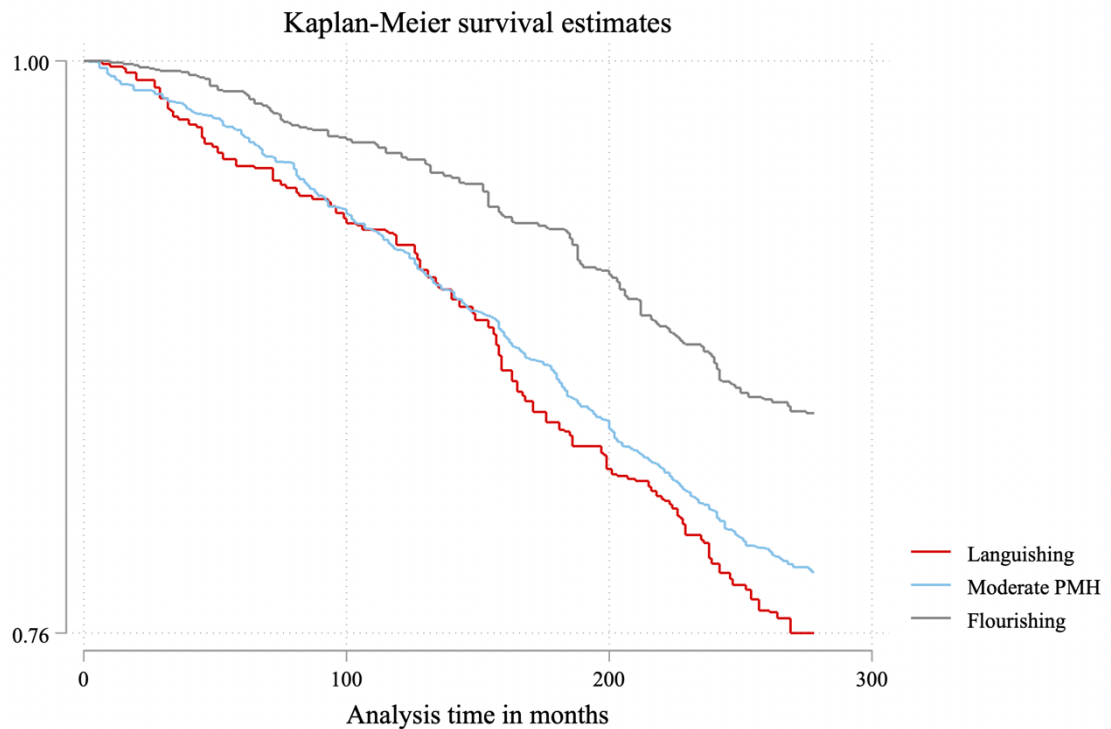


Figure 23 Kaplan-Meier survival estimates by the more detailed PMH status (languishing, moderate PMH, flourishing) (MIDUS 1995/96 and mortality information)

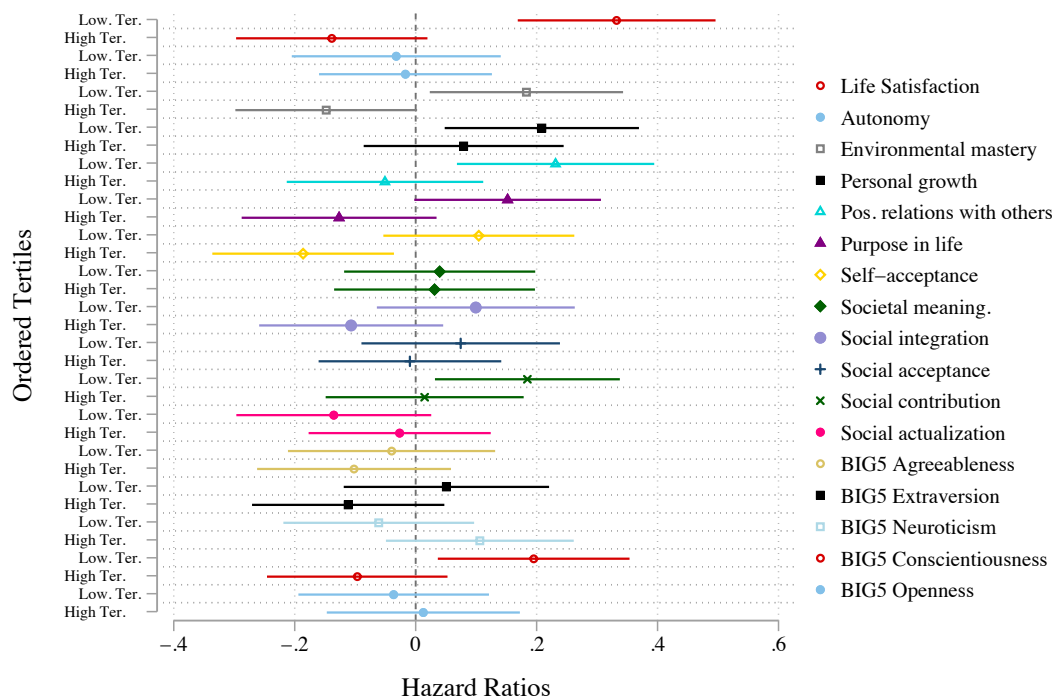


Figure 24 Supplementary material: Level effect of the psychological or mental health variables as based on Cox proportional hazards survival models of mortality risk (MIDUS 1995/96 and mortality information)

Table 71 Models 4a to 4i Cox proportional hazards models of mortality risks by the more detailed PMH measures based (MIDUS 1995/96 and mortality information)

	M4a	M4b	M4c	M4d	M4e	M4f	M4g	M4h	M4i
PMH = 0, Languishing (ref. Moderate PMH)	1.14 (0.90 - 1.43)	1.53*** (1.22 - 1.91)	1.58*** (1.26 - 1.97)	1.54*** (1.22 - 1.93)	1.54*** (1.22 - 1.95)	1.48** (1.17 - 1.88)	1.50*** (1.18 - 1.90)	1.47** (1.16 - 1.87)	1.45** (1.14 - 1.85)
PMH = 2, Flourishing (ref. Moderate PMH)	0.66 (0.42 - 1.02)	0.73* (0.54 - 0.98)	0.73* (0.55 - 0.96)	0.74 (0.55 - 1.01)	0.75 (0.56 - 1.00)	0.70 (0.49 - 1.01)	0.72 (0.50 - 1.04)	0.73 (0.51 - 1.05)	0.73 (0.50 - 1.06)
Chronological age		1.11*** (1.10 - 1.12)	1.11*** (1.10 - 1.12)	1.11*** (1.10 - 1.12)	1.11*** (1.10 - 1.12)	1.12*** (1.11 - 1.13)	1.12*** (1.11 - 1.13)	1.12*** (1.11 - 1.13)	1.12*** (1.11 - 1.13)
Gender: Female = 1, Women (binary)			0.74** (0.62 - 0.89)	0.72*** (0.60 - 0.87)	0.71*** (0.58 - 0.85)	0.72*** (0.59 - 0.87)	0.74** (0.60 - 0.90)	0.73** (0.60 - 0.90)	0.71*** (0.58 - 0.87)
Educational attainment (continuous)				0.91* (0.84 - 0.99)	0.92 (0.85 - 1.00)	0.98 (0.90 - 1.08)	0.99 (0.91 - 1.09)	1.00 (0.91 - 1.10)	1.00 (0.92 - 1.10)
Race = 1, Blacks (ref. Whites)					1.73*** (1.27 - 2.35)	1.82*** (1.33 - 2.49)	1.90*** (1.39 - 2.59)	1.78*** (1.29 - 2.44)	1.70** (1.21 - 2.37)
Race = 2, Other race (ref. Whites)					0.91 (0.54 - 1.55)	1.01 (0.60 - 1.70)	0.92 (0.52 - 1.65)	0.94 (0.52 - 1.67)	0.92 (0.52 - 1.66)
Smoking = 1, Cigarette smoker (binary)						2.52*** (1.97 - 3.22)	2.59*** (2.03 - 3.30)	2.63*** (2.06 - 3.36)	2.55*** (1.98 - 3.28)
CVD = 1, CVD (binary)							2.09*** (1.47 - 2.97)	2.09*** (1.46 - 2.98)	2.02*** (1.41 - 2.90)
Aids = 1, AIDS/HIV (binary)								4.07 (0.72 - 23.14)	3.37 (0.49 - 23.41)
Physical activity (continuous)									0.94 (0.87 - 1.01)
Observations	2,910	2,910	2,910	2,910	2,910	2,910	2,910	2,910	2,910

Exponentiated coefficients representing hazard ratios of the Cox proportional hazards models. 95% percent confidence intervals in parentheses.

*** p<0.001, ** p<0.01, * p<0.05, + p<0.01

Data: MIDUS 1995/96 and mortality information.

Table 72 Models 5a to 5e: Cox proportional hazards model of mortality risk by the detailed PMH status with additional control variables (MIDUS 1995/96 and mortality information)

	M5a	M5b	M5c	M5d	M5e
PMH = 0, Languishing (ref. Moderate PMH)	1.54*** (1.22 - 1.95)	1.50*** (1.19 - 1.89)	1.36* (1.07 - 1.73)	1.43** (1.13 - 1.82)	1.30* (1.02 - 1.65)
PMH = 2, Flourishing (ref. Moderate PMH)	0.75 (0.56 - 1.00)	0.83 (0.63 - 1.09)	0.88 (0.67 - 1.16)	0.85 (0.65 - 1.12)	0.93 (0.70 - 1.24)
Chronological age	1.11*** (1.10 - 1.12)	1.12*** (1.10 - 1.13)	1.12*** (1.10 - 1.13)	1.12*** (1.11 - 1.13)	1.12*** (1.10 - 1.13)
Gender: Female = 1, Women (binary)	0.71*** (0.58 - 0.85)	0.70*** (0.57 - 0.87)	0.71** (0.57 - 0.87)	0.69*** (0.56 - 0.85)	0.69*** (0.56 - 0.86)
Educational attainment (continuous)	0.92 (0.85 - 1.00)	0.93 (0.85 - 1.01)	0.90* (0.83 - 0.99)	0.93 (0.85 - 1.01)	0.97 (0.89 - 1.06)
Race = 1, Blacks (ref. Whites)	1.73*** (1.27 - 2.35)	1.77*** (1.30 - 2.42)	1.77*** (1.28 - 2.46)	1.84*** (1.34 - 2.52)	1.76*** (1.29 - 2.42)
Race = 2, Other race (ref. Whites)	0.91 (0.54 - 1.55)	0.90 (0.53 - 1.51)	0.87 (0.51 - 1.48)	0.89 (0.53 - 1.49)	0.82 (0.49 - 1.37)
Marital status = 1, Married (Ref. Single)		0.57** (0.37 - 0.87)	0.62* (0.40 - 0.95)	0.57** (0.38 - 0.87)	0.56** (0.37 - 0.84)
Marital status = 2, Separated/Divorced/Widowed (Ref. Single)		0.64* (0.42 - 1.00)	0.74 (0.48 - 1.14)	0.62* (0.40 - 0.96)	0.62* (0.41 - 0.94)
Income (log.)		0.96 (0.89 - 1.04)	0.97 (0.89 - 1.06)	0.96 (0.89 - 1.04)	0.97 (0.90 - 1.05)
Religious attendance (continuous)		0.87*** (0.81 - 0.93)	0.89** (0.82 - 0.95)	0.87*** (0.81 - 0.93)	0.87*** (0.81 - 0.93)
BIG5 Agreeableness (continuous)			1.08 (0.97 - 1.21)		
BIG5 Extraversion (continuous)			0.84** (0.74 - 0.95)		
BIG5 Neuroticism (continuous)			1.06 (0.96 - 1.18)		
BIG5 Conscientiousness (continuous)			0.90 (0.81 - 1.01)		
BIG5 Openness (continuous)			1.14 (1.00 - 1.29)		
NMH = 1, Mental illness (ref. No mental illness)				1.36* (1.02 - 1.80)	1.28 (0.97 - 1.70)
Self-rated health (continuous)					0.75*** (0.67 - 0.83)
Cancer diagnosis (ever) = 1, Cancer diagnosis (binary)					1.08 (0.76 - 1.52)
Observations	2,859	2,859	2,859	2,859	2,859

Exponentiated coefficients representing hazard ratios of the Cox proportional hazards models. 95% percent confidence intervals in parentheses.

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Data: MIDUS 1995/96 and mortality information.

Table 73 Models 6a to 6d: Cox proportional hazards models of mortality risk by the more detailed PMH measure with interaction effect for gender, education, mother's education, and NMH (MIDUS 1995/96 and mortality risk)

	M6a	M6b	M6c	M6d
PMH = 0, Languishing (ref. Moderate PMH)	0.92 (0.64 - 1.32)	1.03 (0.68 - 1.55)	1.07 (0.75 - 1.53)	
PMH = 2, Flourishing (ref. Moderate PMH)	1.19 (0.88 - 1.61)	0.38* (0.15 - 0.92)	0.53 (0.27 - 1.01)	
Chronological age	1.07*** (1.06 - 1.08)	1.16*** (1.13 - 1.19)	1.14*** (1.12 - 1.17)	1.07*** (1.06 - 1.08)
Gender: Female = 1, Women (binary)	0.91 (0.73 - 1.15)	0.76** (0.61 - 0.93)	0.74** (0.60 - 0.92)	0.75* (0.61 - 0.94)
Race = 1, Blacks (ref. Whites)	1.27 (0.92 - 1.75)	1.27 (0.92 - 1.77)	1.27 (0.88 - 1.84)	1.29 (0.93 - 1.81)
Race = 2, Other race (ref. Whites)	0.49** (0.30 - 0.80)	0.54* (0.33 - 0.88)	0.36*** (0.20 - 0.64)	0.55* (0.34 - 0.89)
Race = 1, Blacks (ref. Whites)		0.68*** (0.61 - 0.75)		0.74*** (0.66 - 0.83)
Race = 2, Other race (ref. Whites)		0.99 (0.77 - 1.28)		
Languish X Male	1.00 (1.00 - 1.00)			
Languish X Female	1.35 (0.84 - 2.18)			
Moderate X Male	1.00 (1.00 - 1.00)			
Moderate X Female	1.00 (1.00 - 1.00)			
Flourish X Men	1.00 (1.00 - 1.00)			
Flourish X Female	0.31** (0.15 - 0.65)			
Moderate X Education		1.00 (1.00 - 1.00)		
Flourish X Education		1.47* (1.05 - 2.07)		
Mother's education			0.64*** (0.56 - 0.75)	
Languish X Mother's education			1.02 (0.71 - 1.46)	
Moderate x Mother's education			1.00 (1.00 - 1.00)	
Flourish X Mother's education			1.41 (1.00 - 1.99)	
Mental health status = 0, Not flourishing				1.53 (0.93 - 2.53)
NMH = 1, Mental illness (ref. No mental illness)				1.26 (0.43 - 3.66)
Languish X No mental illness				1.00 (1.00 - 1.00)
Languish X Mental illness				0.67 (0.23 - 2.00)
Moderate X No mental illness				1.00 (1.00 - 1.00)
Moderate X Mental illness				1.00 (1.00 - 1.00)
Observations	2,941	2,941	2,941	2,941

Exponentiated coefficients representing hazard ratios of the Cox proportional hazards models. 95% percent

*** p<0.001, ** p<0.01, * p<0.05, + p<0.01

Data: MIDUS 1995/96 and mortality information.

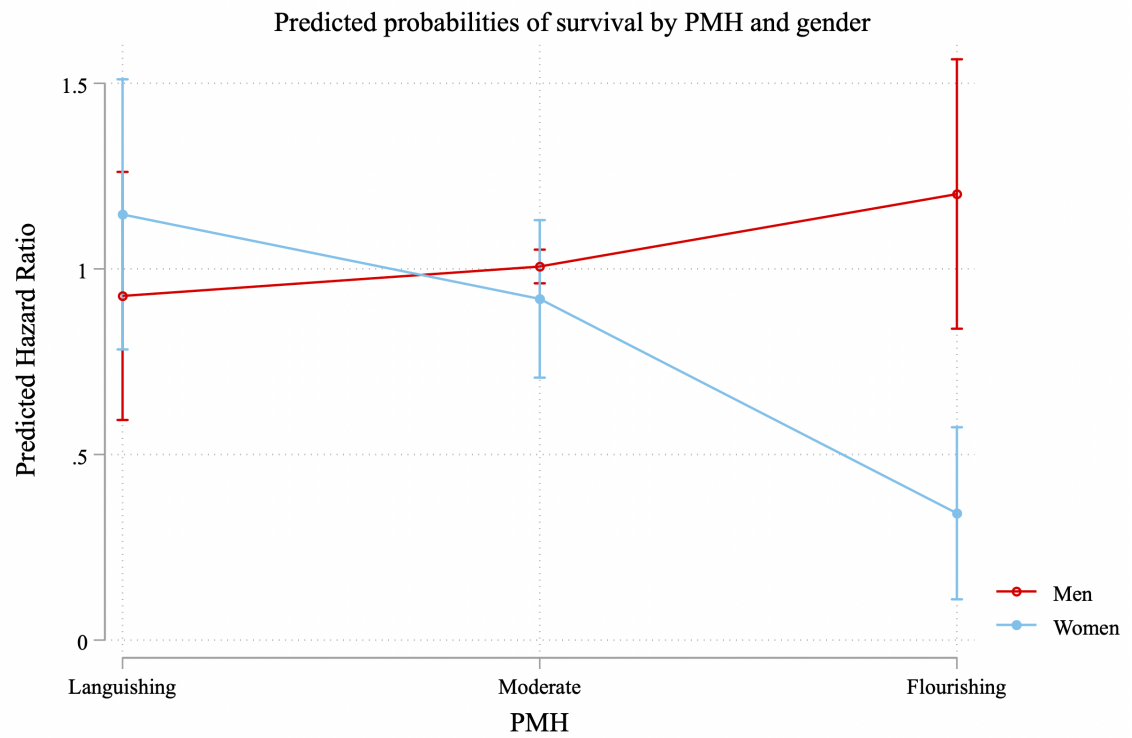


Figure 25 Predicted probability of mortality risk with the interaction effect of model 6a: Detailed PMH and gender (MIDUS 1995/96 and mortality information)

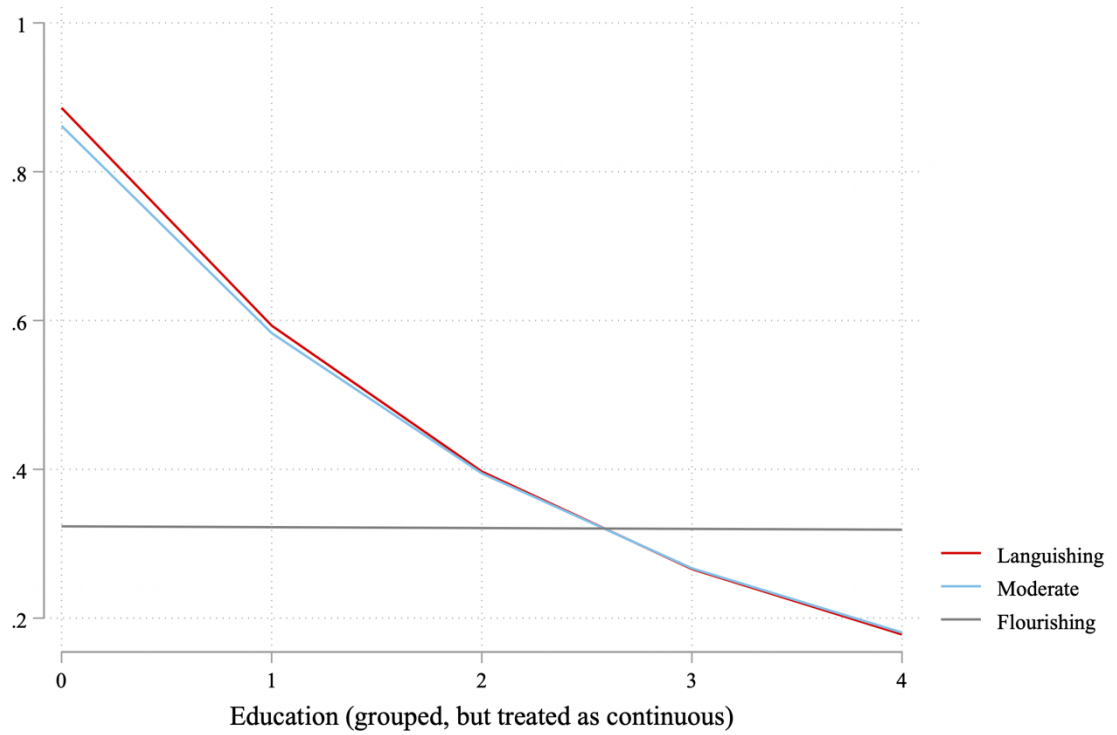


Figure 26 Predicted probability of mortality risk with the interaction effect of model 6a: Detailed PMH and education (MIDUS 1995/96 and mortality information)

With increasing analysis time, the hazard rate of death steadily becomes more likely.

To test the dual continua model, Models 3a-3i include NMH as a control variable. As the Hazard Ratios are essentially identical in Models 3a to 3g, compared to when not accounting for NMH in the previous models, this suggests that PMH and NMH have unique and distinct associations with mortality. Indeed, NMH and PMH are jointly significant of mortality risk.

5.4.1 A finer differentiation of PMH

As a means of providing further specificity, the MHC-SF is now analysed in three instead of two groups. While the Kaplan-Meier survival estimates show that languishing and moderate mental health may indeed be grouped together as they show similar patterns, the following results still point to important details:

Models 4a to 4i (Table 71) – Cox proportional Hazards models of mortality risk on three three-grouped PMH indicator show that it is indeed the languishing domain of PMH that drives the association with mortality risk, not the flourishing one. While the original findings presented by Keyes suggested that the absence of flourishing is a concern for longevity, this finer analysis shows that it is the presence of languishing that drives the associations. People or health professionals should not necessarily boost maximum flourishing but avoid languishing whenever possible.

In Models 5a to 5e we arguably over-control by adding religiosity, the BIG5, NMH, self-rated health and cancer diagnosis, but the effect of languishing remains statistically significant at HR 1.30 (95% confidence interval 1.02-1.64, $p < 0.05$) of higher chances of mortality compared to those with moderate PMH. The HRs for flourishing point to a protective dimension, but statistical significance is not reached. Jointly controlling for

self-rated health and NMH, as well as other covariates in Model 5e, still points to a unique and distinct effect of PMH that cannot be explained away.

Finally, models 6a to 6d explore the interaction of sociodemographic factors with PMH. The results show that the effect of flourishing is particularly strong for women (compared to men): Whereas there is no difference in HR of mortality between men and women when they are languishing or in moderate PMH, while controlling for other factors, women have significantly smaller HR when they are flourishing.

Relating to the interaction of education and PMH, the importance of languishing and moderate PMH is striking for those with lower educational achievement.

5.5 Discussion

The purpose of this study was to examine the association of PMH with mortality and to compare this connection with established measures of NMH (depression) and related other dimensions of mental health and psychological functioning. Death is one of the most critical life-course events, and if the PMH approach has distinct explanatory power in this area of research, then one could expect it to be associated with mortality.

PMH is defined as the combination of emotional, psychological, and social well-being (Keyes 2002; Keyes, Shmotkin and Ryff 2002; Seligman 2008b). It is empirically operationalised via the popular flourishing-languishing scale developed by Keyes. This study uses - to the author's best knowledge – the most extended follow-up period of baseline PMH. Furthermore, this is also the most detailed account yet to consider level effects in a holistic assessment of all dimensions of mental health.

First research question (“replications and extensions of the initial study”)

Overall, the results of this study suggest that the integrated PMH approach has a strong association with mortality risk. Confirming Keyes and Simoes (2012a; 2012b) results which were based on a 10-year follow-up with a 21-year follow-up period, a statistically significant effect when employing a binary model of flourishing and a joint languishing-moderate PMH category as the reference group is found. When using all three original dimensions of the scale, a stable negative effect of low PMH on mortality has been detected. This means that the absence of PMH predicts mortality risk. The effect size of the absence of PMH on mortality (HR around 1.45) is larger than the one of NMH.

The hazard ratios for PMH found in this study are like the ones reported in meta-studies of mental well-being measures on mortality (Chida and Steptoe 2008). Our findings on PMH remain significant even when controlling for health behaviour (in addition to

health diagnosis) indicators. This suggests that flourishing and psychological functioning matter at least as much as hedonic or cognitive well-being in isolation (Huppert 2009; Keyes 2005; Seligman and Csikszentmihalyi 2014).

Liu et al.'s (2016) large meta-study did not find statistically sound associations between happiness and mortality. In model 3 with self-rated physical health, PMH is similarly made insignificant when controlling for all possible other factors. One nuance might be the issue of short vs long-term effects, not least because short-term mortality risk could have a reverse causal effect. Given that in binary form and when controlling for subjective physical health, the effect is not statistically significant, one might tentatively agree with (Veenhoven 2008) that the effects of PMH on mortality do not accumulate over time in longitudinal studies. If there is a duration effect, it could be one of a weakening association with mortality, as not all of Keyes' 10-year follow-up findings could be confirmed.

In terms of the covariates, the strong link between education and PMH, and by implication mortality, has also been found by other researchers (Huppert 2009; Keyes 2007). Old age is strongly related to a higher risk of mortality, but it is simultaneously associated with better PMH, which mitigates the effect of age as a risk factor (Wiest et al. 2011). The authors found that the effects of subjective well-being (SWB), life-satisfaction and positive affect on mortality disappeared once one controls for physical health: In this study, it appears that PMH matters even when one controls for specific physical health conditions like cancer, disability, or BMI, but not when including self-rated physical health. Additionally, we found compelling evidence that health behaviour in smoking and physical activity has a substantial effect on mortality risk and that they explain a small amount of the variance in PMH. Stable personality traits are only

weakly linked to mortality in this study, but we can confirm a protective effect of conscientiousness (Lamers et al. 2012).

This study finds no statistical evidence for interaction effects that would correspond to protective effects of PMH with depression or enhancing effects in the case of absence of depression (Models 5e and 5f). Under the dual continua model, one might have expected to find such interactions terms to be present for extreme cases (Winzer et al. 2014), but the fact that the mediation model in which PMH and NMH are jointly significant is highly significant. One may argue that the data is not necessarily developed detailed to specify cross-interactions over a prolonged amount of time.

Another contribution of this study is its detailed investigation of a holistic range of psychometric variables. The field of research has been limited by the fact that scholars often pick individual mental health or psychological items one at a time without simultaneously controlling for the shared variances of related mental health indicators. This has led to contradictory findings, and it makes comparisons difficult. Even though the individual scales and indicators are only moderately correlated, we found robust evidence that the lowest tertile mainly drives the overall relationship between the psychological and social well-being scales, life satisfaction, and positive affect with mortality: Deprivation of positive psychological, eudaimonic and social well-being links to mortality.

In contrast, only extremely high self-acceptance has a uniquely predictive effect compared to middle levels. Overall, these findings are essential for the framing of the PMH framework. For instance, the focus should be more on avoiding languishing than necessarily aiming for flourishing. Psychologists like to think about this in terms of a “healthy personality”, and the results hence show that one cannot maximise one a single dimension of PMH alone. Incidentally, this finding could support the flourishing-

languishing scale because its scoring mechanism only demands a total joint presence of six out of eleven and one out of two items. On the other hand, some vagueness or flexibility in the PMH concept is not necessarily harmful (Seligman 2008b).

Some researchers have suggested that the differences between mental health variables are overstated and that these differences might be due to the wording differences (Mäkikangas et al. 2006; Shevlin and Adamson 2005). This is to say that genuinely negative scales, as in the case of depression or anxiety or other mental illnesses, would exhibit genuinely distinct patterns from positive ones. Despite the positive wordings, one cannot say that the positive scales differentiate at the highest level apart from self-acceptance. One could speculate how sometimes people might overestimate their psychological functioning (so-called positive illusions), thereby obscuring the otherwise positive effect, but this cannot be inferred from the present study.

The multidimensionality of mental health and illness is frequently ignored in the applied research field (Ryff and Singer 1998). The question of whether the integrated PMH framework truly makes a unique contribution to our understanding of the association of mental health with mortality has not been conclusively settled yet (Kashdan, Biswas-Diener and King 2008), even if most of the studies do support this notion. Nonetheless, the results of this study show that the theory-guided reasons in favour of a PMH approach are reflected in empirical reality, even if not operating via the top levels of PMH. However, it would be overenthusiastic to completely abandon established measures like life satisfaction based on the presented finding, but one can concur with Vanhoutte (2014) that only using a unidimensional well-being concept would not capture the full complexity of mental well-being (but it would be appropriate if one has a theoretical or data-driven reason for doing so).

Second research question (“languishing vs flourishing”)

Major new insights have been derived into the exact nature of positive mental health. In essence, one can say that it is not actually the presence of top levels of flourishing that drives the protective effect on mortality, but instead, it is the presence of languishing that is the lowest levels of positive mental health that drive these associations. Crucially, though, the presence of languishing is not the same as the presence of negative mental health; it is a unique aspect of positive mental health on its own. Conceptually, this might be somewhat confusing because one is inclined to focus on the positive aspect of positive mental health because of the positive wording of the scale. However, it does make sense that just because one has a positive continuum, there is an effect that occurs at the low level of this positive continuum. And this is still distinct from the negative continuum of mental health. Basically, one could say that it's important to differentiate level effects within the continuum.

Third research question (“interaction effects of PMH with sociological factors in shaping mortality risk”)

Very powerful interaction effects of sociological and demographic factors have been reported. This is important because one might criticize the concept of positive mental health by referring to a tangentially psychologically relevant tool that might be relevant for privileged groups of people. Instead, the results show that positive mental has an effect on preventing mortality risk over a long follow-up period. The protective effect of PMH is most important for those with low levels of socio-economic status, e.g., for those with lower levels of education. To put it differently, the benefit of not languishing is greatest for those with low educational achievement.

5.5.1 Limitations and further research

With regards to survey representativeness, the study is limited by its low sample size of only 3,303 and not all participants were chosen through a random choice design (oversampling of metropolitan regions, targeted inclusion of siblings and twins). The literature does not raise any issues why these factors would be particularly pertinent in explaining the effect of PMH and mortality, but it would be desirable to replicate the analyses on other data sets. Missing data in the mental health variables accounted for a sample size reduction of 15%, and 28% because of other variables, but these numbers are moderate given the long follow-up period. Nonetheless, statistical tools such as the `missForest` package in R are available to impute missing data both on categorical and continuous measures; while those imputed results might not be “better”, one would gain some reassurance that the findings are not affected.

One could consider more frequent measurements of the mental health indicators to reach beyond baseline level differences and to capture changes over time. This would also allow for the identification of potential set-point effects or adaptations over time (Begley 2013). Do trajectories of increasing or decreasing positive mental health have particularly strong effects on mortality risk? There are three main MIDUS waves, i.e., 1995/96, 2004/06, and 2013/14, and it would be possible to consider changes in some dimensions of mental health over those periods. However, a major strength of the study lies in the external mortality information that is not affected by attrition or censoring and some of this advantage might be lost if focusing on the mentioned changes.

In addition to educational and retirement status, we included income as another important dimension of socio-economic status (with largely similar results) but chose to ignore it in the final models because of missing data. Future research projects should consider the effects of the SES variables in detail, especially how changes in SES relate

to changes in mental health and vice versa. More research is needed to test the exact pathways in which PMH might affect mortality.

5.6 Conclusion

This study analysed the long-term associations of PMH with mortality via Cox proportional hazards survival analyses on 21 years of MIDUS data (1995-2005). It was found that PMH, as measured via Keyes' flourishing-moderate-languishing scale, appears to be independently associated with mortality, even when controlling for NMH (depression), psychological traits and objective physical health indicators in the majority of models. These results confirm the dual continua model of mental health on which PMH and NMH operate in a correlated but distinct manner.

Interestingly, the effect stems from the languishing rather than middle or flourishing tertiles of the MHC-SF. This reaffirms the importance of the languishing dimension in Keyes' PMH scale and suggests that the PMH framework should pay attention to the absence of positive psychological states which is not the same as the absence/presence of mental illness.

The dual continua model of mental health is, to a considerable extent, supported by the results of this study as the positive indicators appear to have distinguishable associations with mortality risk. The study also found that there are different associations between the individual indicators of life satisfaction, the BIG5 and eudaimonic social well-being, thereby highlighting the need to theorise one's specific research hypothesis carefully. Low life-satisfaction, personal growth, positive relations with others and social contribution were associated with higher risks of mortality compared to the middle and top tertile. Only the highest tertile of self-acceptance had a differentiable positive effect compared to the middle ones. Personality traits had a weak

association with mortality; only low conscientiousness was associated with worse chances of longevity.

5.7 References

- Baselmans, BML, and M Bartels. 2018. "A genetic perspective on the relationship between eudaimonic -and hedonic well-being." *Sci Rep* 8(1):14610.
- Begley, Nick. 2013. "Psychological adoption and adaptation of eudaimonia."
- Blazer, Dan G. 2003. "Depression in late life: review and commentary." *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences* 58(3):M249-M65.
- Boyle, Patricia A, Lisa L Barnes, Aron S Buchman, and David A Bennett. 2009. "Purpose in life is associated with mortality among community-dwelling older persons." *Psychosomatic medicine* 71(5):574.
- Buck, Nick, and Stephanie McFall. 2011. "Understanding Society: design overview." *Longitudinal and Life Course Studies* 3(1):5-17.
- Carney, Robert M, Kenneth E Freedland, and Richard C Veith. 2005. "Depression, the autonomic nervous system, and coronary heart disease." *Psychosomatic medicine* 67:S29-S33.
- Chida, Y, and A Steptoe. 2008. "Positive psychological well-being and mortality: a quantitative review of prospective observational studies." *Psychosom Med* 70(7):741-56.
- Collins, Amy Love, Noreen Goldman, and Germán Rodríguez. 2008. "Is positive well-being protective of mobility limitations among older adults." *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences* 63(6):P321-P27.

- Cuijpers, Pim, Nicole Vogelzangs, Jos Twisk, Annet Kleiboer, Juan Li, and Brenda W Penninx. 2014. "Comprehensive meta-analysis of excess mortality in depression in the general community versus patients with specific illnesses." *American Journal of Psychiatry* 171(4):453-62.
- Diener, Ed, and Micaela Y Chan. 2011. "Happy people live longer: Subjective well-being contributes to health and longevity." *Applied Psychology: Health and Well-Being* 3(1):1-43.
- Fredrickson, Barbara L. 1998. "What good are positive emotions." *Review of general psychology* 2(3):300-19.
- Frey, Bruno S. 2011. "Happy people live longer." *Science* 331(6017):542-43.
- Friedman, Howard S, and Margaret L Kern. 2014. "Personality, well-being, and health." *Annual review of psychology* 65:719-42.
- Gruenewald, Tara L, Arun S Karlamangla, Gail A Greendale, Burton H Singer, and Teresa E Seeman. 2007. "Feelings of usefulness to others, disability, and mortality in older adults: The MacArthur study of successful aging." *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences* 62(1):P28-P37.
- Hemingway, Harry, and Michael Marmot. 1999. "Evidence based cardiology: psychosocial factors in the aetiology and prognosis of coronary heart disease: systematic review of prospective cohort studies." *BMJ: British Medical Journal* 318(7196):1460.

- Howell, Ryan T., Margaret L. Kern, and Sonja Lyubomirsky. 2007. "Health benefits: Meta-analytically determining the impact of well-being on objective health outcomes." *Health Psychology Review* 1:83-136.
- Humphreys, Brad R, Logan McLeod, and Jane E Ruseski. 2014. "Physical activity and health outcomes: evidence from Canada." *Health Economics* 23(1):33-54.
- Huppert, Felicia A. 2009. "Psychological well-being: Evidence regarding its causes and consequences." *Applied Psychology: Health and Well-Being* 1(2):137-64.
- Kashdan, TB, R Biswas-Diener, and L King. 2008. "Reconsidering happiness: The costs of distinguishing between hedonics and eudaimonia." *The Journal of Positive ...*
- Kendler, Kenneth S, John M Myers, Hermine H Maes, and Corey LM Keyes. 2011. "The relationship between the genetic and environmental influences on common internalizing psychiatric disorders and mental well-being." *Behavior genetics* 41(5):641-50.
- Keyes, CL, SS Dhingra, and EJ Simoes. 2010. "Change in level of positive mental health as a predictor of future risk of mental illness." *Am J Public Health* 100(12):2366-71.
- Keyes, CL, and EJ Simoes. 2012a. "Erratum: To flourish or not: positive mental health and all-cause mortality." *Am J Public Health* 102(11):2164-72.
- . 2012b. "To flourish or not: positive mental health and all-cause mortality." *Am J Public Health* 102(11):2164-72.
- Keyes, Corey L. M. 2002. "The Mental Health Continuum: From Languishing to Flourishing in Life." *Journal of Health and Social Behavior* 43(2):207.

- Keyes, Corey L. M., Dov Shmotkin, and Carol D. Ryff. 2002. "Optimizing well-being: The empirical encounter of two traditions." *Journal of Personality and Social Psychology* 82(6):1007-22.
- Keyes, Corey LM. 2005. "Mental illness and/or mental health? Investigating axioms of the complete state model of health." *Journal of consulting and clinical psychology* 73(3):539.
- . 2007. "Promoting and protecting mental health as flourishing: A complementary strategy for improving national mental health." *American Psychologist* 62(2):95.
- Keyes, Corey LM, Kenneth S Kendler, John M Myers, and Chris C Martin. 2015. "The genetic overlap and distinctiveness of flourishing and the big five personality traits." *Journal of Happiness Studies* 16(3):655-68.
- Koivumaa-Honkanen, Heli, Risto Honkanen, Heimo Viinamaeki, Kauko Heikkilae, Jaakko Kaprio, and Markku Koskenvuo. 2001. "Life satisfaction and suicide: a 20-year follow-up study." *American Journal of Psychiatry* 158(3):433-39.
- Koivumaa-Honkanen, Heli, Risto Honkanen, Heimo Viinamäki, Kauko Heikkilä, Jaakko Kaprio, and Markku Koskenvuo. 2000. "Self-reported life satisfaction and 20-year mortality in healthy Finnish adults." *American Journal of Epidemiology* 152(10):983-91.
- Lamers, Sanne Maria Antoinette. 2012. "Positive mental health: Measurement, relevance and implications."
- Lamers, SM, L Bolier, GJ Westerhof, F Smit, and ET Bohlmeijer. 2012. "The impact of emotional well-being on long-term recovery and survival in physical illness: a meta-analysis." *J Behav Med* 35(5):538-47.

- Liu, Bette, Sarah Floud, Kirstin Pirie, Jane Green, Richard Peto, Valerie Beral, and Million Women Study Collaborators. 2016. "Does happiness itself directly affect mortality? The prospective UK Million Women Study." *The Lancet* 387(10021):874-81.
- Mäkikangas, Anne, Taru Feldt, Ulla Kinnunen, Asko Tolvanen, Marja-Liisa Kinnunen, and Lea Pulkkinen. 2006. "The factor structure and factorial invariance of the 12-item General Health Questionnaire (GHQ-12) across time: Evidence from two community-based samples." *Psychological Assessment* 18(4):444.
- Mezuk, Briana, William W Eaton, Sandra Albrecht, and Sherita Hill Golden. 2008. "Depression and type 2 diabetes over the lifespan: a meta-analysis." *Diabetes care* 31(12):2383-90.
- Osborn, David PJ, Gus Levy, Irwin Nazareth, Irene Petersen, Amir Islam, and Michael B King. 2007. "Relative risk of cardiovascular and cancer mortality in people with severe mental illness from the United Kingdom's General Practice Research Database." *Archives of general psychiatry* 64(2):242-49.
- Penley, Julie A, and Joe Tomaka. 2002. "Associations among the Big Five, emotional responses, and coping with acute stress." *Personality and Individual Differences* 32(7):1215-28.
- Pinquart, Martin, and PR Duberstein. 2010. "Depression and cancer mortality: a meta-analysis." *Psychological Medicine* 40(11):1797-810.
- Pressman, Sarah D, and Sheldon Cohen. 2005. "Does positive affect influence health." *Psychological Bulletin* 131(6):925.

- Rasciute, Simona, and Paul Downward. 2010. "Health or happiness? What is the impact of physical activity on the individual." *Kyklos* 63(2):256-70.
- Richman, Laura Smart, Laura Kubzansky, Joanna Maselko, Ichiro Kawachi, Peter Choo, and Mark Bauer. 2005. "Positive emotion and health: going beyond the negative." *Health Psychology* 24(4):422.
- Rozanski, Alan, James A Blumenthal, and Jay Kaplan. 1999. "Impact of psychological factors on the pathogenesis of cardiovascular disease and implications for therapy." *Circulation* 99(16):2192-217.
- Ryff, Carol D. 1989. "Happiness is everything, or is it? Explorations on the meaning of psychological well-being." *Journal of Personality and Social Psychology* 57(6):1069.
- Ryff, Carol D, and Burton Singer. 1998. "The contours of positive human health." *Psychological Inquiry* 9(1):1-28.
- Ryff, Carol D., and Corey Lee M. Keyes. 1995. "The structure of psychological well-being revisited." *Journal of Personality and Social Psychology* 69(4):719-27.
- Sabatini, Fabio. 2014. "The relationship between happiness and health: evidence from Italy." *Social Science & Medicine* 114:178-87.
- Seligman, Martin EP. 2008. "Positive health." *Applied Psychology* 57:3-18.
- Seligman, Martin EP, and Mihaly Csikszentmihalyi. 2014. "Positive psychology: An introduction." Pp. 279-98 in *Flow and the foundations of positive psychology*: Springer.

Shevlin, Mark, and Gary Adamson. 2005. "Alternative factor models and factorial invariance of the GHQ-12: a large sample analysis using confirmatory factor analysis." *Psychological Assessment* 17(2):231.

Steptoe, A, S Dockray, and J Wardle. 2009. "Positive affect and psychobiological processes relevant to health." *J Pers* 77(6):1747-76.

Surtees, Paul, Nicholas Wainwright, Robert Luben, Kay-Tee Khaw, and Nicholas Day. 2003. "Sense of coherence and mortality in men and women in the EPIC-Norfolk United Kingdom prospective cohort study." *American Journal of Epidemiology* 158(12):1202-09.

Vanhoutte, Bram. 2014. "The multidimensional structure of subjective well-being in later life." *Journal of Population Ageing* 7(1):1-20.

Veenhoven, R. 2008. "Healthy happiness: effects of happiness on physical health and the consequences for preventive health care." *Journal of Happiness Studies* 9(3):449-69.

Waldstein, Shari R, Willem J Kop, Louis A Schmidt, Amy J Haufler, David S Krantz, and Nathan A Fox. 2000. "Frontal electrocortical and cardiovascular reactivity during happiness and anger." *Biological psychology* 55(1):3-23.

Westerhof, Gerben J, and Corey LM Keyes. 2010. "Mental illness and mental health: The two continua model across the lifespan." *Journal of Adult Development* 17(2):110-19.

Wiest, Maja, Benjamin Schüz, Noah Webster, and Susanne Wurm. 2011. "Subjective well-being and mortality revisited: Differential effects of cognitive and emotional facets of well-being on mortality." *Health Psychology* 30(6):728.

Winzer, R, F Lindblad, K Sorjonen, and L Lindberg. 2014. "Positive versus negative mental health in emerging adulthood: a national cross-sectional survey." *BMC Public Health* 14:1238.

6 THESIS DISCUSSION

6.1 Summary of findings

The academic ambition of this thesis was to answer the guiding research question: What are the empirical usefulness and conceptual relevance of PMH indicators, primarily the Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS), for sociological research?

By applying PMH concepts and empirical indicators to various sociological topics, the thesis simultaneously tested core assumptions of the PMH approach while elaborating upon the sociological factors that influence mental health. This thesis represents the first comprehensive longitudinal assessment of the SWEMWBS as a state-of-the-art PMH indicator from a demographic and sociological life course perspective. It employs detailed objective data to confirm whether subjective mental health states correspond to real-world outcomes. While this thesis tackled the topic of PMH in an open-ended way, the fact that the reviewed indicators had to compete with a multitude of related mental health measures, and that they had to stand the test of time, meant that this was a rather demanding litmus test of the relevance of the PMH approach for sociological research, also because the GHQ and SWEMWBS have not been chosen to be maximally different. Crucial empirical strategies and theoretical approaches were the joint modelling of negative and positive mental health to draw out the unique aspects of each scale rather than considering them separately, as well as a focus on the differences of the subdomains of the SWEMWBS. This thesis tests the dual continua model of mental health, its empirical prevalence, predictors, and empirical consequences via looking at diagonal and off-diagonal groups (flourishing, floundering, struggling and languishing) and via jointly accounting for both negative and positive mental health in the same models.

The literature review in the first chapter presented a short history of relevant writing on happiness and mental health, presented the immense popularity of positive psychology in academia and policy, drew out key psychological concepts of self-determination theory, positive emotions, and psychological well-being, explored the dual continua model of mental health, and connected these ideas with important sociological theories and a partial life course approach. The empirical findings of this thesis then execute upon this theoretical foundation.

In the first three empirical chapters, Tennant's and Stewart-Brown's (2007a) SWEMWBS had to compete against two established mental health scales (the GHQ as a measure of negative mental health and, occasionally, single-item life satisfaction). Exploratory and confirmatory factor analyses depicted the distinctiveness of the NMH and PMH scales. By testing the empirical relevance of the dual continua model, important differences across the groups of flourishing and floundering, and struggling and languishing have been established; these grouping had starkly differing patterns across important sociological variables such as educational qualification or parental class, but also across different age groups. These groupings even corresponded to differences on the BIG5 personality traits, the chances of smoking behaviour 10 years later, as well as the development of mental illness and changes in the grouping over the 10 years.

Nuances of the domains of the SWEMWBS were analysed via multidimensional scaling and IRT techniques. The chapter also analysed longitudinal trends of the SWEMWBS and its domains. The allostatic load analysis of the SWEMWBS showed that PMH is predictive of the overall "wear-and-tear" of the body. Considering these difficult benchmarks, the SWEMWBS has proven to have favourable psychometric and distributional properties and to be distinct enough from the GHQ and life satisfaction

indicators to be worthy of separation. The “feeling optimistic” and “feeling useful” domains of the SWEMWBS are found to be particularly distinct from the other domains, showing notable different patterns by age, gender, and education.

The second empirical chapter demonstrated the association of neighbourhood conditions, both in terms of objective neighbourhood deprivation and perceived/social neighbourhood factors with PMH. PMH appears to be particularly well-suited for the sociological study of neighbourhood stratification, even when jointly accounting for NMH as a means of drawing out the distinct contribution of PMH that are not explained by depression, anxiety, or other negative conditions. Importantly, longitudinal evidence was compiled that suggests that living in a less deprived neighbourhood is related to better PMH: This finding, again, was distinct from NMH as predicted by the dual continua model.

As expected from the theoretical overlap between eudaimonia and religion, e.g., factors such as hope and gratitude, there was a robust and substantial positive effect of religiosity on PMH in the third empirical chapter. This association was more pronounced than between religiosity and the competing mental health variables. Interestingly, religiosity seems particularly pertinent for the top levels (at the 85th percentile) of PMH, and not so much as a protective effect at the lower levels. Longitudinal panel data analyses further corroborated the robustness of the association between religiosity and PMH. Another outcome of this study is that the indicators on the importance of religiosity rather than the one on religious attendance were most prominently associated with PMH.

The final (fourth) empirical chapter confirmed the long-term protective effect of PMH on mortality risk on American MIDUS data, thereby giving compelling evidence that PMH can have major influences on the most important physical health outcome. Level

effects in terms of buffering and boosting were tested as they are key theoretical PMH dimensions. Interestingly, it was the languishing dimension of PMH that had a negative effect on mortality, and not the flourishing dimension. Negative and PMH were operationalised via Keyes' (2007; 2010) dual continua model, and it is important to note that this finding is qualitatively different than stating that the absence of NMH is associated with lower mortality risks; both statements are equally true and henceforth support the dual continua approach. Nonetheless, the data were not detailed enough to draw out the specific pathways between longevity and PMH, and it is a limiting factor that the inclusion of self-rated health explains away the effect of PMH.

One powerful demonstration of the costs of a lack of eudaimonia is found in Nobel Laureate Angus Deaton's (2018) analysis of the detrimental effects of the rise of "deaths of despair", mainly as a result of the opioid epidemic. In a complete reversal of long-lasting demographic trends, working-class middle-aged white non-Hispanic Americans now face falling levels of life expectancy and increasing rates of suicide. Similarly, Emile Durkheim (2005[1897]) reported differences in suicide rates between Catholic and Protestant regions and thereby established sociology as an empirical scientific discipline. Both scholars touch upon the theme of eudaimonia and at least indirectly find that losing the belief in a better future can have detrimental consequences.

In summary, the findings presented in the previous five empirical chapters provide evidence that PMH is an empirically relevant dimension for sociological research. The results have also shown that even though there is an overlap between the SWEMWBS and the more established indicators of NMH (GHQ) and life satisfaction, PMH is still distinctly and independently associated with sociological applications of interest. Indeed, in the sociological applications of religiosity and neighbourhood conditions, the SWEMWBS enabled novel and distinct insights. Moreover, the SWEMWBS certainly

proved to be performing favourably from a formal psychometric assessment. These results mostly corroborate the notion that PMH is a real and distinguishable aspect of mental health, even if there was a significant amount of overlap between the mental health dimensions that needs to be taken into consideration.

A major theme throughout the thesis is that PMH is not one uniform construct and that large differences occurred in the subdimensions of the SWEMWBS. The inventors of the SWEMWBS have integrated different dimensions of mental health (eudaimonic, hedonic and social well-being) into an overall scale, and this allowed focusing on the subdomains of the eudaimonic and social aspects as they represented the unique aspects that are not part of the competing NMH or other affective scales. Indeed, two of the items of the SWEMWBS, “feeling optimistic about the future” and “feeling useful”, have emerged as particularly distinctive (in terms of the multidimensional scaling, IRT, neighbourhood associations with the IMD, religiosity patterns, but also just with demographic variables). Even though “feeling optimistic about the future” could, to small part, be used as an affective dimension and “feeling useful” as a satisfaction item (Watson 2018), one would be justified to denote them as eudaimonic items in light of the emerging PMH literature and the way in which other scales have incorporated these dimensions in particular.

The health benefits of optimism have now been noted quite widely (Bouchard et al. 2017; O'Connor and Graham, 2019), even during the COVID-19 pandemic as a protector against stress in the UK population (Mead et al. 2021). As pinpointed in the literature section at the beginning, it is useful to build the knowledge base on specific indicators or subdimensions as well as on the overall combined SWEMWBS. Many sociologists might not become interested in the SWEMWBS because certain subdimensions that constitute the scale could be of relevance for their research

endeavours, for instance, when looking at the role of optimism and social mobility or demographic behaviours and autonomy.

The thesis has managed to incorporate – albeit independently and before this was made published- the recommendations that “although extensive research exists, there is a paucity of studies that have jointly examined both [hedonia and eudaimonia] types of well-being” (Ryff, Boylan and Kirsch 2021). If one simply conducts regression models separately of the different dimensions of mental health, it is hard to identify the differences between them as each scale or construct shares a large part of the variance with an underlying mental health trait. It is important to isolate the unique aspects of various dimensions of mental health as they might differently be associated with important outcomes such as longevity and as they might be differently associated with different predictors: “A critical task for future studies is to shed light on how various PWB dimensions relate to health, both separately and synergistically” (Trudel-Fitzgerald, Kubzansky and VanderWeele 2020). While more research is needed, for instance through simulation studies, a rule of thumb might be that one should at least jointly and simultaneously have a hedonic and eudaimonic item or scale in regression models when focusing on a mental health research paper. Otherwise, it simply remains unclear whether a single scale of mental health approximates overall mental health or truly represents a distinct sub-dimension.

A similar case can be made for the dual continua model of PMH, i.e., the notions that NMH and PMH are distinct. Without simultaneously controlling for a depression scale like the GHQ-12, and a PMH scale like the SWEMWBS, it would be impossible to empirically confirm or criticise the model. There is now a substantial evidence base, especially with regard to mortality, that the negative and positive dimensions are indeed not identical (Iasiello and Van Agteren, 2020), so a general recommendation of this

thesis for sociological research would be to include both measures or at least to check for differences when jointly estimating the statistical results. One issue that arises when comparing mental health scales is that they are all often not standardised, thus precluding formal statistical comparisons (Trudel-Fitzgerald, Kubzansky and VanderWeele 2020). As was done throughout the thesis, mental health scales should typically be standardised or analysed in terms of groupings such as tertiles, bottom 20th vs top 80th percentile scores or other techniques.

This thesis has focused on positive mental health, and one intuitive way of doing so would be to study the top and most positive scores of PMH. Indeed, the entire motivation of the approach, from Martin Seligman's Presidential speech to the incorporation of PMH scales in mainstream demographic surveys, have been high-end goals like flourishing, self-realisation, high happiness etc. In many cases, however, academic publications have only focused on average scores through OLS regressions. Arguably, PMH is best defined and understood at the top end of the distribution, but the overlap between NMH and PMH might be larger at the medium level.

When proposing to study the relevance of a psychological concept for sociological research, the question arises whether one is dealing with an antecedent, moderator, collider, or outcome variable. Apart from the demographic study of mortality risk because of differences in positive mental health at a baseline level and the brief study of PMH as a predictor of allostatic load in the first empirical chapter, the two sociological chapters on neighbourhood factors and religiosity have treated positive mental health as the outcome variable. Sociology has a role in providing insights into the social context and conditioning of mental health when psychologists might be more focused on other antecedent psychological concepts. The thesis has shown that the social origin of positive mental health is important, and different, from the origins of negative mental

health. Nonetheless, future research might focus on the predictive effect of positive mental health on sociological outcomes. Convincing evidence would always be gained by predicting objective outcomes such as mortality risk or other health conditions based on baseline levels.

Based on the study's findings, it might be a good idea to revisit older datasets in which there are already several mental health variables and to reinterpret those variables according to positive mental health definitions. It would be feasible to take sub-dimensions of pre-existing mental health scales and rearrange them in a philosophically and psychologically inspired approach. Even if a reader of this thesis were still to be unconvinced that positive mental health is a useful concept or empirically relevant, there is an overwhelming agreement in the field that mental health is a multidimensional construct. Because of the multidimensionality, survey researchers, funders, and academic institutions should always consider using multiple mental health scales so that, in the future, researchers can then apply new statistical techniques or new insights and recreate or isolate the relevant dimensions. Psychometrically, having at least two indicators or items for each dimension of mental health can be advantageous.

6.2 Limitations and further research

The line of research that was presented in this thesis is limited but could also be extended in the following ways.

First, in several analyses, such as the substantive chapters, the thesis has focused on adults and excluded people younger than 25 years old. The purpose behind this choice was that the psychological development of children and adolescents is arguably a separate issue and possibly better left to developmental and educational psychologists

rather than sociologists. Psychological traits and especially happiness and well-being measures are likely to fluctuate substantially among adolescents, which would, therefore, complicate sociological and demographic analysis. There were also pragmatic reasons to exclude young people, namely that there were only relatively few cases of complete data in the MIDUS and to a lesser extent in Understanding Society.

Nonetheless, as more data become available for a long-term life course analysis, sociological research on children and adolescents that employs positive mental health scales like the SWEMWBS should be conducted. It might be particularly interesting to investigate the social inheritance of PMH or some of its domains, like optimism, and how this heritability interacts with socio-economic differences. One could speculate how on the one hand children from privileged households might find it easier to have an optimistic life attitude than children from households in which their parents were constantly worried about employment or not being able to pay rent.

Second, this thesis was focused on the United Kingdom and on the United States. The author proposes that this is a strength and not a weakness because the issues of cross-national comparability of happiness indices carry significant challenges (Cummins 2013; Jang, Kwag and Chiriboga 2010; Park, Norasakkunkit and Kashima 2017; Veenhoven 2012). For instance, Japan has one of the highest life expectancies in the world, but Japanese respondents only rank their self-rated health at mediocre levels, while Americans tend to rate their own health quite highly even though their objective health expectancy is not at the top levels of the international league tables. Given the difficulty of comparing average country responses to PMH scales, a natural first step might be to replicate the results of this thesis in other countries. The Global Flourishing Study that was launched in 2021 will include respondents from a diverse set of 22 countries with a longitudinal follow-up, so in the future, there might be opportunities for detailed analyses.

Third, another deliberate choice that is related to the previous one is the focus on the overall population while not narrowing down on racial or ethnic differences. Even though in the regressions of Understanding Society data, a dummy variable differentiating White British from all other racial groups was always present, and indeed typically statistically significant, racial groups are not homogenous: Further data analyses revealed that Muslim respondents in the UK generally had lower levels of PMH, while those classified as Black Caribbean had more elevated ones than the UK population on average. This thesis represents one of the first analyses of the SWEMWBS and is concerned with the overall associations, so a more detailed analysis of ethnic differences would be beyond its scope. Nonetheless, in terms of religious differences and also in terms of neighbourhood ethnic compositions, there is ample room for further study. On the positive, the UKHLS is so large that a very significant number of ethnic minority respondents were part of all models, even if the statistical focus has not been placed upon them.

Fourth, the thesis has focused on PMH as a broad concept that includes hedonic, eudaimonic and social well-being. Future research could focus on the specific domains of PMH, as this could allow for even greater analytical specificity. Nonetheless, the dashboard approach of the PMH approach has the advantage of allowing some flexibility, while the inter-individual differences in well-being as a result of general personality differences might make it harder to isolate the specific effect of a given emotion.

Fifth, regarding the PMH framework in general, the concepts of boosting and buffering have appeared to be substantiated. As more data become available, future research may want to focus specifically on the lifespan interaction of PMH with NMH. It would be feasible to use changes in PMH as a predictor of changes in NMH and vice versa in a

dynamic structural equational modelling setting. Likewise, it would be worthwhile to ask whether PMH can buffer the negative effects that are usually associated with socio-economic disadvantage: Do people with high levels of positive mental experience a less severe increase of NMH when they lose their job, have a divorce or become ill? It would further be interesting to identify survey respondents who experienced severe strokes of fate, such as a major accident that left them disabled, to understand the ways in which positive mental health is affected by those conditions.

Sixth, this thesis has relied on self-reported measures of well-being. Comparing the reported results with modern big data techniques in which machine learning is used to code the facial expressions of individuals promises to be an innovative approach, or at least to use established techniques of facial action coding systems for nonverbal expressions (Ekman and Friesen 1978). This might be particularly relevant if there were situations in which people have low enjoyment (negative verbal expressions), but still, report high levels of meaning in life and engagement (eudaimonia). At the same time, it is unlikely that these techniques can completely overcome issues such as cross-national variations.

Seventh, the longitudinal data could be utilised further. Judging by the majority of studies on mental health that are purely cross-sectional and considering that the vast majority of studies typically only consider one mental health scale in isolation, this thesis has significantly gone beyond the typical quality level as there was a longitudinal element in all of the empirical chapters. Nonetheless, the longitudinal analyses such as the fixed effects regressions of self-rated changes in religiosity on PMH, or the effects of neighbourhood changes on PMH, could be expanded. To some extent, the longitudinal analyses are a validity check of the cross-sectional findings that are presented in the empirical chapters. While they do certainly provide further insights and

while they significantly contribute to the overall validity of the findings, more focus could be placed on them directly, and ideally, causal mechanisms could be identified. Unfortunately, even though ten years (almost 11 at the time of writing) of data are available in the UKHLS, the SWEMWBS is only measured intermittently, and other interesting variables, such as the perceived/social neighbourhood ratings, are measured in differing intervals.

Finally, and mainly because positive mental health is still a new concept in sociological inquiry, the research questions and approaches have been mostly exploratory. While it might be desirable to derive detailed hypotheses and narrowly-defined research applications in principle, the thesis did not want to presuppose the relevance and usefulness of positive mental health. It would have been possible to simply use the positive mental health scale in any number of potential research studies, but without keeping the approach exploratory and without comparing it to other mental health scales it would not have been possible to evaluate the positive mental health approach in a general sense. Future research can now build on this thesis, apply positive mental health ideas to new fields and gradually build the knowledge base on mental health as a whole.

6.3 Concluding remarks

The thesis has demonstrated that the concept of PMH and the empirical measures of PMH, especially the Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS), are both useful and relevant in sociological and demographic research. The empirical findings of the thesis support the dual continua model of mental health in which negative and positive mental health are correlated but distinct spheres of mental health. PMH can be applied in sociological research and has the potential to tell the researcher new insights in some cases, nuanced new details, or tell roughly a similar story as other mental health scales depending on the specific circumstances under consideration.

Regarding the most objective and most long-term empirical result, the lack of positive mental health is a major and unique predictor of elevated mortality risk even when controlling for other health and mental health factors. The findings throughout the chapters have shown that even though there is, of course, major overlap between the different domains of mental health, there are also noteworthy differences depending on the specific scale, domain, or predictor under consideration. As sociologists, we would potentially draw differing conclusions when studying neighbourhood deprivation or religiosity depending on whether one includes a negative or positive mental health scale. This insight could have important consequences, for instance, with regards to the question of whether measures to reduce neighbourhood deprivation should be seen as priority policy outcomes as they have a net negative association with PMH.

The approach of the thesis has generated several insights that might be useful for other researchers.

Firstly, when trying to evaluate a new concept or empirical measure, it will be hard, if not impossible, to do so by only paying attention to the measure on its own. In most

cases, it is likely that several previous publications already exist on a certain research field or overall research question: For instance, with regards to negative mental health or life satisfaction, there are hundreds of sociological publications already. Even though it is not wrong to simply redo such analyses with new measures like the SWEMWBS as they become available, it is likely to be difficult to assess whether the new measure is telling something different. From a sceptical perspective, there are indeed good reasons to be hesitant to switch measures as one is losing longitudinal comparability. To put it in simple terms, it might not be wise to jump on a new trend from a scientific perspective unless there are good reasons to do so.

Accordingly, it has proven to be essential to always compare the results of the associations or effects of the SWEMWBS with the GHQ, life satisfaction or other measures. Ideally, one should jointly control for both domains of mental health in order to be able to isolate the unique aspect. If one is only using the GHQ, one is partly capturing the latent concept of mental health in its broadest sense and partly the concept of negative mental health and depression. If one is only using the SWEMWBS, one is partly also capturing the latent concept of mental health in its broadest sense and partly capturing the concept of positive mental health. By accounting for measures simultaneously, one can isolate the positive and negative continua of mental health. As seen in the findings, these continua frequently tell different stories.

Secondly, the thesis has shown that whereas the SWEMWBS is a good measure of multidimensional positive mental health, it can sometimes be advisable to focus on the relevant domains (subdimensions). Throughout the chapters, the two items on “feeling optimistic” and “feeling useful” gave evidence of the strongest associations with religious importance and the IMD. Interestingly, these two domains were sometimes negatively associated with demographic conditions like age when the other five

domains were positively associated with them. These two domains are also the most interesting from a theoretical perspective as they closely correspond to the philosophical concept of eudaimonia as coined by Aristotle and ancient philosophy. Because of the robustness of this finding across chapters and contexts, it is advisable that sociologists interested in this aspect of positive mental health should focus on these two items. In some contexts, it might even be advisable to combine these two items for a eudaimonic scale. While the SWEMWBS is well-validated for population-level analyses of health and while the academic committees that decided on its inclusion in the UKHLS had valid reasons to do so that were corroborated by the findings of this study, sociologists who engage in secondary data analysis should be free to only use the items and domains that are most relevant. In a long-run perspective, it will also be productive to build robust knowledge on the effects of domains such as optimism on various life-course outcomes.

Trying to anticipate future development by historical precedent, it seems likely that the usefulness of the SWEMWBS will depend on its popularity: The more funders, surveys and researchers use the scale, the easier it will be to justify its choice for measuring PMH when writing academic papers. The comparison here is Diener's life satisfaction scale which has gained tremendous popularity in sociology, economics, and psychology, even though its statistical properties and conceptual design would not be ideal from today's vantage point. Judging by the good uptake of the SWEMWBS in health and psychological research so far - albeit strongly increasing as more waves of data become available - there might be an opportunity to not just treat it as another mental health scale, but to use it in such a way that draws comparisons with other dimensions of mental health as predicted by the dual continua model.

Thirdly, from a practical standpoint, researchers who might not be interested in nuances of mental health and who prefer to use more established negative mental health scales like the GHQ might want to at least rerun their analyses on one or two positive mental health scales or domains to check that their results do not differ: If there are not any major diversions, just using one measure might be sufficient, especially if the theoretical concern is with mental health as a latent factor in a broad sense.

Furthermore, the SWEMWBS could also be seen as a candidate in a set of control variables.

Fourthly, several statistical issues should be considered. Continuous mental health scales should always be standardised to be able to compare the strengths of the associations or effect size of other variables and other mental health scales in the same analyses, but also to be able to compare findings across studies. Without standardisation, it is hard if not impossible to compare results across studies. This standardization requirement is particularly important for mental health as there is no underlying objective scale (as in the case of income or even interval scales for educational attainment) and as scales differ dramatically in terms of their range of scores. Moreover, the issues of missingness and panel attrition cause severe challenges to the estimation of time trends and causal effects and mental health variables are often high in missingness and likely also associated with attrition. Strategies and methods need to be carefully considered to deal with these potentially large limitations.

Fifthly, there is a question of what a sociology of the positive could become.

Sociologists are traditionally and professionally interested in problems (e.g., health or depression), inequalities, discrimination, and power imbalances among many other factors. While it may not be well advised to focus on only positive outcomes, it might be the case that positive outcomes shed new light on sociologically relevant factors. It

can be risky to operate in a new field. However, the facts that the eudaemonic domains have proven to be so distinct and that the dual continua of negative and positive mental health are strongly supported and that they do indeed tell different stories, for instance, about religiosity, have been beneficial for the line or argument of the thesis.

6.4 References

Bouchard, Laura C, Charles S Carver, Maria G Mens, and Michael F Scheier. 2017.

"Optimism, health, and well-being." Pp. 112-30 in *Positive psychology*:
Routledge.

Cummins, Robert A. 2013. "Cultural response bias." *The Encyclopedia of Cross-Cultural Psychology*:330-33.

Deaton, Angus. 2018. "Deaths of despair." *Lancet*, 392(10152):26.

Ekman, Paul, and Wallace V Friesen. 1978. *Manual for the facial action coding system*:
Consulting Psychologists Press.

Iasiello, M., & Van Agteren, J. (2020). Mental health and/or mental illness: A scoping review of the evidence and implications of the dual-continua model of mental health. *Evidence Base: A journal of evidence reviews in key policy areas*, (1), 1-45.

Jang, Yuri, Kyung Hwa Kwag, and David A Chiriboga. 2010. "Not saying I am happy does not mean I am not: cultural influences on responses to positive affect items in the CES-D." *Journals of Gerontology Series B: Psychological Sciences and Social Sciences* 65(6):684-90.

Keyes, Corey LM. 2007. "Promoting and protecting mental health as flourishing: A complementary strategy for improving national mental health." *American Psychologist* 62(2):95.

Mead, Jessica P, Zoe Fisher, Jeremy J Tree, Paul TP Wong, and Andrew H Kemp.

2021. "Protectors of Wellbeing During the COVID-19 Pandemic: Key Roles for

Gratitude and Tragic Optimism in a UK-Based Cohort." *Frontiers in Psychology* 12.

O'Connor, K. J., & Graham, C. (2019). Longer, more optimistic, lives: Historic optimism and life expectancy in the United States. *Journal of Economic Behavior & Organization*, 168, 374-392.

Park, Joonha, Vinai Norasakkunkit, and Yoshi Kashima. 2017. "Cross-Cultural Comparison of Self-Construal and Well-Being between Japan and South Korea: The Role of Self-Focused and Other-Focused Relational Selves." *Frontiers in psychology* 8:1516.

Ryff, Carol D, Jennifer Morozink Boylan, and Julie A Kirsch. 2021. "Eudaimonic and hedonic well-being: an integrative perspective with linkages to sociodemographic factors and health." Pp. 92-135 in *Measuring Well-Being*: Oxford University Press.

Tennant, R, L Hiller, R Fishwick, S Platt, S Joseph, S Weich, J Parkinson, J Secker, and S Stewart-Brown. 2007. "The Warwick-Edinburgh Mental Well-being Scale (WEMWBS): development and UK validation." *Health Qual Life Outcomes* 5:63.

Trudel-Fitzgerald, Claudia, Laura D Kubzansky, and Tyler J VanderWeele. 2020. "A review of psychological well-being and mortality risk: are all dimensions of psychological well-being equal?" *Measuring Well-Being*:136-88.

Veenhoven, Ruut. 2012. "Cross-national differences in happiness: Cultural measurement bias or effect of culture?" *International Journal of Wellbeing* 2(4).

Watson, Kelly J. 2018. "Establishing psychological wellbeing metrics for the built environment." *Building Services Engineering Research and Technology* 39(2):232-43.

Westerhof, Gerben J, and Corey LM Keyes. 2010. "Mental illness and mental health: The two continua model across the lifespan." *Journal of Adult Development* 17(2):110-19.

