Neighbourhood deprivation and self-esteem: is there equalisation in early adolescence?

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Dedication

This thesis was inspired by, and is dedicated to

Bill Hannaford and Alan Fagg

Declaration

I hereby declare that the work presented in this thesis is entirely my own.

Signed……

James Fagg

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The concept for this thesis originated with the author. The thesis was developed with the assistance of supervision from Dr Steve Cummins, Professor Sarah Curtis and Professor Stephen Stansfeld.

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Abstract

B**ackground** - Residents of more deprived and socially fragmented neighbourhoods are more likely to suffer from poor physical health and severe psychiatric morbidity than individuals living in more affluent and socially cohesive neighbourhoods. However, this pattern is less clear for more common psychological outcomes such as depression, anxiety and psychological traits such as self-esteem in early adolescence. In particular, the relationship between adolescent mental health and psychological traits may vary by national context. Two hypotheses broadly frame these variations: the deprivation amplification hypothesis and the socio-economic equalisation in youth hypothesis. Specifically, deprivation amplification is supported for adolescents in the U.S, while equalisation hypothesis appears to be supported outside that national context.

Aims - The study aims to extend existing international research by addressing three research questions using data on adolescents aged 10-15 in the UK and Canada.

1. *Is there support for socio-economic equalisation in early adolescent self-esteem in the UK and Canada across household socio-economic status and neighbourhood deprivation?*

2. *Is support for equalisation consistent across the socio-geographic levels of family, neighbourhood, region and nation?*

3. *Is there evidence for prospective associations between adolescent self-esteem and socio-geographic processes of neighbourhood context, composition, health selective migration and socio-geographic mobility in the UK and Canada?*

Methods - Two longitudinal datasets, the British Youth Panel (UK) and the National Longitudinal Survey of Children and Youth (Canada) were analysed using multilevel logistic regression and cluster-adjusted multinomial logistic regression models.

Results – Contrary to prevailing deprivation amplification hypothesis, self-esteem was not inversely associated with neighbourhood deprivation and social fragmentation neighbourhoods in both countries either prior to, or after controlling for individual and family characteristics. In fact, living in the least deprived 20% of Canadian neighbourhoods was associated with *lower* self-esteem in boys. Other than this, neighbourhood composition accounted for all significant associations with self-esteem. However, low teenage self-esteem *was* associated with subsequent household socio-geographic mobility, an effect explained by family factors. In addition, *moving* to more socially fragmented neighbourhoods is associated with low self-esteem but moving to more materially deprived neighbourhoods is not, independently of individual and family variables.

Discussion and conclusions – Results are discussed with reference to the implications for deprivation amplification and socio-economic equalisation in youth hypotheses. Contributions to health geography and limitations of the study are then addressed before policy implications are considered.

Glossary

PMK - Person Most Knowledgeable

BYP - British Youth Panel

BHPS - British Household Panel Survey

NLSCY - National Longitudinal Survey of Children and Youth

ISER - Institute of Social and Economic Research – organisation responsible for data collection, collation and neighbourhood linkage for the BYP and the BHPS surveys

MAR - Missing at Random assumption. One of three broad processes through which the presence of missing data in a dataset can be understood.

't' - Time-point. T1 and t2 refer to the first and second observations in a longitudinal series

StatCan – Statistics Canada, Statistics agency responsible for collection of NLSCY and Census data in Canada

OSM – Original Sample Member. Relates to respondents in the BHPS who made up the original adult sample.

ONS – Office for National Statistics in England and Wales. Organisation responsible for collating and managing national statistics for England and Wales.

GROS – General Register Office for Scotland. Organisation responsible for collating and managing national statistics for Scotland.

CASWEB - web interface to census aggregate outputs and digital boundary data run by the Census Dissemination Unit (CDU) at the University of Manchester, UK.

MAUP – modifiable areal unit problem. Relationships between characteristics is dependent on the level of aggregation

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CHAPTER 1 - INTRODUCTION

1.1 Introduction

This thesis focuses on debates about socio-geographic inequalities in adolescent self-esteem and mental health. Written from a health geography perspective, the thesis focuses on the complex interactions between individuals and their socio-geographic environment; and aims to consider how this perspective might improve understanding of variations in self-esteem in this age group.

The thesis starts by considering how health and place might be associated. As a result of this discussion it draws attention to the consistent observations that socio-geographic inequalities emerge in health and illness and that these variations are often closely associated with neighbourhood deprivation in the developed world (Pickett and Pearl 2001; Boyle et al., 2004). The thesis describes this relationship in terms of the deprivation amplification hypothesis in common with other researchers in the field (Macintyre, 2008).

Adolescent self-esteem is an important psychological trait and the thesis reviews theoretical arguments which would suggest that it would vary with levels of neighbourhood deprivation. However, inequalities in this, and related outcomes are only consistently observed by literature from the United States. Outside that particular national context, relationships are observed to be much less weaker and less consistent.

The fact that socio-geographic variation is not observed at the neighbourhood level is consistent with observations that mental health in adolescent may be 'equalised' by socio-economic status (West (1991, 1997, 2004). Equalisation refers to processes which actively

reduce socio-geographic inequalities in health. In this situation, no relationship between neighbourhood deprivation and health, or even *reverse* gradients might be expected. As observed above, evidence for either this hypothesis or the deprivation amplification hypothesis is inconsistent and thus the thesis examines the support for both hypotheses as explanations for the socio-geographic distribution of self-esteem.

The review identifies that while the deprivation amplification hypothesis is are supported by rigorous analyses in the United States, the available studies outside that context are limited in their ability to provide robust support for either hypothesis. The thesis addresses this gap in knowledge by drawing on two nationally representative, longitudinal datasets: the British Youth Panel in the UK, and the National Longitudinal Study of Children and Youth in Canada. The analyses consider several dimensions of support for each hypothesis; including sub-group interaction and longitudinal processes, but focus on equalisation given that previous findings from the UK suggest that this model may be most appropriate for self-esteem.

Results suggest consistent support for equalisation in the UK and Canada, and as such the thesis contributes significantly to debates about socio-geographic inequalities in adolescent self-esteem and mental health, but also more widely to the socio-geographic inequalities literature and health geography.

1.2 Organisation of the thesis

The conceptual background for the research questions posed by this thesis is described in Chapter Two. This chapter sets the scene for the thesis and is organised in four sections. Section one considers the geographical literature which theorises and examines associations between the neighbourhood of residence and health. A second section discusses the specific case of the relationship between neighbourhood deprivation and adolescent self-esteem

outlining two key theories, the deprivation amplification hypothesis and the socio-economic equalisation in youth hypothesis. The review then shows that there is empirical support for the deprivation amplification hypothesis in the United States, but that studies outside that national context support the socio-economic equalisation hypothesis. The review highlights that studies in the United States may be better placed to observe deprivation amplification than in the UK and other national contexts and that work is needed to address that gap. A third section highlights that few studies outside the United States test the consistency of these theories by key sub-groups in the population. Finally, a third section discusses socio-geographical processes which might account for support in these studies for equalisation or deprivation amplification, and develops a conceptual model from this discussion. The central relationships in this conceptual model are then used to frame three research questions which the thesis then goes on to address.

Chapter three outlines the methods used to address the three research questions framed in chapter two. The first part of the chapter describes the datasets from the UK and Canada, and the variables used to operationalise the constructs identified in the conceptual models described in chapter two. It then considers the analytic strategy, describing in detail methodological principles, assumptions and techniques used in the empirical work which follows. Phenomena relevant to these types of analysis are discussed, including the concept of clustering and its implications for inference about equalisation. The analytic strategy then goes on to discuss how each of these methods is applied, in specific sequences designed to test the hypotheses underlying the research questions.

Chapter four describes key aspects of the datasets. The first part of this descriptive analysis describes the samples, illustrating how they were drawn from the wider datasets, the implications that the exclusion process had on the ability to generalise from the results presented throughout the thesis to the Canadian and UK adolescent populations of interest.

The same tables are then described in more detail to highlight key age, sex and age by sex trends in the outcome and covariates. These descriptive analyses are expanded by illustrating relationships between the outcomes and covariates to consider how self-esteem is distributed by neighbourhood characteristics. This first, exploratory analysis is complemented by descriptive work which considers how individual and family risk and protective variables are distributed by neighbourhood characteristics. Finally, the degree of clustering of repeated measures between individuals and between neighbourhoods is assessed. This strongly informs the decisions about the analytic designs employed in chapters five, six and seven.

Chapter five makes up the first test of the equalisation hypothesis. The chapter uses multilevel logistic regression models to examine associations between neighbourhood deprivation and social fragmentation and the odds of adolescents reporting current low self-esteem. An individual and family model is developed as outlined in the methodology, before a fully adjusted model is used to test the hypothesis that there is no relationship between low self-esteem and neighbourhood deprivation independent of individual and family factors. The second part of the chapter then considers whether those relationships are consistent for sub-groups of the populations under analysis. The identification of several sex interactions in both populations leads to a final stratification of the models by sex. These findings are situated in the literature outlined in chapter two, and the strengths and limitations of the analysis are considered.

Chapter six to some extent replicates the analytic sequence of chapter five, but considers the prospective associations between neighbourhood deprivation and change in self-esteem. This chapter therefore adds a second dimension to the test of the equalisation hypothesis undertaken in chapter five, by adjusting for prior self-esteem status and by examining the relative risks of self-esteem transitions by baseline neighbourhood deprivation. Thus, this model tests the equalisation hypothesis at the household and neighbourhood level using a

technique which allows for stronger causal inference about the associations between socio-economic status at both levels and self-esteem.

Chapter seven tests two specific theories which might help to explain processes of equalisation, health selection and socio-geographic mobility. These tests examine whether, at the individual level, moving to a more deprived neighbourhood may present a risk to adolescent self-esteem independent of the characteristics of their families. This is tested both in terms of self-esteem at follow-up and with change in self-esteem. The second part of the chapter considers whether low adolescent self-esteem prospectively influences how families with adolescents may sort into more deprived neighbourhoods. These findings are situated and discussed with respect to the most relevant available literature.

Chapter eight discusses the central findings of the thesis in relation to the research questions as they contribute to debates about inequalities in adolescent mental health, health geography and policy. The chapter identifies the limitations of the thesis as a whole and this is used to formulate a number of suggestions for further work. Finally, the policy implications of the findings are considered before the chapter draws overall conclusions.

A glossary is provided as a reference for terms used throughout the thesis.

CHAPTER 2 – LITERATURE REVIEW

2.1 Introduction

Adolescent self-esteem is a psychological trait which is associated with a range of social and health consequences in adolescence and adulthood. Variations in the construct have been extensively documented in social psychology. However, few studies locate this phenomenon within a wider socio-geographic framework, and it has received little explicit attention in health geography.

This chapter considers the potential of studies which examine neighbourhood variations in health to contribute to debates which aim to contextualise adolescent self-esteem within its wider social context. The chapter considers theoretical and empirical debates in health geography which are used to generate *a priori* ideas about how neighbourhood level deprivation and adolescent self-esteem might be related. In addition, it discusses how sociological perspectives relating to apparent socio-economic equalisation in adolescent mental health might be extended by adopting an explicitly socio-geographical approach. Finally, it considers how perspectives from health geography might contribute to debates about the production and maintenance of geographical inequalities in health, and more specifically, adolescent self-esteem.

The chapter is organised in four sections. The first situates the debate in the wider context of work from health geography and related disciplines. Work which has theorised and tested associations between mental health and the neighbourhood environment is then discussed. The first two sections are used to construct a comprehensive model of relationships between

self-esteem and the socio-geographic setting. This is followed by a final section which considers possible explanatory processes through which observed relationships between adolescent self-esteem and the neighbourhood might be explained.

2.2 Place and health

Over the last twenty years 'place' as a concept has gained a central position in health geography (Luginaah, 2009). This has been partially due to wider theoretical work in human geography which has reconceptualised 'place' in terms of the relationships between people and places, rather than simply the location of observations in geometric space (Massey, 1994; Massey, 2005). This 'relational' view of place has been considered with respect to health (Cummins et al., 2007) and insights from these developments, as well as perspectives from more conventional theories of the relationship between place and health are used to frame the research questions posed by this chapter.

Before the 1990s, the medical geography literature focussed on health service accessibility and disease ecology and examined spatial variation and diffusion of disease across geometric space. These strands of work were criticised because they did not incorporate theoretical insights from human geography more widely (Kearns and Joseph, 1993), and for under-estimating the importance of place in favour of space (Jones and Moon, 1993). Further criticisms of the nature and content of medical geography led to the eventual rebranding of the sub-discipline from 'medical' to 'health' geography. Traditional medical geography over-emphasised the importance of the bio-medical conceptualisation of health which tends to focus on the presence of disease to the exclusion of a wider concept of health and well-being (Kearns and Moon, 2002). This argument suggested that traditional descriptions of spatial variation implicitly lead to a conceptualisation of places as simply spatial containers in which health outcomes are distributed (Kearns and Joseph, 1993). Thus, the existence of spatial

variations in health are essentially descriptions of 'isolated spatial phenomena' when they are presented without explanation (Jones and Moon, 1993). Eyles argued that places cannot be separated from people, as individuals experience places in particular ways (Eyles, 1985) as the spatial distribution of health is constituted, constrained and mediated by multi-scale economic, political and social processes (Dear and Wolch, 1987). Therefore, the variation in individual health between places must be analysed at the level of the individual and at the area level (Kearns and Joseph, 1993).

Mortality and morbidity were observed to vary between regions and continents by Hippocrates in the 5th century BC in the seminal text, "Airs, Waters, Places" (Macintyre and Ellaway, 2003). This work drew attention to environmental factors such as the winds, but also recognised the important role played by the characteristics of individuals to explain differences in health. In the UK, regional differences were observed more than 150 years ago by Edwin Chadwick in his report to the Poor Law Commission in 1842 (Macintyre, 1999). There is, therefore, a long tradition of studying health inequalities by examining their geography.

A central debate in this field over the last two decades has examined the relative importance of places and people in explaining those variations (Macintyre et al., 1993). Macintyre suggested that an independent effect of place, if it could be demonstrated, would mean that interventions operating at the area-level, as well as the individual-level could be a focus for public health.

This observation was made in a key period for research on geographies of health. Politically and ethically radical, emphasis shifted from the neo-conservative position which attributed for health to individuals and towards an increasing emphasis on the wider structural and societal determinants on health (Smith and Easterlow, 2005). Secondly, in order to obtain evidence for this position, developments across social science research meant that the research community

was particularly well placed to examine the relative importance of the context of place, over and above the characteristics of the people living there (Duncan et al., 1993; Duncan et al., 1995; Jones and Duncan, 1995; Macintyre et al., 1993). The *context versus composition* debate which followed has dominated much of health geography research in the developed world since that time (Boyle et al., 2004c).

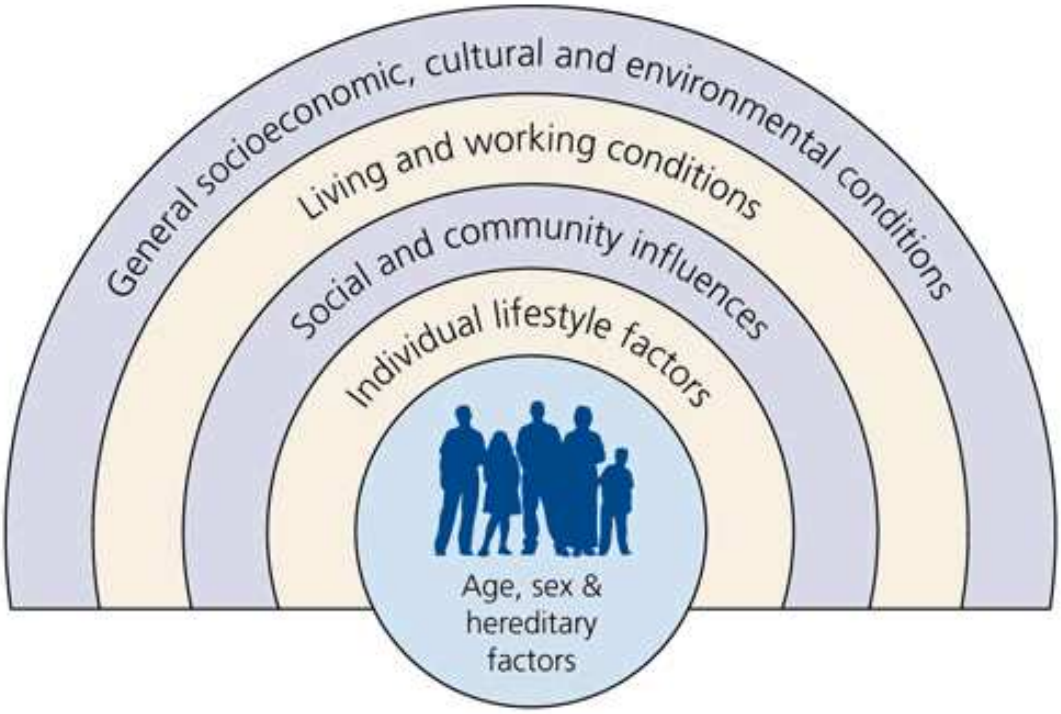
2.2.1 Context or composition?

A compositional explanation suggests that similar types of people will have a similar health experience regardless of where they live (Curtis and Rees Jones, 1998). Compositional factors such as individual poverty and family structure may influence health outcomes, and the relative concentration of those risk factors in different neighbourhoods would explain why health varies between neighbourhoods.

A contextual explanation suggests that place is important for health over and above individual level characteristics. Where this is the case, it would be expected that individuals living in a range of neighbourhoods would have different health experiences independently of individual and family compositional factors (Curtis and Rees Jones, 1998).

In order to conceptualise and assess the relative importance of places (context) and people (composition), researchers have discussed both as features operating in a hierarchy (Duncan et al., 1998). Place can be conceptualised as operating at a higher level of the hierarchy, and features of individuals and families operate at a lower level. Hierarchical conceptual diagrams have also been extended to highlight the fact that individuals are nested within multiple spheres of influence. The social model of health, as illustrated in Figure 2.1, is widely used to illustrate these concepts, and to draw together characteristics from individuals' genetic makeup to the global socio-economic, cultural and physical environment (Dahlgren and Whitehead, 1991).

Figure 2-1: The social model of health (source: Dahlgren and Whitehead, 1991)



While conceptually important for describing one aspect of how places and people relate, hierarchies present problems when drawing inferences about the relative importance of both these features. Ecological studies were the principal statistical analytic tools available to investigate relationships between area level, social and health data before the late eighties (Duncan et al., 1998). Findings from these studies contributed significantly to knowledge about relationships between place and health, and remain important for research questions which do not require analysis of data at multiple levels of aggregation (Whitley et al., 1999). However, in terms of inference, ecological studies, and single level regression models at the level of the individual are subject to four inferential fallacies (Diez-Roux, 1998): the ecological (Robinson, 1950), sociologistic, atomistic (Alker, 1969) and psychologistic fallacies. The ecological and atomistic fallacies refer to inference: group (for example 'neighbourhood') level relationships from ecological models cannot be used to draw inferences about analogous relationships at the level of the individual, while conversely, studies at the individual level cannot be used to draw inferences about relationships at the neighbourhood level. The

psychologistic and sociologistic fallacies refer to 'confounding'; respectively an individual level model may omit a critical explanatory variable at the neighbourhood level, while a group level model may omit a critical explanatory variable at the individual level.

Health geographers and social epidemiologists have been concerned with the ecological and sociologistic fallacies, as these prohibited researchers from drawing *robust* inferences about the influence of place (measured at the group level) upon health at the individual level. However, multilevel regression models, developed in education research (Goldstein, 1987), were designed to partition and model variation at the pupil and school levels to address these fallacies for analyses investigating the school and classroom effects on pupils' educational achievement. The potential for these techniques to assess the relative role of the geographical context and composition for health outcomes was rapidly recognised for geographical research in health inequalities (Humphreys and Carr-Hill, 1991; Jones, 1991). They extended multilevel analysis in order to partition the *contextual variation* attributable to the neighbourhood (or any higher geographical level) and to the individual (Duncan et al., 1998). They could therefore be used to assess the degree to which differences in health were attributable to variations between neighbourhoods, and / or to variations between people. Where this contextual variation remained statistically significant after the addition of compositional information about individuals and their families who live within the neighbourhood (composition), an *independent* effect of place was theorised (Duncan et al., 1998).

Multilevel modelling work quantifying the amount of variation in health has had one consistent finding: that the contribution of place in context to variations in health has been assessed as one which exists, but which is very modest relative to effects attributable to composition (Sellstrom and Bremberg, 2006; Pickett and Pearl, 2001; Riva et al., 2007; Curtis and Rees Jones, 1998; Smith and Easterlow, 2005; Oreopoulos, 2008).

One reading of this finding might be that place as an effect, is indeed modest, as concluded by Pickett and Pearl (2001). From a public health perspective these modest effects are not problematic. Interventions targeted at whole areas might improve health status for the whole population in those neighbourhoods. Even if the effect is modest for each individual, the net effect on the population burden of morbidity would be larger than might result from interventions which have larger effects at the individual level but for only a small proportion of the population (Rose, 1992).

Geographers increasingly question the implicit assumption of many multilevel modelling studies that contextual effects are indeed universal, Cummins et al. (2007) have argued that the relationships between place, space and health may be under-estimated by the focus on context-composition to the exclusion of other debates. They suggest that place effects might be more comprehensively understood from a relational perspective. This emphasises that while multilevel models have always had the capability to explore the differential impacts of places on individuals and families (Duncan, 1998), these are rarely comprehensively theorised and explored. Secondly, it emphasises that places can be thought of as nodes connected by networks (Murdoch, 1997) which operate over intersecting layers of socio-relational space. Within any given network, relationships between socio-relational space and health are spatially contingent. Associations between neighbourhood deprivation and health may be conditional on the local socio-spatial topology (Boyle et al., 2004a; Cox et al., 2007b) but might also interact with other socio-spatial layers such as social fragmentation or rurality (Caughy et al., 2003). Places and people are not static, but vary in their socio-geographic trajectories over time (Massey, 2005). This has implications for health, as individuals and populations are differentially 'exposed' to different types of environments over time. Power relationships operating at the societal level are also pivotal in shaping relationships between people and places (Harvey, 1989). These are made relevant to health by the interests of actors operating at a number of spatial scales from an individual's personal attributes and activities to

transnational commercial and political institutions operating in globalised markets (Cummins et al., 2007).

2.2.2 Geographies of children and youth

The development of health geography has run in parallel, but with relatively few intersections with the emergence of a second relevant subfield of 'children's geographies' in the 1990s. In the 1970s, geographical work recognised that children's lives were highly socially and spatially structured and that children have quite different relationships with places than adults (Hart, 1979; Blaut and Stea, 1971). However, despite these pioneering studies, children and young people have been marginalised in geographical research relative to adults until relatively recently (James, 1990). James called for a focus on children and young people as individuals in their own right who merited specific attention. These observations were influential in prompting a growing number of studies investigating how place contributes to children's identities (Abbott-Chapman and Robertson, 2001; Aitken, 2001; Valentine, 2000), and their appreciation of and use of place and space (Chawla, 2003; Matthews and Limb, 1999; Matthews et al., 2000; van der Burgt, 2008).

Early childhood interactions with places are often conducted through the medium of play (van der Burgt, 2008). Of course, early adolescence is also marked by considerable changes in the relationship of the child to the social world; marked particularly by the transition to secondary education, greater autonomy from the family environment and the increasing importance of wider contextual settings such as the neighbourhood and peer group (West et al., 1997). The neighbourhood and street environments become increasingly important as sites for *socialisation* and *social observation*, where socialisation is the process where 'children learn what it is to be fully human adult beings' (Holloway and Valentine, 2000, p. 2). Matthews et al. (2000), amongst others showed that 'the street', for ten to sixteen year olds, was important as

a place for social interaction, where adolescents perform to their peers, 'showing off to each other', and 'test' behaviours on passers-by. Older youth are further differentiated by their access to vehicles, and their increasing engagement with risky substances, sexual and romantic behaviours and independence to explore the wider geography of their local region (van der Burgt, 2008). Geographers argue that researchers should clearly recognise differences in these uses and experiences of socio-relational space and place, and that young children should be clearly differentiated from early adolescents, and early adolescents from youths in the later stages of adolescence (Evans, 2008; Weller, 2006).

2.2.3 Summary and implications

Overall, the review above highlights that there are several dimensions to the concepts of place and space that move far beyond geometric location and distance, but are fundamentally constituted and constructed by people: through independent measurement, individual subjective experience and imagination, and by reputation. These place constructions are themselves contingent on a historical legacy of socio-geographical processes which continually operate to produce places. These constructions of place and space will interact with health, in ways which are theorised to be conditional on characteristics of individuals and populations. Thus, while broad, these concepts are useful for considering current empirical work, and how it can be extended, interpreted and developed in new directions. A selection of empirical work which has described relationships between health and characteristics of places is discussed below with consideration of the theoretical pathways which might produce variations at the neighbourhood level.

2.3 Socio-geographic inequalities in health

The discussion above emphasises that place cannot be readily disentangled from society and suggests that terminology should reflect that relationship. Therefore, throughout this thesis, the term 'socio-geographic' refers to the ways that sociological constructs are necessarily bound with place. This section draws upon one particular socio-geographic perspective, the idea that places vary in the degree of material deprivation, and that this concept might be expressed geographically in ways associated with 'socio-geographic' inequalities in health.

The role of *characteristics* of places has been recognised as potentially independent of the role of characteristics of people since Edwin Chadwick in the middle of the nineteenth century. He observed that life expectancy was differentiated by social class, with higher life expectancy among the 'gentry and professionals' than 'labourers and artisans'. However, this differentiation varied by the region of residence: life expectancy was worse for both upper and lower classes in Liverpool which was highly deprived in comparison to the other regions that he examined. This suggested an independent effect of deprivation of the place of residence over and above individual social class (Macintyre and Ellaway, 2003).

Current research continues to examine neighbourhood deprivation and its relationship to health, building on work by Peter Townsend, among others (Townsend P., 1987). The concept was described by Townsend and colleagues in terms of both social and material deprivation. The latter has been widely used in health studies and was defined by Townsend, Phillimore and Beatty (1988, p. 36) in the following way:

"Material deprivation entails the lack of goods, services, resources, amenities and physical environment which are customary, or at least widely approved in the society is under consideration."

Townsend's definition implies a number of assumptions about the pathways through which neighbourhood deprivation might be associated with health. These pathways from deprivation to health have been discussed as the *deprivation amplification* hypothesis (Macintyre, 2007). Under this hypothesis, deprived areas are likely to have fewer health-promoting resources, and more health-damaging resources than more affluent areas. *Amplification* refers to the manner that health promoting or health damaging resources accumulate unequally in deprived neighbourhoods, over and above those available to the individual through their family circumstances. This links the theory directly with the social model of health discussed above, and the context-composition debate, and shows how deprivation amplification as a mechanism might be invoked to explain variations in place.

Resources are broadly defined under this theory and relate to five themes (Macintyre et al., 1993): physical features of the environment; availability of resources; availability of services; socio-cultural features and reputation. These themes are listed in Table 2-1. These resources are not necessarily expected to impact on all health outcomes in the same ways. In addition, the assumption that resources are systematically unequally distributed by deprivation has been questioned by studies which have investigated the concentration of, and access to, environmental resources by neighbourhood deprivation in contrasting neighbourhoods in Glasgow (Macintyre, 2007; Macintyre et al., 2008). In recent summaries of this evidence, the authors cautioned that this assumption does not necessarily hold across all types of resources in Glasgow (Cummins et al., 2005; Macintyre et al., 2002). Health damaging resources were sometimes concentrated in deprived areas, but not always. Similarly, affluent neighbourhoods did not always have the highest concentration of health-promoting resources. This means that deprivation may not necessarily be systematically associated with the geography of health damaging and health promoting features.

Table 2-1: Deprivation amplification themes and resources categorised within themes. Drawn from description in Macintyre et al. (1993)

Theme	Types of resources implied
Physical features of the environment	Air and water quality, climate
Access and availability to resources	Housing, food, gainful employment, safe and healthy recreation
Access and availability of services	Transport, health, social, education, street cleaning, and churches, informal services
Socio-cultural features	Political, economic, ethnic composition and history, social cohesion, crime and fear of crime, norms and values and informal social support
Reputation	How areas are perceived by residents, outsiders, and service providers

With this in mind, several authors advocate exploring the constituent features which are theorised to promote or damage health specifically. These are listed above in Table 2-1 and examples include studies examining associations between the built environment and mental health (Weich et al., 2002; Fagg et al., 2006). This has certainly been shown to have considerable merit empirically but as Cummins et al. (2005) note, the construction of measures of such integral variables is often a project of major scope in itself, or simply not feasible.

In order to illustrate how deprivation might be statistically associated with health, Townsend and colleagues, aimed to measure concepts of deprivation using information about the neighbourhood level and to rank neighbourhoods using indices of deprivation. The details of these indices are discussed in more depth in chapter three but since the late eighties, a large number have been developed and used to examine associations between neighbourhood deprivation and health (Carstairs and Morris, 1989; Carstairs and Morris, 1991; Townsend P. et al., 1988).

Early work established relationships between deprivation and mortality. Carstairs and Morris (1989) observed that mortality was strongly associated with a deprivation index constructed from measures of unemployment, car ownership, low social class and overcrowding. Similarly, Townsend et al. (1988) observed patterns of mortality in small areas independently of the

effects of occupational social class, with an indicator composed of similar components. This pattern of findings has also been found consistently for a number of morbidity outcomes such as limiting long term illness (Humphreys and Carr-Hill, 1991), coronary heart disease (Diez-Roux et al., 1997; Davey Smith et al., 1998), self-rated health (Stafford et al., 2004) and limiting long-term illness (Shouls et al., 1996; Gould and Jones, 1996). These relationships are explained in part by analyses which highlight the systematic distribution of health related risk factors for morbidity and mortality by neighbourhood deprivation. These include studies of smoking (Duncan et al., 1999), alcohol use (Davey Smith et al., 1998), physical activity (Yen and Kaplan, 1998) and diet (Forsyth et al., 1994).

Studies have been conducted where neighbourhood deprivation has not been found to have been statistically significantly associated with the outcome in question. Sloggett and Joshi (1994) for example, concluded that while deprivation was associated with mortality in unadjusted analyses, it was adjusted to non-significance by inclusion of variables measuring car access and housing tenure. The authors draw strong messages from their analysis; that neighbourhood composition fully accounted for associations between deprivation indices and mortality, and moreover, that policies which targeted health interventions at deprived neighbourhoods may be inequitable. This makes an important point. Regardless of the health outcomes observed, the most consistent effects of poverty are typically observed at the family and household level. Poor households are *concentrated* in deprived neighbourhoods, but are also distributed across *all* levels of neighbourhood poverty throughout the country. An over-emphasis on neighbourhood poverty in a policy response may lead to those families being inequitably missed by interventions.

Relationships between neighbourhoods and health have tended to be theorised as the 'effects' of the neighbourhood environment *upon* health (Smith and Easterlow, 2005). The use of the term 'effects' in this context is important because it implies a causal association of the

neighbourhood environment which, in epidemiological terms, acts as an *exposure* to *cause* the *outcome*, health. In order to establish causality, a study (or, more likely, several studies) must meet many criteria (Rothman and Greenland, 1998), of which one is the establishment of prospective association, where cause temporally precedes effect. Several studies have established prospective associations between neighbourhood deprivation and mortality (Jaffe et al., 2005; Jerrett et al., 2005; Yen and Kaplan, 1999a; Marinacci et al., 2004; Martikainen et al., 2003; Mohan et al., 2005), cardio-vascular disease and stroke morbidity (Sundquist et al., 2004; Sjarne M.K. et al., 2004) and limiting long term illness (Curtis et al., 2004a).

2.3.1 Summary and implications

These patterns are demonstrated in this section for many outcomes including mortality and life expectancy measured in many ways and physical morbidity relating to a range of outcomes. There is also evidence for causal associations between neighbourhood deprivation. This suggests that there is consistent evidence of inequalities in health which are associated with neighbourhood deprivation. These associations can be explained with reference to a hypothesis of *deprivation amplification.*

While this review shows consistent evidence in favour of health inequalities and deprivation amplification for mortality and physical morbidity outcomes, it has not investigated whether these relationships are observed for mental health outcomes. While some studies were conducted in the 1990s in this area, it is only now that there is a considerable evidence base to draw on in this field. This evidence base is reviewed below for adults and adolescents and, given the focus of this thesis, more attention is also given to the theoretical pathways that might underlie these relationships.

2.4 Socio-geographic inequalities in mental health

There is a long tradition of research into the relationships between geography and severe psychiatric disorders (Wolch and Philo, 2000). This literature has considered the geographic distribution of people with psychiatric conditions and the services that are provided for them (Faris and Dunham, 1939; Silver et al., 2002; Giggs, 1988; Giggs, 1973; Dean, 1981; Curtis et al., 2006; Duncan et al., 1995 ; Allardyce et al., 2005). This has identified the ways that these individuals appear concentrated in parts of the city which are particularly deprived and socially fragmented.

Contemporary research has built on this area of inquiry to consider more common mental health outcomes such as depression (Matheson et al., 2006) and psychological traits like self-esteem (Haney, 2007). The following sections consider *how* and *why* neighbourhood deprivation might be associated with self-esteem. In order to address this, however, it is necessary to consider constructs of self-esteem, depression and their relationship with the wider field of common mental health and psychological outcomes.

2.4.1 Defining mental health: situating depression and self-esteem in adolescence and adulthood

This section considers mental health and self-esteem in terms of the broad constructs and their relationships to each other for the purpose of situating the review of the neighbourhood effects literature. It is therefore relevant to both adults, adolescents and children although of course, these outcomes are also experienced and expressed in quite specific ways within those stages of the life course (see Figure 2-2)

Reference to an internationally agreed classification of mental health and behavioural outcomes shows that depression and emotional disorders in adulthood and adolescence fit into a much broader set of psychiatric, personality and behavioural 'disorders' (WHO, 1993). Depression is thought to be common in the general population although prevalence is hard to measure. For example, population surveys in the UK suggest that at any point, roughly 25% of adults may be suffering from a common mental disorder (Weich et al., 2003a), while studies using Canadian data suggest lower prevalence rates of depression (Matheson et al., 2006) and psychological distress (Curtis et al., 2009) between 8-9%. Differences in measures and perhaps cultures of reporting depression are likely to partially underlie these variations. The picture is no more certain for adolescents, as highlighted by Fleming et al., (1989) in their analysis of prevalence of adolescent depression where rates varied from 1.8% to 43.9% in the same sample depending on the diagnostic certainty of methods This highlights that there is considerable uncertainty in the diagnosis of these conditions and the implication which is taken for this thesis is that strict attention should be paid to the nature of the measure used in studies in order to compare work , where possible, on a like-for-like basis.

As most work in neighbourhoods and health refers to depression, this outcome is defined here and considered with respect to its relationship to self-esteem. Depression is defined by Beck and Alford (2009) in terms of five attributes (see Figure 2-2). These attributes highlight that depression is an unpleasant and debilitating condition, and when suffered particularly severely or on a chronic basis can have severe life consequences for individuals, and more broadly for society.

Figure 2-2 highlights that low self-esteem is closely related to this common mental illness. Furthermore, self-esteem theorists also recognise the conceptual overlap between these two constructs. Harter (1999) for example, notes that empirical work on the causal direction between depression and low self-esteem cannot establish any consistent temporal

precedence. This has led reviewers to suggest that research *should* utilise findings from studies on depression to inform understanding of self-esteem and vice versa (Emler, 2001). However, neighbourhood effect studies rarely examine self-esteem and frequently assess depression. Therefore, Emler's proposal allows us to draw from both the self-esteem and depression literatures to generate hypotheses about self-esteem and the neighbourhood. Given its centrality to this thesis, self-esteem is considered in more depth below as the definition is important when considering *why* it might be related to neighbourhood characteristics.

Figure 2-2: Five attributes of depression.

1. A specific alteration of mood: sadness, loneliness, apathy
2. A negative self-concept associated with self-reproaches and self-blame
3. Regressive and self-punitive wishes: desires to hide escape or die
4. Vegetative changes; anorexia, insomnia, loss of libido
5. Change in activity level: retardation or agitation
Source: Beck and Alton (2009), p. 8. Second attribute highlighted here to emphasise relationship of depression to self-esteem

James (1890) suggested that self-esteem should be considered in terms of what an individual aspires to (their 'pretensions') and the degree to which they meet those aspirations. He summarised this balance in a classic equation, whereby self-esteem is equal to successes / pretensions (James, 1999, p.1). An individual would have high self-esteem where their pretensions (hopes, desires and aspirations) were fulfilled by their successes. As success is dependent on *competence,* this has achieved an important role in self-esteem research (Mruk, 2006). The conceptualisation is intuitive and self-esteem has often been considered to be an important correlate of educational achievement.

A second dimension of self-esteem, "worth", was introduced by Morris Rosenberg in 1965. He conceptualised self-esteem as an evaluative *attitude* towards the self. Evaluations, in this definition are made on the degree to which an individual perceived themselves to have 'worth'. This had particular resonance with many empirical researchers because attitudes are particularly useful for measurement (Emler, 2001), and was also important in capturing the affective aspect of this trait (Rosenberg, 1965; Rosenberg, 1979). However, the use of worth as the sole dimension of evaluation without some qualification from what is known about the individual, can lead to considerable unwanted overlap with egotism, arrogance and narcissism

(Mruk, 2006; Cigman, 2004). Cigman (2004, p.93) argues that in the context of the educational and lay settings:

"… the concept of self-esteem is associated with a reasonably truthful perception of oneself in the world. A person who sees himself unreasonably, thinking he is more respected or more accomplished than is the case, is not normally said to have good self-esteem."

Ruth Cigman (2004) draws away, as does Mruk (2006) from the singular definitions offered by competence (James, 1890) or worth (Rosenberg, 1965). Rather, she builds directly on the work of Nathaniel Branden (1969 p. 110) who argues that self-esteem:

"… entails a sense of personal efficacy and a sense of personal worth. It is the integrated sum of self-confidence and self-respect. It is the conviction that one is *competent* to live and *worthy* of living."

Taking quite a pragmatic view, Cigman (2004, p.100) also suggests that teachers should be aware of…

"… the deceptive appearance of high self-esteem as a cover for low self-esteem. They should also be aware of naked low self-esteem, as in children who are timid, lacking in confidence, oppressed by a sense of their own inadequacy. Low self-esteem is a grittier concept than high self esteem, and indeed I believe that low self-esteem in children should concern us all."

Cigman's "naked" low self-esteem (considered here as that which individuals *publicly report*) is used below to consider how self-esteem might relate to neighbourhood deprivation. It will also be important when considering how to measure self-esteem.

Worth and competence are both relative, and can *only* be formulated by individuals with reference to others (Mruk, 2006). Self-esteem is therefore a *relational* construct, formulated

by individuals by considering what others think of them (Cooley, 1902) through mechanisms of social comparison (Festinger, 1954). Social relationships are theoretically central to its formulation for individuals (Harter, 1999; Baumeister and Leary, 1995). This centrality of the social world to self-esteem links it closely with disciplines such as geography which are concerned with interactions between people and their environment.

Self-esteem is widely considered to be a psychological *trait* (Clark, 1999). This might be taken to suggest that it might not be environmentally responsive (and therefore unlikely to vary with neighbourhood, or any other social conditions) or to vary over time. However, empirical work has identified statistically significant variation in the stability of the construct over time (Zimmerman et al., 1997; Baldwin and Hoffmann, 2002; Greene and Way, 2005). This implies that self-esteem should be expected to vary in association with social contexts, in a similar way to other psychological outcomes, but might be expected to be more stable than other constructs such as mood.

2.4.2 Theorising neighbourhood deprivation and self-esteem

Many possible linkages between neighbourhood and self-esteem have been theorised. For example, neighbourhood reputation may play a role in the development of low self-esteem (Macintyre et al., 1993). This argument is explicitly developed by Haney (2007) for self-esteem and Cutrona (2006) for depression. They draw upon the theory of *reflected appraisal* (Mead, 1934), whereby individuals internalise the opinions of others. In this case these opinions are mediated through the inequitable distribution of neighbourhood resources. According to deprivation amplification theory, these environmental resources might be expected to be particularly esteem-promoting in affluent neighbourhoods, and esteem-diminishing in deprived neighbourhoods.

Depression is often theorised to be responsive to stress (Cutrona et al., 2006). At least two sources of stress are identified in deprivation amplification theory. Firstly, the lack of resources and services in deprived neighbourhoods is thought to lead to high levels of daily effort needed to meet daily needs and are therefore demoralising (Matheson et al., 2006). While individually these 'quotidian' stressors are relatively minor life events, when they arise at a chronic level in the local environment they are difficult to avoid and represent an ongoing low-level stress that is theorised to be damaging (Matheson et al., 2006).

Drawing on the definitional arguments from self-esteem research above, the quotidian stresses are also likely to directly impact on self-esteem and depression in another way. Highlighting how self-esteem is at least a partial function of competence, it is likely that the neighbourhood environment may impact on an individual's sense of competence by virtue of the opportunities and constraints that the environment places on their ability to complete daily tasks. Thus through the lens of deprivation amplification theory, constraints will be higher in deprived neighbourhoods and individuals will feel powerless to maintain areas of competence tied to their self-worth. The fact that they might not appreciate the extent of the constraints in the wider neighbourhood over and above family poverty may even emphasise this, as Cutrona (2006 p.188) argues:

"People often do not realize that they are affected by the context around them and thus mistakenly blame themselves."

Deprivation amplification specifies a second set of stressors for depression that arises from higher rates of perceived and reported crime in more deprived neighbourhoods which are then internalised as *fear* of crime (Hill et al., 2005). Cutrona et al. (2006) suggest that fear of crime is a potent source of stress in individuals' everyday lives, and that this stress can

contribute significantly to the likelihood of developing anxiety and depression (Ivory, 2009; Congdon, 1996; Congdon, 2004; Durkheim, 1951).

Social relationships are central to the formulation of self and the mechanisms through which individuals evaluate their self-esteem (Baumeister and Leary, 1995; Leary et al., 1995). Social fragmentation of neighbourhoods presents barriers to the ability of individuals to *integrate* socially and form personal relationships (Ivory, 2009; f, 1996). Hence, Ivory (2009) and Matheson (2006) theorise that social fragmentation is associated with mental health more broadly, which draws on the classical work by Durkheim with respect to suicide (Durkheim, 1951, p.209, in Ivory 2009):

"… when society is strongly integrated, it holds individuals under its control, considers them at its service and thus forbids them from disposing of themselves."; "…suicide varies inversely with the degree of integration of the social groups of which the individual forms a part"

Social fragmentation is also associated with the degree of societal *regulation*. Durkheim regarded individuals as unable to limit their goals and passions, and argued that one of the features of integration of an individual into a social group was the regulation, and limitation, of the *passions* of the individual (Ivory, 2009). When considered alongside James' (1890) self-esteem competence equation *(self-esteem = successes / pretensions)* discussed above, Durkheim's thoughts on the subject resonate particularly strongly:

"…one does not advance when one proceeds toward no goal, or -- which is the same thing -- when the goal is infinity. To pursue a goal which is by definition unattainable is to condemn oneself to a state of perpetual unhappiness" (Durkheim, 1897, *Suicide*)

These types of processes were discussed by Durkheim with respect to family and religious groups; however, they have been extended to wider social processes. Specifically, work

discusses how urbanisation has often been described as socially fragmenting and has led to the breakdown of the ability for societies to adequately regulate and integrate individuals (Acevedo, 2005; Congdon, 1996). In terms of its relationship with neighbourhood deprivation, social fragmentation may thus be a key proximal pathway through which neighbourhood deprivation might be expected to be inter-related with self-esteem and mental health.

Mental health might also impact on an individual's perception of their neighbourhood. For example, one of the cognitive manifestations of depression is the tendency of individuals to perceive the outlook for the future and of the world in general, more negatively than it might appear to outside observers (Beck and Alford, 2009). Furthermore, recent work argues that adolescents' perceptions of their neighbourhoods might be impacted by their mental health (Fagg et al., 2008a). Literature on neighbourhood perceptions is therefore concerned with a different set of issues, in particular the potential for bidirectional associations, and is thus not considered here in detail. This review concentrates on those studies which have investigated the associations between independent measures of neighbourhood and individual mental health.

In summary, self-esteem and depression can be theorised to vary with neighbourhood deprivation in many ways. Pathways have in general been conceptualised in terms of the ways that neighbourhoods impact upon individuals. However, psychological state may also have an important role to play in the ways that neighbourhoods are perceived and, therefore, the ways that they might be internalised into the psyche. The following sections examine the evidence for these pathways among adolescents and adults.

2.4.3 Neighbourhood deprivation and adult depression

Studies of mental health and neighbourhood deprivation have grown in number in the last ten years since a review of research in the 1990s identified only one study of this nature (Pickett

and Pearl, 2001). However, the neighbourhood effects literature on mental health is dominated by work from the United States. For example, a recent systematic review of neighbourhood effects and depression identifies that thirty four out of forty five studies were based on U.S samples (Mair et al., 2008).

Relational theories discussed above emphasise that processes operating at the global level cannot be separated from those operating within very local spheres such as the neighbourhood (Massey, 2005). Even when Canada and the United States are compared, two countries which are in many ways socio-geographically similar and share both cultural, socio-economic and strategic interests, very strong differences emerge when the neighbourhood context is compared (Oreopoulos, 2008). Oreopoulos compares and contrasts an inner city project (now demolished) in Chicago (Robert Taylor Homes) and Toronto (Regent Park) for illustration. He highlights that rates of crime were high in Regent Park compared to Toronto more widely (15 reported assaults per 1000 in 1999, compared to 1.7 over the whole city in 1995), but that the average for neighbourhood across the whole of Chicago was similar to the worse project in Toronto at 14.3 in 1995in Chicago, while tenants of the Chicago housing project described crime in terms of the "total disruption to everyday life" (Oreopoulos, 2008, p.239). In terms of deprivation, 95% of the 20,000 residents of the Chicago project were without work, in contrast to 59% of the Toronto neighbourhood. Significantly for adolescent mental health, 75% of the Chicago project households were single parent, in contrast to 56% of those in Toronto. The lived conditions implied by these statistics are illustrated in the photos below although of course these cannot capture the *differences* between the two contexts (Figure 2-3).

Figure 2-3: Photos of Regent Park Project (Toronto) and Robert Taylor Homes (Chicago).

Regent Park, Toronto, Canada

Robert Taylor Homes, Chicago, U.S.

This perspective is supported by empirical cross-national work on other health outcomes (Ross et al., 2005) and reviews of the literature in other fields (Cummins and Macintyre, 2006; Lynch et al., 2001). Rates of crime, poverty of the scale seen in Toronto are disturbing and reflect an inequitable distribution of risks due to both composition and context to residents living in those neighbourhoods. However, it is striking how much worse neighbourhood deprivation in the United States is on a city wide basis in Chicago, and also in the particular case of the Robert Taylor Homes project. The implication is two fold: relationships between neighbourhood deprivation and health from U.S. based studies should only be used critically to inform hypotheses in other developed world countries. Moreover, this shows that work should continue outside of this context to build up an evidence base which is socio-geographically appropriate.

The volume of research in this area from the U.S., and the argument made above, that it should be generalised from cautiously here, means that all U.S. primary studies are not reviewed here in depth. However it is important to note that of studies with large sample sizes

covering the whole of working age adulthood and investigating links with between independently measured neighbourhood deprivation and depression, five identified statistically significant cross-sectional associations after adjustment for individual and household factors (Silver et al., 2002; Ross, 2000; Cutrona et al., 2006) while two identify prospective associations between change in depression and neighbourhood deprivation after adjusting for individual and household socio-economic characteristics (Galea et al., 2007; Yen and Kaplan, 1999b).

Associations between neighbourhood deprivation and depression are consistent across studies examining the links across adulthood in the U.S. However, the arguments reviewed above about the socio-historical context of neighbourhood deprivation in the United States suggest that these relationships may not be observed outside of that national context.

The earliest work in this field found that psychological morbidity varied across regions in the UK in ways which are associated with material deprivation (Blaxter, 1990; Lewis and Booth, 1992; Skapinakis et al., 2005). This led to the assertion that variations in psychological morbidity were, like other health outcomes, likely to be associations with place characteristics.

The majority of work which takes account of small area level variation finds that regional variations in psychological morbidity are due to sampling fluctuations. For example, Duncan et al. (1995) report that variations between regions, and wards, were not significant after adjustment for local composition of the neighbourhood in a model examining both regional and local variations. Neighbourhood deprivation was not examined as an explanatory variable for this reason (Duncan et al., 1995). Similar findings were found in studies of adults in Amsterdam, which found that associations between variations in psychological morbidity and neighbourhood deprivation could be explained by adjustment for individual socio-economic status (Reijneveld, 1998).

More recently, Scott Weich and his co-investigators have conducted a series of studies using the British Household Panel Study (BHPS). These investigations examine the multi-level components of variation in psychological morbidity and found no between-ward differences and no associations with neighbourhood deprivation with prevalence of psychological distress (Weich et al., 2003b; Weich et al., 2005a), or onset or maintenance of the condition (Weich et al., 2005a). No statistically significant relationships were observed in either study between neighbourhood deprivation and these outcomes independently of individual characteristics over the sample as a whole. However, in the prevalence study, an independent association between deprivation and psychological morbidity was observed for those who were economically inactive and more likely to spend considerable time in their home (Weich et al., 2003b).

Using data from the Health Survey for England (HSE) collected in 2000-2003, Fagg et al. (2008b) examined the psychological health of young adults aged 16-24. Neighbourhood deprivation was not statistically associated with psychological morbidity measured by the GHQ-12. In a separate study of all working age adults, Fagg (2008b) found an inverse association between neighbourhood deprivation and psychological distress from adults drawn from the Health Survey for England (2002-2004). Social fragmentation was also found to be inversely associated with the outcome independently of neighbourhood deprivation.

Wainwright and Surtees (Wainwright and Surtees, 2004b; Wainwright and Surtees, 2004a) analyse two sets of psychological morbidity outcomes from the European Prospective Investigation into Cancer and Nutrition in Norfolk, UK (EPIC-Norfolk). The first study showed that neighbourhood deprivation was significantly associated with the odds of individual

reporting life time prevalence of *mood disorders*[1] after taking account of individual and family factors (Wainwright and Surtees, 2004b). However, a second study using the sample dataset, suggested that mental health measured by the SF-36 mental health subscale was not associated with neighbourhood deprivation independently of composition (Wainwright and Surtees, 2004a). This highlights that measurement of mental health can have important impacts on whether relationships are observed even within the same broad set of individuals.

Steptoe and Feldman (Steptoe and Feldman, 2001) examined perceptions of neighbourhoods and independent measures of neighbourhood deprivation to examine the distribution of depression for 658 respondents based in London, UK. They find that the independently measured neighbourhood deprivation measures were not significantly associated with depression, although perceptions of neighbourhood problems were. This illustrates the reverse causation issue: independent measures may be associated with perceptions of place, but not with health, perceptions may also be simultaneously associated with health. This pattern of association might imply that individuals with poor mental health might be perceive deprived neighbourhoods as more deprived, but variations in their mental health are not necessarily causally associated with neighbourhood variations (Fagg et al., 2008a).

In another study of 848 mothers with small children in Nottingham, UK, Mulvaney and Kendrick (2005) report that neighbourhood deprivation is significantly associated with depression after adjustment for composition. This is interesting because single parent families are noted for being relatively deprived compared to families with the potential to earn two incomes (McMunn et al., 2001). This result is therefore interesting when considered with the

[1] Defined by Wainwright and Surtees (2004b), as "a structured self-assessment approach to psychiatric symptoms representative of selected DSM–IV criteria for major depressive disorder and generalised anxiety disorder (American Psychiatric Association, 1994)".

findings by Weich et al. (2003b) who describe an emergence of a place effect when examining low income groups.

In one of the most powerful study designs observed in the literature, Stafford and Marmot (2008) use the Whitehall II cohort to identify prospective associations between neighbourhood deprivation and social fragmentation and mental health (Stafford et al., 2008a). This study is of particular interest as it investigates these relationships longitudinally, examining how neighbourhood deprivation and fragmentation are associated with subsequent changes in health status. They report evidence of a dose-response relationship between the length of exposure to neighbourhood deprivation and social fragmentation and mental health, providing important evidence for a partially causal role of these variables.

Matheson et al. (2006) examine depression in urban neighbourhoods across Canada. They go on to find that deprivation is significantly associated with depression after adjustment for individual characteristics and a number of socio-demographic features of neighbourhood including residential stability. This residential mobility score shares key components with the social fragmentation score and includes the percentage of lone parent families in each neighbourhood in addition to other social fragmentation indicators. They find that this score is independently associated with depression.

Neighbourhood deprivation was not associated with depression in a study of British Columbia (Veenstra, 2005). The author also investigated interesting elements of the neighbourhood social environment, including the number of voluntary organisations, levels of trust (aggregated from individual sample responses) and number of 'public spaces' per capita for recreation (including churches, parks and retail). In their analysis of depression, individual but not collective trust was associated with depression, as were the number of public spaces.

Ivory (2009) analyses the relationship between mental health, neighbourhood deprivation and social fragmentation. Using the SF-36 score, Neighbourhood deprivation is strongly associated with mental health after adjustment for social fragmentation. Social fragmentation, measured in separate analyses, by the Congdon and New Zealand indices was independently associated with mental health after adjustment for neighbourhood deprivation and composition.

Curtis et al. (2009) employ a longitudinal design to test the prospective association between neighbourhood deprivation and psychological distress in a sample drawn from the Canadian National Population Health Survey (NHPS). Their findings showed that there were no associations between distress and neighbourhood deprivation or social fragmentation after adjustment for individual and family factors.

One final, but important point to note about this review is that only one study in the entire international literature (Haney, 2007) was found which considered adult self-esteem as a function of neighbourhood problems. This study was based in the United States and assessed neighbourhood problems through the perceptions of the respondent and so was not considered above. Using structural equation models, Haney investigates social disorder mechanisms which might underlie this relationship using participant-reported perceptions of neighbourhood physical disorder (street cleaning, crime and vandalism) and civic engagement (membership of local organisations) as mediators. He finds that perceptions of these variables by respondents explain much of the relationship between *perceived* neighbourhood deprivation and self-esteem (Haney, 2007). This is important, because even though self-esteem is considered to be the least mutable (and therefore the least environmentally responsive) in adulthood, it constitutes some evidence for associations between the neighbourhood environment and this construct.

The body of work from the UK and Canada suggests that neighbourhood deprivation and social fragmentation are not consistently associated with depression and mental health but that studies with particularly robust designs (Stafford et al., 2008a) or large power to detect statistically significant gradients between deprivation and health outcomes (Fagg, 2006) *do* identify associations between these indicators.

International systematic reviews of the literature on depression suggest that there are inconsistencies, but that the evidence points to a relationship between neighbourhood deprivation and depression (Mair et al., 2008; Kim, 2008). They suggest that U.S. based studies seem to report stronger relationships than those based on samples from 'more egalitarian countries' where income inequality is lower (Kim, 2008). This particular question is not the focus of this thesis, but by situating the work in the adult mental health literature from Canada and the UK, it becomes clear that several robust tests of the relationship between mental health suggest that there is only a weak relationship.

Other commentators agree with this viewpoint with respect to the UK. In his focus on the lack of a relationship between mental health and neighbourhood Weich (2005) considers the lack of a relationship between mental health and the neighbourhood environment. He suggests that this is due to the heterogeneity of electoral wards as a unit of analysis. From a sociological perspective, it is possible that the lack of variation may be due to differences in responses to mental health instruments. For example, measures such as the General Health Questionnaire (GHQ) may be prone to socioeconomic response bias, with those from lower socio-economic status groups underreporting psychological distress symptoms (Stansfeld and Marmot, 1992).

Weich (2005) offers key recommendations to focus research on neighbourhoods and mental health. Firstly, he consistently highlights the importance of cross-level interactions (Weich, 2005, p. 255). Specifically, he draws attention to both the salience of wider geographies of

rurality, but also interactions between individual and family factors in teasing out where neighbourhood interactions with mental health may or may not be observed. Secondly, he highlights the 'dearth of prospective studies' (p.256), and suggests that associations between mental health and neighbourhood deprivation may only emerge when individuals reside in neighbourhoods for a considerable amount of time. This recommendation has since been confirmed by Stafford et al. (2008) as discussed above. Thirdly, he argues that neighbourhood risk factors for mental health may be most profitably explored with a focus on risk factors in childhood context and lastly he suggests that:

"We need to know much more about residential mobility, who moves between areas, why they move, and what effect this has on their health. The health effects of residential mobility (or lack thereof)—like those of place more generally—may vary with individual circumstances, including health" Weich (2005, p.256).

Overall, his assessment suggests that the lack of strong relationships between depression and neighbourhood deprivation may be explained by close attention to the nature of these types of relationships earlier in the life course. This project has already been started, with a small, but growing international literature which investigates these associations in childhood and adolescence. This literature is examined below, after consideration of the specific theories relevant to associations between neighbourhood deprivation and adolescent health.

2.4.4 Theorising neighbourhood deprivation in adolescence: Deprivation amplification and socio-economic equalisation perspectives

Section 2.2 highlighted that the relationships between health and place are not just contingent on the characteristics of places, but also on the characteristics of people. Life stage fundamentally defines how individuals interact with places and means that research should

distinguish between adolescents and adults in theoretical perspectives (section 2.2.2). The following section describes the implications of two influential hypotheses: deprivation amplification (outlined in section 2.4.2) and socio-economic equalisation for relationships between neighbourhood deprivation and self-esteem.

The majority of theoretical and empirical work reviewed above suggests that for adults health inequalities in mental health should be considered through deprivation amplification pathways. Theorists in neighbourhood effects research directly apply this hypothesis to adolescents, although they use different terminology (Mayer and Jencks, 1989; Leventhal and Brooks-Gunn, 2000). Jencks and Mayer's framework of neighbourhood effects has been widely acknowledged as providing the theory for many empirical studies in this age group (Sampson et al., 2002).

Jencks and Mayer (1990) discuss deprivation amplification in terms of the positive benefits that adolescents might obtain from living in close proximity to neighbours who were typically affluent. They theorise in particular that adolescents would derive benefits from three mechanisms labelled as 'epidemic', 'collective socialization' and 'institutional'. The first suggests that adolescents tend towards the behaviour of local peers in order to belong, and that this behaviour may be more positive in affluent neighbourhoods, but more negative in deprived neighbourhoods. The second mechanism refers to the presence of positive role models in the form of local adults in affluent neighbourhoods who show that success might be achieved with hard work. This has resonance for self-esteem as the definitions above suggested that there is likely to be a strong competence component to its formation. Finally, the institution model specifically describes the idea that adolescent-specific contexts such as the school, out of school activities and other care structures outside of the home are likely to be better resourced in affluent neighbourhoods. Greater resources not only allows greater

educational achievement, but also more time for teachers and pupils, and other external adults to develop positive, nurturing and self-affirming relationships with adolescents.

A strong argument might be made that deprivation amplification can be extended to adolescents and that inverse associations might be expected between self-esteem and neighbourhood deprivation (and a positive association with depression). However, while the deprivation amplification is persuasive, it is not the only model which has gained considerable support in the literature.

In the UK, work in adolescence has consistently supported an equalisation hypothesis which suggests that neighbourhood deprivation may be associated quite differently with adolescent health. Class based variations due to socio-economic status undergo an apparent 'equalisation' over the transition from childhood to adolescence as has been specified in the UK (West et al., 1997). The hypothesis takes a life course perspective, suggesting that there are strong socio-economic gradients in health in childhood, which equalise in adolescence, and subsequently re-emerge in adulthood. This life course perspective is not focussed on here as it cannot be examined empirically in this thesis. However, the hypothesis is useful because it theorises socio-economic status broadly as a construct operating at both family and neighbourhood level (West, 1997) and considers how it relates to adolescent mental health.

Literature around this hypothesis is used here to consider what equalisation processes might explain the weak relationships between neighbourhood deprivation and psychological outcomes outside of the U.S. (West and Sweeting, 2004). West et al. (2004) draw together three theories specifically associated with the transition from childhood to adolescence. Firstly, the childhood-adolescence transition is characterised by the onset of puberty. Developmental perspectives highlight that adolescents will increasingly focus on physical attractiveness, a dimension which is strongly associated with low self-esteem. This pathway has been discussed with respect to the tendency of self-esteem to decline (especially for girls)

over the course of early adolescence (Baldwin and Hoffmann, 2002). The transition to secondary school also brings with it social and cognitive challenges. Belonging is important for mental wellbeing, and this socialisation process increasingly operates through peer (Ingoldsby et al., 2006; Lundborg, 2003; Rankin and Quane, 2002; Turley, 2002a) and school contexts (Greene and Way, 2005) after the transition from childhood to adolescence. These processes are, West (2004) argues, independent of, and more important to adolescent mental health than social status marked by parental social class.

The contextual-composition framework would frame the first two pathways in terms of composition; adolescent age and sex, and happiness peer networks can all be thought about as compositional characteristics. A third pathway relates more directly to the social context of the school, and concerns the *educational stressor* hypothesis. First formulated by (Rutter M. and Smith, 1995), this process draws on the assumption that parent, school and neighbourhood level educational expectations and pressure to achieve might be much higher for adolescents living in affluent neighbourhoods, and attending affluent schools. These expectations may typically be higher than what is reasonable for many adolescents without experiencing considerable stress, and negative self-evaluation. This pathway links in with the competence aspect on self-esteem, whereby self-esteem = successes / pretensions. As James (1890) points out, a person may enjoy great success, but where their pretensions (set by their social context) are unreasonably higher, they may suffer low self-esteem as a consequence of the imbalance. This pathway is consistent with research which demonstrates that aspirations are closely linked to educational achievement and success both concurrently in adolescence and in later life (Sacker and Schoon, 2007). It can be consistent because successes are achieved, but perhaps at the cost of self-esteem at this age.

West et al. (1997, 2004) review a large number of studies to demonstrate that there is consistent evidence for a lack of association between mental health and socio-economic status

in adolescence. These studies will not be re-reviewed here, but key points are drawn from the reviewed material, Firstly, they draw on findings from the classic Isle of Wight studies of adolescents to show that the prevalence of emotional problems (discussed in the original studies as 'neurotic disorders') were not associated with parental social class (Graham and Rutter, 1973). Other work examining the Young People's Leisure and Lifestyles survey suggests that there is apparent equalisation in psychological distress (assessed by the GHQ-12) by parental social class at age 15 (Glendinning et al., 1992). Findings from the Twenty-07 study support this for psychological distress and find the same pattern for anxiety and depression measured by the hospital anxiety and depression scale (Ford et al., 1994).

Critiques of the theory have been based on whether equalisation by occupational social class is an artefact of the measure, which excludes adolescents living with 'unoccupied' people (Judge and Benzeval., 1993). Judge and Benzeval (1993) argued that 'uncoccupied' people are often single mothers, who are also typically socio-economically deprived, and that it is their exclusion from the analysis which effectively equalises the gradient. They re-analysed West et al's (1991) findings, to include single mothers in the lowest social class group and found that an inverse gradient emerges. However, while this is a robust criticism; extensive further work establishes that patterns of equalisation are evident on several non-occupational class measures. For example, West and Sweeting (2004) demonstrate equalisation by housing tenure, and adolescent-perceived family affluence. Similarly, Fagg et al. (2006) establish that free school meals are not associated with psychological distress in a contemporary cohort.

The evidence base for equalisation is not completely consistent. For example, work from the National Child Development Study (Sacker et al., 2002) has suggested that psychosocial adjustment was weakly associated with social class at ages 11 and 16. The authors fit one model which took account of the direct associations between parental social class and the psychosocial adjustment and educational achievement of their children and found only weak

relationships. However, a more complex 'contextual systems model' considered how class was mediated by intervening social relationships between parental social class and these outcomes found strong intervening pathways from class to these outcomes. The analysis highlights that models testing equalisation should ensure that family social environments are examined in order to determine whether equalisation is supported.

The development of the theory has tended to rely on studies examining the influence of *either* family level socio-economic status (West and Sweeting, 2003), *or* neighbourhood level deprivation (West and Sweeting, 2004). For example, in their most recent published review of their theory, they analyse information to show that age and sex adjusted associations between adolescent mental health and levels of deprivation are equalised. In independent analyses they show that mental health is equalised by perceptions of family affluence, parental social class, and housing tenure. As they do not employ a multivariate approach, they do not comment on the ways in which neighbourhood deprivation might *interact* with family level socio-economic status.

This omission is potentially important because it means that socio-economic status can only interact with adolescent health directly, through, for example, differential access to resources. However, as was made clear in earlier sections, self-esteem is defined and constructed by individuals with respect to others. Even though they have little to no control over their parents' socio-economic circumstances, and thus their own relative socio-economic standing adolescents are not immune from drawing comparisons with others in their local context based on socio-economic status. Jenks and Mayer (1990p. 116-117) argue that effects of relative socio-economic deprivation might be important for adolescents because they are aware of their relative living standards to others. This has been observed in several contemporary qualitative accounts of adolescents in terms of the importance of 'keeping up appearances' (Middleton, Ashworth and Walker, 1994; Attree, 2004; Daly and Leonard, 2002).

This process is likely to operate through peer networks, where popularity is a function of fashion and consumer culture. For example:

"Look at these crap runners I'm wearing. My ma can't afford to get me the right ones and it's terrible when you can't afford the right ones. You have no choice, but we couldn't afford it so I was the one that got picked on." (Daly and Leonard, 2002, p.137)

Therefore, there appears to be good reason to expect that the impacts of family socio-economic status might interact with neighbourhood deprivation. This pathway is, in conjunction with the deprivation amplification pathways outlined in section 2.4.2, important for understanding how equalisation may be observed over a whole sample. Jencks and Mayer (1990) provide one of the most widely cited frameworks for thinking about how neighbourhood interact with adolescent mental health. They focus on how having neighbours who are affluent might impact on health and suggest three sets of pathways. The first refers to deprivation amplification processes, highlighting the formal and informal resources of local adults and peers for young people. The second, refers to the cross-level interaction outlined above, suggesting that *competition* and *relative deprivation processes* might lead adolescents from poor families to perform poorly in affluent neighbourhoods. The third, and least cited, suggests that these processes might both be partially correct, with the result over the whole sample that no neighbourhood effect is observed, Jencks and Mayer (1990, p.118). Effectively, the authors outline a situation where multiple pathways produce *apparent* equalisation which might not be observed without due attention to cross-level interactions between levels.

The discussion above suggests that conceptually and empirically, there is some evidence for socio-economic equalisation in mental health in adolescence at the family level. This argument is conceptually extended to take into account socio-economic variations at the family and neighbourhood level, but West et al. (2004) do not build discussion of this into their

hypothesis. The next section of this review considers the evidence base that does exist and which examines socio-economic inequalities in adolescent mental health and self-esteem at the family and neighbourhood level before considering the implications for the body of research on adolescent mental health.

2.4.5 Empirical relationships between adolescent depression, self-esteem and neighbourhood deprivation

Adolescent mental health can be broadly categorised into externalising and internalising sub-categories (Cicchetti and Toth, 1991). Externalising mental health includes problems associated with a child's conduct, including behavioural issues such as hyperactivity and aggressive behaviours. In contrast, internalising problems relate to depression and anxiety and somatic concerns (Cicchetti and Toth, 1991). Externalising outcomes are more clearly observed than internalising outcomes, and relationships between these outcomes differ substantially in terms of direction, magnitude and significance in the same individuals (Collishaw et al., 2009). For this reason, the study is situated in work relating to internalising mental health in adulthood and adolescence which examines outcomes such as mood disorder, depression and anxiety.

Using a school-based sample in three East End London boroughs, Fagg et al. (2006) found no cross-sectional association between psychological distress and neighbourhood deprivation. A similar finding was noted for social fragmentation. However, the authors noted a key limitation of the data specifically that the inner-city sample used was likely to be restricted in terms of the range of deprivation. The majority of the small areas in question fell in the highest quintile of deprivation on a national level (Fagg et al., 2006).

In analyses based in the Netherlands, Drukker et al. (2003) found no statistically significant relationship between neighbourhood deprivation and mental health either before or after

adjustment for individual or family factors. Interestingly, family socio-economic status was not found to be inversely associated with mental health or self-esteem. Drukker et al. (2006) then present prospective evidence where they examine whether neighbourhood deprivation was associated with change in self-esteem. Changes in mental health or self-esteem were not associated with neighbourhood deprivation. However, when this study tested whether the relationship between neighbourhood deprivation and change in self-esteem varied by levels of maternal education, an interaction emerged. Specifically, for adolescents whose parents had lower educational qualifications, neighbourhood deprivation at time 1 was associated with increases in self-esteem from time 1 to time 2. In contrast, where parents were highly educated, neighbourhood deprivation was prospectively associated with a decrease in self-esteem over the same time period. No effect of neighbourhood deprivation was observed independently of this interaction. This emphasises that equalisation may be observed over the whole sample where neighbourhood deprivation is associated with youth outcomes in opposite directions among two sub-groups of the population (Jencks and Mayer, 1990).

Schneiders et al. (2003) report that neighbourhood deprivation *was* associated with both prevalence and change over a two year period in adolescent internalising mental health. These associations are powerful because mental health was assessed from two perspectives, reported by both parents and adolescents using the well-validated child behaviour checklist and associated youth self-report measures (Achenbach, 1987).

Although studies of neighbourhood effects have been conducted in Canada, they were not directly applicable here. For example, three studies investigate neighbourhood effects in the NLSCY but are restricted to younger ages (Boyle and Lipman, 2002; Curtis et al., 2004; Georgiades et al., 2007; Oliver and Hayes, 2008). As described above, children have a quite different relationship with the neighbourhood environment than adolescents and results are not considered to be generalisable from this literature.

The body of literature in this area is again, sparse. There are no studies from Canada which explicitly test these questions for adolescents and those based in the UK are regionally-restricted (Fagg et al., 2006; West and Sweeting, 2004), which might have restricted the variability of the sample in terms of the amount of neighbourhood variation (Fagg et al., 2006).

Owing to the lack of studies for the UK and Canada, literature from the United States is examined. Here, evidence for associations between depression and neighbourhood concentrated poverty comes from three linked studies by Wickrama et al. (Wickrama et al., 2005b; Wickrama and Bryant, 2003; Wickrama et al., 2005a). These studies used the National Longitudinal Study of Adolescent Health (AddHealth) study to investigate direct associations between concentrated poverty and depressive symptoms. The first study operationalised concentrated poverty with a composite measure (a composite of % families living in poverty, % single parent families, % adults in service occupations and % of unemployed men), found an association with neighbourhood deprivation, which disappeared after adjustment for family socio-economic status (Wickrama and Bryant, 2003). However, as family economic hardship was strongly associated with symptoms in all models this can still be considered as supportive of the equalisation hypothesis. The second study, using a slightly different sample and a single indicator of poverty (% families in poverty) did find consistent relationships (Wickrama et al., 2005b). Finally, a third study, using the original, composite measure investigated the influence of neighbourhood on prevalence and change in depressive symptoms and found a significant effect (Wickrama et al., 2005a). Both outcomes were inversely associated with neighbourhood deprivation as might be expected from the deprivation amplification perspective.

Turley et al. (2000b) find a significant relationship between self-esteem and neighbourhood level median income after adjustment for a broad range of confounding variables at the child and family level. The study is interesting because it tests the influence of neighbourhood

median income as quadratic and linear coefficients in the model. The linear term is positive and significant, indicating that as neighbourhood income increases, self-esteem also increases. However, the quadratic term is negative and highly significant indicating that as income increases, the effect becomes weaker.

2.4.6 Summary and implications

To summarise, literature from the United States draws on nationally representative, socio-economically diverse surveys and consistently supports the deprivation amplification hypothesis for adults and adolescents. In contrast, the adult evidence base outside the United States only weakly supports the deprivation amplification hypothesis. This is particularly true in adolescent research which is entirely based on samples from regions and cities and is therefore potentially socio-economically restricted. The adolescent literature typically supports an equalisation hypothesis.

The implications of this review are that deprivation amplification may exist outside the U.S but that study design has not been sufficient to observe the full range of neighbourhood deprivation. To test this, a study would need nationally representative data for adolescents living in countries which were comparable to the U.S. The UK is a useful comparison because previous research supports *equalisation* despite its methodological flaws and a second useful comparison would be Canada because, like the UK, it shares socio-historical, cultural, political and commercial interests with the United States but differs in key ways such as the degree of income inequality and provision of social welfare which might be salient for mental health. Thus, the overall conclusion of this section of the review is that research should examine whether equalisation is observed for adolescents in the UK and Canada in a sample which is nationally representative and therefore captures the full range of neighbourhood deprivation.

2.5 Reconnecting adolescents and places

The equalisation hypothesis specifies that relationships between adolescents and socio-economic context will trend across early adolescence and will vary by sex. In addition, for a comprehensive test of the theory it is important to check that inverse associations between neighbourhood deprivation and self-esteem are not evident for any sub-groups of the population defined by socio-economic status or the social characteristics of the family. Finally, there are important reasons why relationships between neighbourhood deprivation might vary by levels of social fragmentation and more widely with urban/rural status. These interactions are discussed with respect to theoretical and empirical work below.

2.5.1 Trends over time

Longitudinal data is essential for testing trends with age. These are also particularly important when considering the processes of equalisation suggested by equalisation theory. Firstly, age marks out, to some extent, the stage in the life course. West et al. (1997) hypothesise that SES inequality will be evident in childhood as a stage in the life course, but that the transition to adolescence will see an equalisation. This perspective could not be tested as the current study is focussed primarily on interactions within and across early adolescence. However, these processes have been examined elsewhere (Sacker et al., 2002), and results were reported above.

Within the stage of early adolescence, West et al. (1997) suggest that inequalities in mental heath will gradually weaken towards mid-adolescence. In later work, they revise this to suggest that the inverse gradient may even reverse with increasing age following the results from a longitudinal sample which examined the gradients at ages 11, 13 and 15 (West and Sweeting, 2004). This mechanism can be thought of as a cross-level interaction between age

and socio-economic status. This would be measured at the household level, and at the neighbourhood level, and the interactions would encapsulate how both levels of context trend in their relationships with self-esteem.

Age trends are also implicated in explanatory mechanisms for equalisation theory. Specifically, West et al. (1997) suggest that over the course of early adolescence, peer social influences will become more closely related to self-esteem. This builds on work which suggests that peer influences may increase in importance relative to family influences in early adolescence. This mechanism, supported by empirical findings from the Twenty 07 study (West and Macintyre, 1990), established that peer influences were associated with smoking, but not with class. However, more relevant and recent literature from the U.S. suggests that age trends in self-esteem are, when tested simultaneously, modified by family factors more than peer factors (Greene and Way, 2005). This is contrary to the assertion made by West et al. (1997) and highlights that age trends in social relationships between parents and adolescents remain a contested area of the equalisation hypothesis.

2.5.2 Gender and place

The experience of place, and it implications for health, cannot be separated from wider, gendered power relationships in society (Dyck, 2003). The importance of such power relationships is central to a relational geography of health and highlights that research must recognise how health and place may interact different for boys and girls. These differences are widely recognised and are relevant to adolescent mental health and self-esteem at all levels of social context. For example, Mazza (2009) also stresses the importance for designing interventions of identifying how family settings might impact differentially on girls and boys.

Self-esteem is correlated independently with age and gender (Kling et al., 1999). The two also interact such that gender differences widen over the transition from late childhood to mid-

adolescence (Baldwin and Hoffmann, 2002; Wade et al., 2002). This pattern is consistent with studies of depression at the same age group, strengthening the assertion that the two are conceptually and empirically similar and likely to have similar social aetiologies (Wade et al., 2002). However, this pattern is contested by Greene and Way in analyses with a multi-ethnic sample, and highlights that there is good reason to expect that self-esteem would vary by ethnic group (Greene and Way, 2005). However, this assertion is contested by a large number of other authors who argue that there is no association between self-esteem and ethnicity (Emler, 2001; Rosenberg, 1965).

Trends in self-esteem by gender are likely to be associated with many processes including physiological changes over puberty, and changes in the ways that social contexts are experienced differentially as girls and boys are increasingly socialised into gender-differentiated roles over this period (Baldwin and Hoffmann, 2002; Valentine, 2000). It may therefore be important to explore whether trends in relationships between socio-geographical context and self-esteem are similar for both boys and girls.

Equalisation might operate differentially for girls and boys (West and Sweeting, 2004). In their analysis testing this, there are no differences in malaise symptoms by neighbourhood deprivation for boys, but in the most affluent neighbourhoods, girls report *more* malaise symptoms. While the sex of respondents is controlled for in all the studies of adolescent self-esteem and mental health reviewed above, only one tests for interactions with sex (Schneiders et al., 2003). No association was found in this case. However, experimental evidence from the Moving to Opportunity Study (Kling et al., 2007), shows strong differences in mental health for girls and boys following a move from a deprived to an affluent neighbourhood (described in more detail in section 2.6.1).

In the larger literature examining family poverty and socio-economic status, girls appear to be more resilient to low family socio-economic circumstances than boys (Schoon, 2006). Empirical work which has identified such interactions including work from the United States has found that socio-economic status in families is more strongly associated with low self-esteem in boys than girls (Bolger et al., 1995). This may be indicative of two complementary processes; girls might be less susceptible to risks posed by social environments at the family level, or boys might react more negatively to adverse family circumstances.

This suggests that the interaction between sex and socio-economic context at both the neighbourhood and household levels is likely to be important. It is not clear how such an interaction would operate for the neighbourhood level if it were significant, but empirical work suggests that socio-economic equalisation at the household level would be more evident in girls than boys.

Family environments are also important for self-esteem because of their social dimensions. Mazza et al. (2009) describe risk factors for depression in adolescence, and examine how these prospective associations between these risk factors and depression vary by sex. Writing from a developmental psychology perspective, their model does not include aspects of socio-geographic setting outside of the family. However, they identify that family and marital conflict is associated with depression in girls seven years later, but not for boys. Work examining interactions between parents and adolescents supports this, suggesting that self-esteem is associated with maternal monitoring in girls but not in boys (Bamaca et al., 2005).

2.5.3 Examining families in place

Models of adolescent mental health suggest that the family/household is a critical environment for teenage psychological development (Mazza et al., 2009). Self-esteem is consistently associated with social relationships with family and peers including adolescents'

relationship with their parents (Bamaca et al., 2005; Baumrind, 1968; Coopersmith, 1967), peer support and friendship quality (Way and Robinson, 2003; Coates, 1985). Indeed self-esteem tracks relationship quality so closely that some theorists have suggested that its fundamental psychological role is one of a barometer of social relationships, a 'sociometer' designed to ensure that the individual remains socially integrated (Baumeister and Leary, 1995; Leary et al., 1995).

Family socio-economic status measured by household income and maternal education have both been associated with emotional problems in this age group (Emerson et al., 2005). However, as is discussed above, these findings are contested by proponents of the socio-economic equalisation hypothesis who suggest that there are few clear associations between teenage mental health and socio-economic status (discussed in section 2.4.5) and also disputed by reviewers of the self-esteem literature (Emler, 2001).

The social context of the family is also important. Adolescent self-esteem is associated with maternal depression (Baldwin and Hoffmann, 2002) and family functioning (McMunn et al., 2001; Rodgers and Pryor, 1998; Fagg et al., 2006). Associations between lone parent family structure and self-esteem are typically attenuated to non-significance by adjustment for family socio-economic status. Consistent patterns emerge for reconstituted families from these studies, such that there is an increased risk of low self-esteem compared to families with both biological parents even after adjustment for family SES (McMunn et al., 2001; Rodgers and Pryor, 1998; Fagg et al., 2006). This suggests that lone parent effects may operate through socio-economic pathways, while reconstituted families which are socio-economically similar to intact families, may present social challenges.

Socio-geographical perspectives suggest that the family cannot be disassociated from the local neighbourhood environment. In their classic framework of neighbourhood effects in

adolescence, Jencks and Mayers (1990) identify how family socio-economic status might be expected to interact with neighbourhood socio-economic context through processes of relative deprivation and competition for resources. This is not confined to professional geographers of course and resonates strongly with ecological theorists in developmental psychology where these types of interactions have also been recognised for decades (Bronfenbrenner, 1979).

Drukker et al. (2006) found limited evidence (not significant at conventional, 95% levels of confidence) for a cross-level interaction between the effect of neighbourhood socio-economic disadvantage and parental educational status with change in self-esteem. This analysis showed results which ran counter to the relative deprivation and competition theories. Baseline neighbourhood material poverty was positively associated with an *increase* in self-esteem for adolescents whose parents had lower educational qualifications, and a *decrease* in self-esteem for adolescents with higher educated parents. This might seem anomalous, except that it is also supported by work in the Untied States by Turley(2002b). The finding from this suggested that adolescent self-esteem was higher in families who were relatively income deprived in comparison to the local neighbourhood in which they lived. Associations with relative advantage were not significant, indicating that this effect was not apparently linear – i.e. those who are in relative advantage do not report lower self-esteem. Finally, Wickrama et al. (Wickrama et al., 2005a) find that as neighbourhood deprivation increases, the risk associated with family poverty reduces.

These three studies are intriguing for equalisation hypotheses which have generally been tested for either family or neighbourhood SES, or their independent effects. Further work to establish whether these interactions are apparent in a situation of socio-economic equalisation would be helpful. Where household level equalisation was apparent, this presence of this type

of interaction would contextualise the finding within a wider socio-economic setting of neighbourhood deprivation.

Leventhal (2000) expand on the Jencks and Mayer (1990) framework to identify several other cross-level interactions which were central to a comprehensive model of the linkages between adolescent health and the neighbourhood. They also built on Jencks and Mayer's (1990) framework, emphasising that neighbourhood deprivation interacts with family socio-economic status, but also describing research which reported interactions between family social relationships and neighbourhood adversity. Leventhal and Brooks-Gunn (2000) set out a *meditational* model of neighbourhood effects; they suggest that associations between neighbourhood context and adolescent mental health are mediated by the family social environment:

"Parental characteristics (mental health, irritability, coping skills, efficacy, and physical health), support networks available to parents, parental behavior (responsivity/ warmth, harshness/control, and supervision/monitoring), and the quality and structure of the home environment." Leventhal and Brooks-Gunn, 2000, p.322

Features of the family social environment are important independent correlates of self-esteem and therefore to some extent, have often been considered as confounders of relationships between adolescent mental health and the neighbourhood environment. However, Leventhal and Brooks-Gunn (2000) argue that meditational models may be indirect, that neighbourhood deprivation may be associated with parental mental health through the pathways identified in section 2.4.2, and that parental depression might then impact upon adolescent mental health. Literature from the United States is relevant here and relates to specific samples comprised of African American mothers of adolescents aged 10-12 (Cutrona et al., 2000). No associations were found between neighbourhood deprivation and mothers' depressive symptoms although

perceptions of neighbourhood social disorder were associated with distress. This is important because those respondents are likely to have been amongst the most appropriate for identifying neighbourhood effects.

A second interaction relates to the suggestion that the association between parent-adolescent relationships and self-esteem might be moderated by neighbourhood deprivation. Leventhal and Brooks-Gunn (2000) suggest that levels of parental nurturance and warmth in interactions with children and adolescents may vary by neighbourhood deprivation. These types of qualitative relationships may be most likely to be observed using in-depth research methods. Ethnographic work by Furstenberg (1993, quoted in Leventhal and Brooks-Gunn, 2000, p. 325) identifies that

"parents who reside in impoverished and dangerous neighbourhoods may be less warm and more controlling with their children than parents in more advantaged and safe neighborhoods"

Information about parenting is not always available in large scale studies investigating how neighbourhood deprivation is associated with adolescent outcomes. However, analogous effects have been identified in recent work from the U.S.. Wickrama and Bryant (2003) provide evidence for interaction between independently measured neighbourhood deprivation, adolescent-parent relationships and adolescent depressive symptoms. They report that the protective effects of parent-report parental acceptance weaken under conditions of neighbourhood socio-economic deprivation. No such interaction was observed for the youth-reported parental nurturance variable, suggesting that this aspect of the parent-child relationship was universally protective. They interpret these findings as an effect of contextual dissipation, whereby the benefits of parental and family resources dissipate under

neighbourhood adversity – a hypothesis which is consistent with particular vulnerability of some groups (Wickrama and Bryant, 2003).

A study of self-esteem (Bamaca et al., 2005) specifically investigates the moderating influences of (perceived) neighbourhood risk on the relationship between parenting and self-esteem. The results supported direct effects of parenting for both girls and boys, but risks associated with neighbourhood effects for boys only. In terms of interaction effects, the article tested eight sex-specific interactions between neighbourhood risk and parenting, of which one was statistically significant. Overall, findings indicated that parental behaviours were not moderated by adolescents' perceptions of neighbourhood risk.

These findings suggest that there are significant interactions between neighbourhood deprivation, parenting and adolescent mental health as Leventhal (2000) suggests. However, other pathways which she suggests, such as the examination of differential impacts of neighbourhood deprivation for adolescents living with a depressed mother, or in non-intact family structures have not been addressed in the literature reviewed here. These lacunae offer important elements of interactions between the family and social environment which should be considered.

2.5.4 Interactions between neighbourhoods and wider geographical contexts

In addition to independent associations with health, neighbourhood and regional variables might interact such that their individual associations with health are modified. Thus, a study in the Netherlands highlighted that neighbourhood socio-economic status was associated with several dimensions of quality of life, but only in residentially stable neighbourhoods, leading the authors to speculate whether, in some socio-economic circumstances, residential instability might be beneficial for health (Drukker et al., 2005). Similar results were observed in an investigation of associations between child mental health and social fragmentation and

neighbourhood deprivation (Caughy et al., 2003) and led the authors to speculate that high levels of social fragmentation in highly deprived neighbourhoods might be beneficial as mothers and children were relatively isolated from the risks of deprivation.

Similar interactions might also be observed when considering how neighbourhoods impact on mental health across variations in wider geographical settings. Weich (2005) describes how neighbourhood effects which are not apparent in a pooled urban and rural sample, emerge in rural settings when samples are stratified. This assertion was tested by a stratified analysis undertaken by Riva et al. (Riva et al., 2009). This found that, over England, psychological distress was equalised by neighbourhood deprivation in London, semi-rural areas, and villages, but that weak gradients were observed in 'other cities'.

2.5.5 Summary and implications

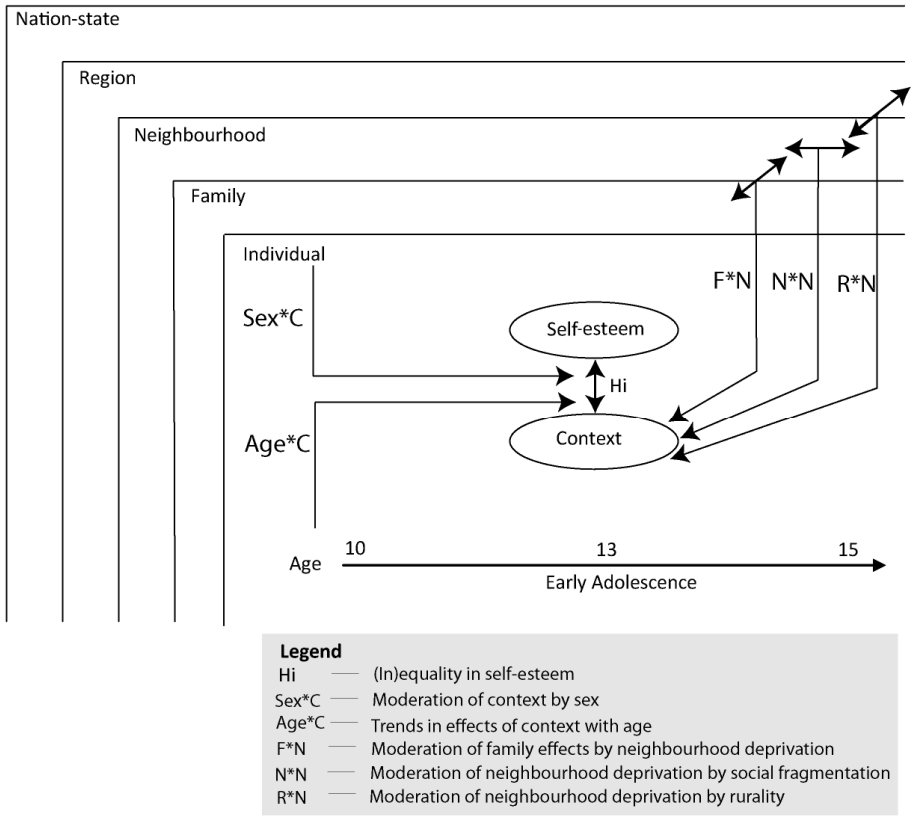
In summary, for a comprehensive test of the equalisation hypothesis, an analysis must test for interactions. This leads to an interesting conceptual model which is illustrated in Figure 2-5 below. This characterises the relationship between neighbourhood deprivation and self-esteem as one of health inequalities (Hi) and a product of a social model of health. The relationship between self-esteem and that social model is expected to trend with age (Age*C) and to be differentiated by sex (Sex*C). It is also expected that the relationships between the family/household and self-esteem will vary by neighbourhood (F*N), the effects of neighbourhood may vary by social fragmentation (N*N) and rurality (R*N).

The age*C and sex*C interactions will be used to assess whether the specifics of the equalisation theory are supported while the sex*C, F*N, N*N and R*N interactions will be used to see whether it is consistent across all policy relevant sub-groups of the adolescent population. This is to highlight that equalisation and deprivation amplification are not competing hypotheses, but could be supported in different sub groups in the same wider

population. However, if they are found in two sub-groups of similar size, the overall picture could be one of equalisation.

The implications of these tests are that conclusions can be drawn as to whether equalisation is the product of a combination of neighbourhood processes supporting both deprivation amplification and equalisation. Alternatively, it could be consistent across all sub groups of the adolescent populations. The first supports an important role of neighbourhoods in the production of low self-esteem while the second suggests that influence of neighbourhood deprivation may be relatively unimportant at the stage in the life course compared to other factors.

Figure 2-4: Conceptual model of interactions between adolescents and places (adapted from the developmental-contextual model of resilience presented by Schoon, 2006, p.26)



2.6 Dynamic relationships between health and place

The review of the empirical literature highlighted that few longitudinal studies of neighbourhood effects have been conducted outside of the United States, and none have been conducted with adolescent populations. This is important because longitudinal data allows stronger inferences to be made about the causal processes through which health and place interact. The following section considers what socio-geographic processes can be identified using longitudinal data. Key mechanisms include social causation, health selective migration, and continuities in health and context.

2.6.1 Causal influence of socio-geographic context and composition

Social causation theory describes the idea that socio-geographic contexts are *causally* associated with health (Schoon et al., 2003). From a socio-geographical perspective, this thesis has presented arguments in section 2.4, that neighbourhood deprivation might be associated with health *damaging* and health *promoting* resources. This language implies that the neighbourhood environment causes health, indeed Smith and Easterlow (2005, p.176) argue that most work in this field at least implicitly takes this position, despite the fact that the majority of empirical work cannot support such causal assertions.

Neighbourhood context and neighbourhood composition can both be considered socio-geographic processes as characteristics of individuals, like characteristics of neighbourhoods are not randomly distributed geographically, but are often systematically distributed. Smith (2005) argues for a compositional geography which recognises the power relationships which select people into particular areas, and highlights that these processes are not ethically neutral but can be viewed as actively *discriminatory*.

Thus, both neighbourhood socio-economic *context* and *composition* are important socio-geographic mechanisms which may causally explain variations in health. At the individual level, these processes have been demonstrated in the studies above which present prospective evidence that neighbourhood of residence is associated with variations in the probability that individuals will become depressed (Yen and Kaplan, 1999b; Galea et al., 2007; Wickrama et al., 2005b; Schneiders et al., 2003). Where neighbourhood compositional factors are concerned, these prospective associations are often discussed as controls, but it is important to remember that these compositional factors are, by definition, distributed in a socio-geographic way and so might offer important information for policy makers who are often interested in geographical work to inform *where* and *how* to distribute resources.

Just as it is important to establish whether there is prospective evidence for inequalities, it is just as important to establish prospective evidence for equalisation. It might be possible that on a cross-sectional basis equalisation is observed in a sample, but when this is investigated prospectively, significant associations emerge with change in the outcome (Weich et al., 2005a). For example, in the review above, Druker et al. (2003) report no association between self-esteem and deprivation, but in a later paper Drukker et al., (2006) find that change in self-esteem is associated with neighbourhood deprivation, albeit in the presence of an interaction between maternal education and neighbourhood deprivation which may have obscured the overall relationship in the first paper.

A second empirical perspective on the theory of social causation from a socio-geographical point of view suggests that *changes* in neighbourhood deprivation might be expected to be associated with *changes* in health. Relational theory draws upon earlier work to identify that changes in the experience of deprivation can result from two types of socio-geographical change: changes in neighbourhood context, and changes due to *socio-geographic mobility* (Norman et al., 2005; Boyle et al., 2004b; Curtis et al., 2009).

Non-movers in neighbourhoods which have declined over a twenty year period have poorer health than those living in neighbourhoods which did not experience a decline(Boyle et al., 2004b). This has important implications for area regeneration policies because all aspects of the individuals including their health and social status were controlled. For adolescents, there is also evidence that, controlling for residential mobility, deteriorations in terms of neighbourhood problems assessed by mothers, are associated with deterioration in mother reported child depression (Silver and Sussman, 2008). This is interesting because it highlights that changes in the wider environment might impact on child mental health.

This area remains relatively under-explored for adolescents outside the U.S., where there is a growing literature (Jackson and Mare, 2007). However, while it offers several avenues for research, longitudinal census data are not yet available for research into contemporary neighbourhoods (from 1991 to 2001) in the UK or Canada owing to problems associated with inconsistent administrative units over time. Thus, neighbourhood changes could not be explored here and are not discussed further.

Socio-geographic mobility describes how individuals follow different trajectories through deprivation space which are likely to impact on their health. Only one study has been found which has investigated how socio-geographic mobility might impact on adolescent health. Building on an earlier intervention based on race (the Gautreax Program, (Rosenbaum, 1995), the Moving to Opportunity Study (MTO), *intervened* in the lives of income-deprived families living in high poverty (greater than 40% of residents were poor) neighbourhoods. The study entered those willing to participate into a lottery to move to low poverty neighbourhoods. Three groups were then randomised into three socio-geographic mobility groups. The first remained in their neighbourhood of origin (the in-place controls). The second received 'Section 8' vouchers subsidising a geographically *unrestricted* move from public sector to private housing. The *intervention* group was also given 'Section 8' vouchers, but restricted to moves to

low poverty (less than 10% of residents were poor) neighbourhoods. The randomisation of each group is important as this design implicitly *adjusts* for health and social selection processes (discussed in more detail below). Adult family members and female adolescents reported significant and substantial mental health improvements at a five year follow up compared to the in-place controls (Kling et al., 2007; Jackson et al., 2009). However, male adolescent mental health *declined* significantly, and to the same magnitude. These effects were important because they showed that independent of the factors which might lead individuals into making socio-geographic moves, including their prior health state, neighbourhood socio-geographic context can have important implications for health.

The MTO findings have important implications for the assumption that socio-geographic mobility can be used to infer causal processes about neighbourhood effects across the whole population of movers and non-movers (Jackson et al., 2009). In support of the social causation theory, it suggests that movers do experience changes in context that result in improvements in the physical environment, lower crime levels, and a higher degree of social integration (Popkin et al., 2002; Goering, 2003). These processes were not consistently experienced by both boys and girls. Evidence suggests that girls derived considerable benefits from the increased safety of the new neighbourhoods, and that this helped them to socially integrate (Pettit and McLanahan, 2001). Girls typically reported having more friends, participating in more extra-curricular activities and had more positive adult role models than girls who had remained in the origin neighbourhoods. In contrast, boy experienced considerable social exclusion in the new neighbourhoods which were less racially diverse than older neighbourhoods and boys reported discrimination by police and that they were viewed as a threat by their new neighbours (Clampet-Lundquist et al., 2006). Overall, therefore, this highlights the important cross-level interactions between individual characteristics such as sex and the impact of neighbourhood context on health, and that shifting socio-geographic moves may change that dynamic in both positive and negative ways.

The MTO findings also highlight that socio-geographic mobility does not *just* involve social causation processes of neighbourhood context. Residential mobility itself is associated with variations in adolescent well being (Jelleyman and Spencer, 2008; Mohamud et al., 2006; Warfa et al., 2006) and many of the MTO changes in health may have been attributable to those processes. Research suggests that while mothers in MTO actively sought to remove their son's from dangerous neighbourhood, many of MTO boys may have only moved involuntarily (Jackson et al., 2009). This is important because previous research shows that the risk of detrimental health consequences of moves is associated with whether they are made voluntarily or not (Stroh, 1990; DeWit et al., 1998).

Current residential context does not absolutely define exposure to risk so it follows that socio-geographic mobility cannot therefore change contextual exposure absolutely. Adolescents are active agents who are not constrained to their neighbourhoods of residence but differentially exploit different areas of the city according to class and age (Cattell and Herring, 2002; Clark and Uzzell, 2005). This was important in MTO because adolescents who were moved returned frequently to their neighbourhoods of origin (Popkin et al., 2002; Clampet-Lundquist et al., 2006). This serves to emphasise that place is essential in formulations of adolescent identity (Valentine, 2000; Min and Lee, 2006; Abbott-Chapman and Robertson, 2001) and that moving effectively *displaces* adolescents (Fullilove, 1996). Theories of self-esteem emphasise the importance of social relationships and residential displacement may have impacted on this for boys by removing them from important adults and peers outside of the family (Silver and Sussman, 2008).

The MTO therefore illustrates that socio-geographic mobility may well have important implications for adolescent mental health, both positively and negatively. However, it is important to note that MTO is an experimental design. This means that while the design is extremely powerful for determining causal associations, its ability to generalise those

processes is limited to the population under investigation. This population is incredibly deprived at the household and neighbourhood level and reflected the most deprived five percent of Chicago's population, which as Oreopoulos (1998) observes above, suffers similar levels of poverty over the city as a whole to the worse housing project in Toronto (see section 2.4). As Jackson et al., (2005) note, the MTO is an experimental intervention, and does not analyse socio-geographic mobility as it is experienced *naturally*, as a consequence of families' social and health biographies. There is a significant gap in research where the effects of 'natural' socio-geographic mobility are concerned.

Residential mobility is clearly a dynamic process but the majority of work investigating residential mobility is cross-sectional, relying on retrospective recall of mobility (DeWit et al., 1998). Work which does incorporate longitudinal data on health has found that symptom levels of mental health remained virtually the same following a move (Kantor, 1965). This highlights that it is important to assess health before and after a socio-geographic move to establish a causal link.

2.6.2 Socio-geographic health selection

A second set of mechanisms which might contribute to explanation of the magnitude of health inequalities, or equalities, are processes of health and social selection (Townsend and Davidson, 1982). These processes suggest that early health status is causally related to health and social position later in life. This concept has also been noted for its socio-geographical implications for health (Bentham, 1988). Bentham (1988), argues that almost all studies of health and deprivation are *confounded* by the fact that significant proportions of the population move, and that this mobility is systematic, selecting and sorting people into different neighbourhoods by their social and health characteristics. Work across the social sciences is recognising that selection processes should be considered as substantive, rather

than confounding processes (Sampson, 2008; Smith and Easterlow, 2005). For example, in recent work in health geography, Susan Smith (2005, p.176) argues that:

"The contextual approach in all its richness and diversity remains anchored to …the way that places affect people", "To complete the [health inequalities] agenda, a different conceptualization of health inequalities is required: one which accommodates the way health histories and conditions themselves (through their encounter with markets, institutions, political norms and cultural expectations) impact on life chances and opportunities." [text in brackets added])

Health selective migration at the population level can impact on the strength of the observed relationship between health and place at any one time (Bentham, 1988; Boyle et al., 1999). This can operate in terms of mobility, whereby migrants who are healthy move to more affluent neighbourhoods, while those in poor health move to more deprived neighbourhoods, thus reinforcing the relationship between deprivation and health at the population level (Norman et al., 2005; Boyle et al., 2002). It can also be viewed in terms of immobility, where poor health traps people in deprived neighbourhoods while healthy people move out (Cox et al., 2007a). It is also important to remember that people in poorer health do not always move to more deprived places but may have significant resources at the family level to facilitate moves to more affluent neighbourhoods (Norman et al., 2005).

Unadjusted effects of health selection might be accounted for by social selection processes (Curtis et al., 2009). Using longitudinal data, Curtis et al. (2009) employ logistic regression models to estimate the prospective associations between the probability of individuals or groups in the sample moving up or down in terms of deprivation (termed socio-geographic mobility by the authors). Unadjusted health status was associated with socio-geographic mobility, but these associations were attenuated to non-significance by the addition of

baseline individual and family characteristics. Thus, while health status *is* associated with socio-geographic moves in ways anticipated from the work described above at the population level, this *apparent* psychological health selection effect is observed to operate indirectly through *social selection*.

Socio-geographic selection processes as they contribute to adolescent outcomes are generally framed in terms of their repercussions for drawing inferences about the relative importance of context (e.g. Haynie et al., 2006). As discussed above, this mirrors the adult literature.

Adolescent health might be indirectly associated with socio-geographic moves. Work which has examined the reasons for moving by families often cites concerns for the well being of dependent children and adolescents (Clampet-Lundquist et al., 2006; Rabe and Taylor, 2009). These might include worries about safety and increases in involvement with more negative peer environments (Clampet-Lundquist et al., 2006) or a desire to access better educational or social facilities for adolescents as they reach school age (Rabe and Taylor, 2009). Both concerns are associated with the desire to move to more affluent neighbourhoods (Rabe and Taylor, 2009). Adolescent health might be expected to be apparently health selective into more affluent neighbourhoods on an indirect basis. This is because such adolescent-centred moves are likely to be associated with parental conscientiousness (motivation for move) and socio-economic status (facilitation of move) (Haynie et al., 2006). These factors are also likely to be associated with adolescent self-esteem. As both might be associated with health status of adolescents at the neighbourhood of origin, these processes may constitute an indirect health selection effect.

Indirect health selection may also underlie how relationships between adolescent health and neighbourhood deprivation are produced. As described in section 2.5.3, adolescent well being is consistently associated with family structure. Single mother households are less likely to

move out of deprived neighbourhoods, and more likely to move into them (South and Crowder, 1998). Therefore, adolescents with low self-esteem may be selected into poorer neighbourhoods, or to remain in them by virtue of their family circumstances.

2.6.3 Contextual and health continuities

Contexts may cause health, but once established, geographical and social inequalities may persist because of *continuities* in health and context (Schoon et al., 2003). This argument is important when considering life course perspectives in particular, because it highlights how health inequalities, once established, are maintained from one life stage to another. However, in addition to the long term life course perspective, health and context are also likely to strongly predict how health inequalities are maintained over shorter time periods (Weich et al., 2005a).

Health measured at one point in time strongly predicts health at a later point in time. As identified above, one of the critical strengths of longitudinal analysis is the ability to identify that an effect of neighbourhood context is associated with changes in health state over and above previous health (Yen and Kaplan, 1999b). However, Hauck et al. (2004) argue that a focus on persistence of health outcomes is also needed. Individual and groups who report health problems on a relatively transient basis may be indicative of resilience to shocks to health, while some groups may experience poor health on a more persistent basis. This might inform policy makers as the resources required to alleviate transient versus persistent ill-health may vary considerably (Hauck and Rice, 2004).

Weich et al. (2005) investigate neighbourhood level variations in the onset and maintenance of depression during two waves of a prospective cohort study (BHPS). This study examined two outcomes: the first related to the ability of neighbourhood deprivation at time 1 (t1) to predict a *change* in health state, namely the onset of depression, between t1 and time 2 (t2) a year

later. The second related to the *maintenance* of depression, and specifically observed whether individuals who maintained depression between t1 and t2 were more likely to live in deprived neighbourhoods. Neither outcome was associated with neighbourhood deprivation. This study was important because it highlighted that individuals follow different health trajectories, and that different types of health *continuity* in the short term could be more likely in some neighbourhoods than others.

One important omission from this study was the possibility that health can *improve*, that a person might be depressed at t1 and not depressed at t2. This omission is studied by Italian researchers investigating well being transitions in old age (Minicuci et al., 2005). These authors found important variations in patterns of association between trajectories associated with declines, improvements in well being, and maintenance of low well being. This was not a socio-geographic study so the outcomes are not of substantive interest here, but the approach highlights that considerable information is lost by focussing on poor health to the exclusion of good health, or improvements in health.

Prospective studies examining associations between 'change' in mental health status in adolescents and neighbourhood associations have been conducted and the results are reported above (Drukker et al., 2006; Wickrama et al., 2005b; Wickrama et al., 2005a; Schneiders et al., 2003). These studies *implicitly* adjust for prior mental health status by measuring mental health at t1 and using it to predict mental health at t2: the model becomes a transition model measuring adolescent mental health *net* of prior mental health state (Rabe-Hesketh and Skrondal., 2008). These models are useful for examining change, and for measuring the strength of the continuity between prior health status and current health status. They do not explicitly determine whether adolescents who maintain, improve or decline in mental health over the time period share the same associations with neighbourhood deprivation.

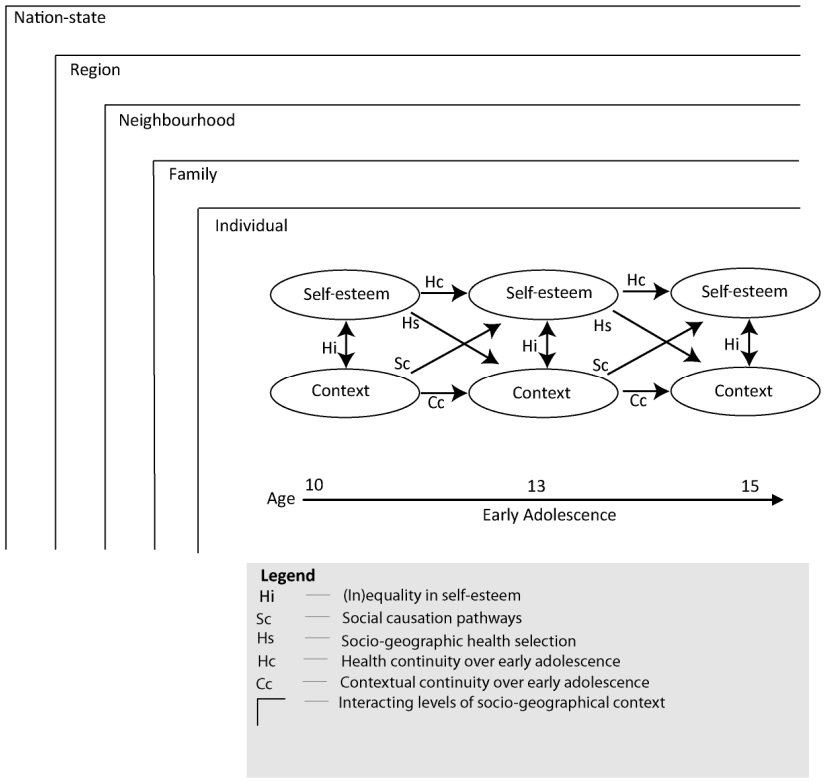
Contextually, continuities in context are often overlooked in socio-geographical research in favour of change trajectories. For example, under the relational view, places are viewed as 'declining', or 'advancing' as opposed to 'deprived' versus 'affluent'. An additional, and important category here which has not been discussed might be that neighbourhoods are perhaps most often (actively or passively) 'maintained'. Thus recent work examines the differentiation between health of people whose context (through moving or staying in place) remains either deprived, affluent or average at both points over a twenty year interval (Norman et al., 2005).

2.6.4 Summary and implications

In summary, this section has outlined that health inequalities are theorised to be produced by a combination of early life course socio-geographic context, combined with the intermediate processes of social causation, health selection and continuities in health and context.

Longitudinal survey data can indicate whether there is evidence for these processes at an individual level. In the case of samples which do not contain early life course data, as is the case here, only evidence for the intervening processes can be assessed. The relationships of these processes to health inequalities is described by Figure 2-6, this shows how, from a starting point of health inequalities at age 10, the processes of social causation (Sc), health selection (Hs) and continuity of health (Hc) and context (Cc) act together to produce a pattern of health inequalities at age 15.

Figure 2-5: Relational model of inequalities in adolescent self-esteem (adapted from the developmental-contextual model of resilience presented by Schoon, 2006, p.26)



2.7 Conclusions and implications

In conclusion, this review has considered how inequalities in adolescent self-esteem might be produced, and whether there is evidence for those inequalities in the existing body of literature. The review concluded that evidence existed in the United States supporting a deprivation amplification hypothesis. However, research in the UK and elsewhere supported an equalisation hypothesis. That said, while research in the United States was powerfully designed and therefore well placed to observe inequalities in mental health, studies outside that national context were less socio-economically diverse and therefore more likely to observe equalisation. Moreover, studies did not exist in Canada and this was identified as a useful point of comparison in the debate, given its close links to the U.S. but also the clear

differences with respect to income inequality and social welfare provision. This gave rise to the following research question

Is there support for socio-economic equalisation in early adolescent self-esteem in the UK and Canada across household socio-economic status and neighbourhood deprivation?

The lack of socio-economic diversity within the existing literature, and its generally cross-sectional focus means that few studies have comprehensively tested the equalisation theory in terms of trends across early adolescence, and interactions between neighbourhood deprivation and the characteristics of individuals, families and wider socio-geographic contexts. It is therefore uncertain whether equalisation is consistent for all adolescents, or whether deprivation amplification would be observed in some particularly vulnerable sub-groups. This prompted the question:

Is support for equalisation consistent across the socio-geographic levels of family, neighbourhood, region and nation?

Finally, while several studies have investigated prospective associations between neighbourhood deprivation and adolescent mental health, few have investigated the longitudinal evidence for the socio-geographic mechanisms of neighbourhood context, composition, socio-geographic mobility and health selection which are considered to be salient to the relationship between self-esteem and neighbourhood deprivation. This is expressed in the final question:

Is there evidence for prospective associations between adolescent self-esteem and socio-geographic processes of neighbourhood context, composition, health selective migration and socio-geographic mobility in the UK and Canada?

CHAPTER 3 – METHODOLOGY

3.1 Introduction

The previous chapter presented an extensive review of the empirical work into neighbourhood effects on teenage mental health and self-esteem. This highlighted inconsistency in the results of studies, and found only weak evidence for the general hypothesis that living in materially deprived and socially fragmented neighbourhoods may be associated with low teenage self-esteem. Research needs to address these issues in a wider international context by comparing nationally representative samples. The use of studies with regional samples has hampered the ability to draw national level conclusions about the patterning of self-esteem by neighbourhood variables such as deprivation and social fragmentation. In addition, as the majority of studies are cross-sectional, few have been able to assess whether neighbourhood characteristics are prospectively associated with low self-esteem. Finally, owing to study design limitations, these studies have not been able to assess systematically the association between health and socio-geographic mobility.

This study aims to extend existing research by addressing three research questions using data on adolescents aged 10-15 in the UK and Canada. This chapter provides detailed consideration of methodological strategies for addressing these research questions. The chapter begins by describing the secondary datasets used in this analysis, the British Youth Panel and the National Longitudinal Survey of Children and Youth. It describes the variables in those studies and then the methods which were used to investigate the research questions which were posed in chapter two above.

3.2 Quantitative analysis

The review presented in chapter two suggests that geographers have investigated identity and well being in children and adolescents in considerable depth but have predominantly used qualitative techniques (Holt, 2006). However, these in-depth studies cannot be used to infer associations and processes at the population level, and accordingly researchers in this sub-field are increasingly calling for more quantitative analysis of this age group (Holt, 2006). In addition to the specific empirical gaps addressed by this thesis, it is important to note its contribution in this area.

3.3 Datasets

Chapter two identified that nationally representative, longitudinal data were needed to address the research questions of interest here. Specifically, information about self-esteem must be measured at least twice for the same adolescent, with the capability to analyse differences by neighbourhood deprivation and social fragmentation for the UK and Canada. Two datasets were selected as particularly appropriate for this analysis; the British Youth Panel (BYP), and the Canadian National Longitudinal Survey of Children and Youth (NLSCY).

The NLSCY and BYP were selected because they allow a longitudinal analysis of self-esteem which could be broadly comparable across the UK and Canada (the rationale for these specific analytic requirements and this particular comparison is discussed in chapter two). This comparison was possible because both surveys capture information about adolescents aged between 10-15 (the BYP starts at age 11) over the period 1994-2004, with repeated measures on individuals. Both include information on self-esteem at all time-points as well as data about individuals and their families, and could be linked to national census data in order to provide information about the neighbourhood environment.

To keep analyses comparable, individual, family or neighbourhood variables which could be measured in one country but not the other (for example school data in the NLSCY is not readily available for the BYP) are not analysed here.

Alternative datasets of contemporary UK and Canadian adolescents were considered. For example, the Health Behaviour in School Aged Children (HBSC) study is an international study which investigates health in 11-15 year olds and from 1987 included information from both England and Canada. This study has already been useful for researching household level elements of the questions addressed in this thesis (Currie et al., 2000; Torsheim et al., 2004). However, the theoretical concerns discussed in chapter two require longitudinal data and the HSBC surveys are repeat cross-sectional studies and, as such, the surveys are not the most appropriate source in this case.

3.3.1 British Youth Panel and the British Household Panel Survey

The British Youth Panel (BYP) is nested within the British Household Panel Survey (BHPS), an annual panel survey of a nationally representative sample of more than 5,000 households in the UK in approximately 10,000 individual interviews of adults (aged 16 and older). The initial sample selection used a two-stage, clustered probability design and systematic sampling (Taylor et al., 1998). Original sample members (OSM) of the initial sample in 1991 continue to be followed even if they leave the original household. New individuals enter the panel if they move into a household containing an OSM, are born to an OSM, or if an OSM moves into a household with 1 or more new people.

The British Youth Panel (BYP) was added in wave 4 (1994) and included approximately 700 household members aged 11 to 15 at each wave. The survey design is a variant of the standard rotating panel (Gayle et al., 2009). Each year, newly eligible 11 year-olds (those who turn 11 by December 1st) are included in the BYP. These new members of the sample are followed each

year until they turn 16. Following this, they join the BHPS. At the time of writing the BYP contains fourteen waves of data collected between 1994 and 2008, this thesis examines waves D to M corresponding to the period 1994-2004.

The dataset is publicly available to researchers from the Essex Data Archive. All records are anonymised and have been approved by the Ethics Committee at the University of Essex. In addition all procedures relating to the survey are considered by a Scientific Steering Committee. All researchers sign an agreement to observe a set of data management and disclosure guidelines prior to obtaining access.

The survey collects information about adolescents' lifestyles, attitudes, health behaviours and subjective well being. This analysis only used 'core' variables (those collected at every wave) in order to make full use of the longitudinal data. Information from the BYP is linked to data about their parents, and BHPS households collected as part of the BHPS survey. This linkage is made possible by the relationship grid provided by the BHPS which identifies the relationship of the adolescent to the other members of the household and the household (Scott et al., 1995).

The sample represents 11-15 year olds living in private households between 1994 and 2004. The BYP carries cross-sectional weights for each wave. These take account of the probability of each BYP member being selected from the private household population and weight that individual accordingly. These weights were used to adjust the analyses where appropriate to allow generalisation to the population of interest, discussed in more detail in the analytic strategy (section 3.5 below).

The potential size of any given wave-specific age cohort is relatively small in the BYP (Gayle et al., 2009). Thus, to maximise the statistical power of the dataset to address the research questions, synthetic panels were created by pooling the age cohorts within the study (see

Table 3-1 below). This follows recommendations by (Gayle et al., 2009) and (Brynin, 2004). However, while this has clear benefits, it is possible that this may introduce cohort effects, arising from changes in national socio-economic cycles. For example, on a longer time-scale cohort effects have been identified in work using the British birth cohorts (Schoon, 2006). These types of effects might also be observed where there was a significant change to the survey design such as the switch in 1999 from paper based to computer based interviewing in the BHPS (Banks and Laurie, 2000).

Table 3-1: British Youth Panel design (1994-2004) by year and age.

	Year										
Age	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
11	S	S	S	S	S	S	S	S	S	NFU	NFU
12	S	S	S	S	S	S	S	S	S	S	S
13	S	S	S	S	S	S	S	S	S	S	S
14	S	S	S	S	S	S	S	S	S	S	S
15	NFU	NFU	S	S	S	S	S	S	S	S	S

S indicates potential for inclusion in sample on age and follow up criteria. NFU indicates individuals who were not followed up two years later.

The longitudinal nature of the sample means that data are 'clustered' for the same individual, This phenomenon has implications for analysis and is explained in the analytic strategy (see section 3.5.2). Similarly, the use of synthetic cohorts must be adjusted for. The analytic strategy discusses how these two features of the dataset are taken into account in the analyses (see section 3.5.2).

3.3.1.1 Neighbourhood Data

Neighbourhood data has not been previously linked to the BYP. This data was collated on a UK wide basis for this thesis (see section 3.4.2) from the 1991 England and Wales Census (ONS, 2008a), and 1991 Scottish Census (GROS, 2008) from 1991 using the CASWEB web facility at the University of Manchester. 1991 data was chosen as this preceded all of the BYP individual and family variables.

Neighbourhood factors were operationalised at the scale of the electoral ward across England (8,601) and Wales (N=908), and the postcode sector in Scotland (N=895). This combination has been used in other studies which seek to analyse data across the three constituent countries of the UK (Weich et al., 2005a). These units are small enough to represent relatively homogeneous characteristics of local areas but are large enough for rates underlying area data to be relatively stable (Weich et al., 2005a). The mean population size across all wards and postcode sectors was 5,222 and this ranged significantly from a minimum of 54 to a maximum of 31,609 people although 75% of the wards and postal sectors ranged from 2,155 and 7,020 people.

Owing to BHPS and BYP data protection rules, only Local Authority level identifiers were publicly available to researchers in the BHPS/BYP public release data files. Therefore, smaller scale neighbourhood data had to be linked in separately for this thesis, using neighbourhood 'pseudocodes' so that an individual's neighbourhood of residence is not directly identifiable to the researcher. Neighbourhood data were linked remotely by sending a file containing the neighbourhood identifiers and their characteristics to analysts at the Institute of Social and Economic Research (ISER), where it was subsequently linked to the dataset. ISER would then randomly generate a unique pseudocode to reflect where multiple individuals in the sample lived in the same neighbourhood, and where the same individual lived in the same neighbourhood at different time points (1994-2004). However, the pseudocode did not identify the 'actual' neighbourhood of residence. Introduction of the pseudocode identifiers into the data introduces multilevel 'clustering' to the dataset. This is discussed in more detail in the analytic strategy below (see section 3.5.2).

Although Northern Ireland adolescents are included in the BYP sample, analyses were only conducted for adolescents living in England, Wales and Scotland. This is because ISER do not

have a data linkage agreement for neighbourhood data with Northern Ireland (personal communication with ISER, 2008).

3.3.2 Canadian National Longitudinal Study of Children and Youth (NLSCY)

The NLSCY uses an *accelerated cohort design* with the overall aim of investigating the health and development of Canadian children from birth (0) to early adulthood (25). An accelerated design follows children and adolescents aged 0-11 in 1994 (N=22,831), to ensure that after 10 years, analysis can be undertaken across the full span of childhood, adolescence and early adulthood. The NLSCY is jointly conducted by Statistics Canada (StatCan) and Human Resources Development Canada (now Social Development Canada) and covers a broad range of topics including health, physical development, learning, behaviour, and proximal social contexts such as the family and school (Nicholson et al., 2002). At the time of writing, eight cycles were available, with information on adolescents from birth to 25.

Access to the NLSCY confidential microdata files is given through statistics labs run by StatCan. A legal contract and police checks are required for all researchers wishing to use the data. All results are checked by StatCan analysts to ensure that they comply with disclosure risk rules.

The survey was nationally representative of children in *t*he general population in Canada in 1994. Several key exclusions were made in the sample design of the main component of the survey: individuals living in the Yukon or Northwest Territories, individuals living in institutions, and finally individuals living on Indian Reserves were not included in the sampling frame (StatCan, 2006). High levels of immigration to Canada have meant that the survey was no longer representative by 2004 on a cross-sectional basis as immigrant populations became under-represented. Hence, the survey generated weights that adjust for attrition to the cohort and for the original biases incurred in the sampling strategy in 1994, so the survey remains representative of children aged 0-11 in the 1994 general population.

Analysis of the cohort in 1994 suggested that non-response was more likely in older (40+) parents, with lower education (educational status of 1-8 years of schooling), and living in a metropolitan area (StatCan, 2006) . Response was more likely if parents were students in 1994. The other factors tested and which were non-significant included; single versus intact families, occupation of parent, industry of parent, labour force status of parent and number of children in the household.

This analysis uses information from cycles 1 to 6, and therefore covering the same period (1994-2004) as the BYP. Individual and family data (described in section 3.4) is used from the survey only when it was available at every cycle. The research questions limit the analysis to those members of the NLSCY who have been surveyed twice between the ages 10-15. This sample is illustrated in Table 3-2 below using grey shading with an 'S'. The rest of the table puts the sample in the context of the full NLSCY cohort sampled in the course of cycles 1-6. Three reasons for non-inclusion are illustrated, either the individuals are too young (<10), too old (>15) or they have not followed up longitudinally as part of cycles 1-6 (NFU).

This design introduces 'clustering' due to repeated measures on the same individuals (clustering explained in the analytic strategy, see 3.5.2). It may introduce cohort effects, as a 'synthetic cohort' design is used; pooling individuals from involving six cohorts starting at age 10/11 in 1994, 1996, 1998 and 2000. The analytic strategy adjusts for these two aspects of the sample design (discussed in section 3.5.2).

Table 3-2: The NLSCY cohort (1994-2004) by year and age.

	Year					
Age	**1994**	**1996**	**1998**	**2000**	**2002**	**2004**
0	<10	-	-	-	-	-
1	<10	-	-	-	-	-
2	<10	<10	-	-	-	-
3	<10	<10	-	-	-	-
4	<10	<10	<10	-	-	-
5	<10	<10	<10	-	-	-

6	<10	<10	<10	<10	-	-
7	<10	<10	<10	<10	-	-
8	<10	<10	<10	<10	<10	-
9	<10	<10	<10	<10	<10	-
10	**S**	**S**	**S**	**S**	**S**	NFU
11	**S**	**S**	**S**	**S**	**S**	NFU
12	-	**S**	**S**	**S**	**S**	**S**
13	-	**S**	**S**	**S**	**S**	**S**
14	-	-	**S**	**S**	**S**	**S**
15	-	-	**S**	**S**	**S**	**S**
16	-	-	-	>15	>15	>15
17	-	-	-	>15	>15	>15
18	-	-	-	-	>15	>15
19	-	-	-	-	>15	>15
20	-	-	-	-	-	>15
21	-	-	-	-	-	>15

S indicates sample analysed here, <10 and >15 indicates too young and too old for sample respectively. NFU indicates individuals not included in sample as they were not followed longitudinally within cycles 1-6.

3.3.2.1 NLSCY Data Management

Key issues in the NSLCY involved the standardisation and subsequent collation of variables over the six cycles of interest. The original codebook of the survey is not comprehensively standardised, with different variable naming schemes, coding and missing data conventions in different cycles. The Canadian Research Institute for Social Policy (CRISP) data managed key variables in the NLSCY in order to facilitate analysis of the NLSCY by researchers (Willms and Fedick, 2003). This group provided programming syntax which standardises many of the raw variables from cycles 1-5. This was adapted for this analysis and clarified many data management issues for cycles 1-5, allowing data management efforts in this thesis to concentrate on issues raised with the integration of cycle 6.

3.3.2.2 Neighbourhood Data

The NLSCY was not linked with neighbourhood information at every cycle (1-6) of interest prior to this thesis (only cycle 1). As the data was nationally representative it was therefore necessary to use neighbourhood data which was systematically available over the whole of Canada. Dissemination Areas (DAs) are one of only two levels of geography which are

systematically available over the whole of Canada and are reasonably homogeneous for the assessment of neighbourhood characteristics. Census subdivisions are also collected for the whole country, but they are too socially heterogeneous to be considered 'neighbourhoods' as they encompass whole cities in many cases. There are 52,993 DAs in Canada nationally in the 2001 census which a mean average of 567 people. They range in size from 0 to 11,657, but are designed according to zoning methods so that 75% contain from 400-700 people. The small populations described by DAs are designed statistically to reflect local geographical conditions (i.e. bounded by roads and other obvious aspects of the physical environment) and also to be statistically homogeneous in terms of the local population (Statistics Canada, 2003).

Postcode information was used to merge in codes identifying individual DAs. The merge operation was done using a linking program developed by Statistics Canada researchers (Gonthier et al., 2006). Where the postcode area covered all or part of more than one adjacent DA, the matching procedure operated a random allocation procedure to return a DA of residence. This makes the allocation process to DA an approximation, but one which is impossible to avoid given the nature of the postal and administrative geographies. The introduction of the DA identifiers into the data introduces multilevel clustering to the dataset. This is discussed in more detail in the analytic strategy below (see section 3.5).

Neighbourhood data was not collated directly from the Census in this case as there are particular issues involving small counts which destabilise estimates of rates of, for example unemployment at the small area level (Pampalon and Raymond, 2000). Instead, information about neighbourhood deprivation which had been pre-derived from the 2001 Census specifically to describe health variation in Canada was used (Pampalon and Raymond, 2000). These pre-derived indices were chosen over other neighbourhood disadvantage indices because they were directly comparable with the neighbourhood indices used in the UK. The

components making up the indices and their relationship to the latent constructs of neighbourhood deprivation and social fragmentation are discussed in section 3.4.2 below.

3.4 Variables

This section describes the variables which are used in the analysis to measure self-esteem, neighbourhood characteristics and the individual, family and wider geographical characteristics.

3.4.1 Self-esteem

Self-esteem is measured in both the NLSCY and the BHPS using psychometrically derived scales of 4 and 5 items respectively. This is the only multi-item measure of subjective mental wellbeing which is carried in the BYP over all waves and so this was chosen for comparison. The scale in the BYP has been used in a number of peer reviewed articles (Glendinning, 1999; Zagefka, 2005). The scale ranges theoretically from 5-20, again a range which is fully observed empirically. The scale has an alpha reliability of 0.71 indicating that the items are also internally homogeneous.

The four item self-esteem scale used in the NLSCY was the General Self-Scale, originally developed as part of a wider self-concept inventory (Marsh and O'Neil, 1984). The scale ranges theoretically from 0-16, and the full theoretical range is realised empirically in the NLSCY data. The degree to which the items in the scale are tapping different aspects of the same trait, and not overlapping parts of several traits (also known as internal homogeneity), was assessed using Cronbach's alpha (Cronbach, 1951). The alpha coefficient ranges from 0-1 and is generally considered to be internally homogeneous when it lies within the range 0.70-0.90 (Streiner and Norman, 2003). According to this criterion, the NLSCY scale was internally homogeneous; the alpha coefficient for the sample was 0.80.

Both scales draw conceptually on the Rosenberg scale (Rosenberg, 1965) but operationally differ. All four of the NLSCY items map directly on to the Rosenberg scale, while one item of the BYP does not. In addition, and perhaps more importantly, the NLSCY items are all positively worded. This means that responses to the scale may be positively biased by the tendency of some respondents to answer all questions in a similar way. This bias is potentially averaged out in the mixed valence BYP and Rosenberg scales. Overall, although both scales are different, they do represent the Rosenberg scale conceptually, measuring global self-esteem. Perhaps most importantly, both short form scales contain items measuring self-worth (e.g. I like the way I am) and competence (e.g. I have a lot to be proud of), which are, as discussed above, key components of the definition of self-esteem.

Table 3-3: Comparison of the NLSCY and BYP scales with Rosenberg self-esteem scale.

Rosenberg 10 item scale	NLSCY	BYP
On the whole, I am satisfied with myself (+)	In general I like the way I am. (+)	
I feel I do not have much to be proud of (-)	Overall I have a lot to be proud of (+)	
I take a positive attitude toward myself (+)	A lot of things about me are good (+)	I feel I have a number of good qualities (+)
I am able to do things as well as most other people (+)		
At times, I think I am no good at all (-)		At times I feel I am no good at all (-)
I feel that I'm a person of worth, at least on an equal plane with others (+)		
I wish I could have more respect for myself (+)		
All in all, I am inclined to feel that I am a failure (-)	When I do something I do it well (+)	I am inclined to feel I am a failure (-)
		I am a likeable person (+)
I certainly feel useless at times (-)		I certainly feel useless at times (-)

(+) indicates that the question has a positive valence, (-) indicates that the valence is negative.

Self-esteem was modelled as a dichotomous variable reflecting high and low self-esteem. This decision was made on both a theoretical and statistical basis. Theoretically, it was considered important to understand the distribution of risk of having publicly reported low self-esteem. This reflects arguments made in the literature review (section 2.4.1), that high self-esteem measured in terms of worth only may overlap problematically with narcissism or egotism when aspects of competence are not incorporated in the measure.

From a statistical point of view, the scales are not normally distributed in either sample (see Figure 3-1), displaying a peaked distribution in the BYP, and there is skew in the NLSCY. Particularly for the NLSCY, the skew suggests that the distributional assumptions of *linear* regression may not be appropriate. Appropriate transformations

for negative skew were tested and were not found to improve the distributions of the variables[2]. This means that a regression approach which did not assume normality would be more appropriate to modelling these data.

Figure 3-1: Histogram of self-esteem in the BYP

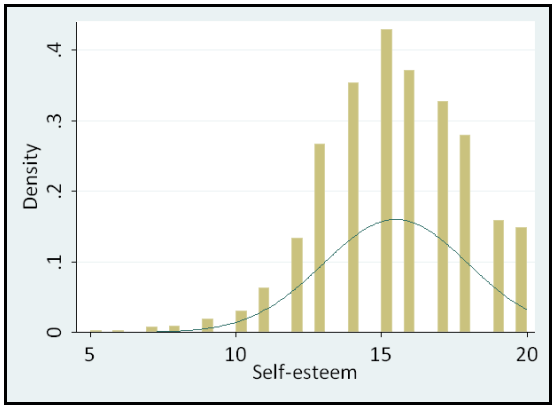
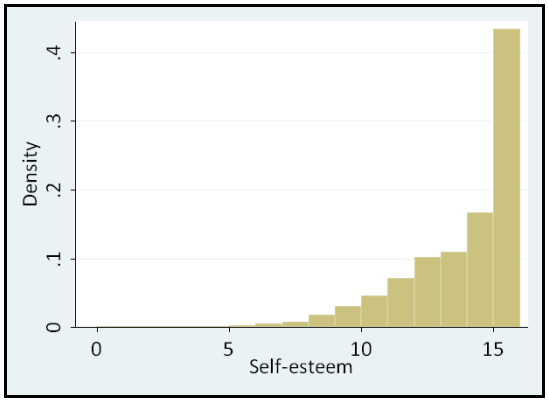


Figure 3-2: Histogram of self-esteem in the NLSCY



[2] Transformations applied by reflecting the distribution (subtracting the maximum value) to bring it to a positive skew, and adding a constant to increase all values to be greater than 1. Then square root, log and inverse transformations were tested.

No recommended theoretical or clinical cut-offs were found in the literature with respect to either the BYP or the NLSCY global self-esteem scores to determine what constitutes 'low' self-esteem. Therefore, the threshold for low self-esteem was calculated as one standard deviation below the mean average for self-esteem. Where adolescents reported lower self-esteem than this threshold, they were classified as having 'low self-esteem'. This follows earlier work with NLSCY measures (Willms, 2002; Borkovsky, 2006). This is intuitive for interpretation, low self-esteem can be thought of as a state where the individual reports substantially lower self-esteem than is typical for the early teenage years in their own country.

A second outcome variable was used to evaluate observed changes in self-esteem over time. Four categories of changes in self-esteem were constructed by considering the values of self-esteem esteem at two different points in time (t1 and t2):

- 'Maintain High', high self-esteem at both t1 and t2
- 'Maintain Low', low self-esteem at both t1 and t2
- 'Improvement' – low self-esteem at t1 and high self-esteem at t2
- 'Decline' – high self-esteem at t1 and low self-esteem at t2

3.4.2 Neighbourhood characteristics

3.4.2.1 Neighbourhood Environment

Two variables differentiating neighbourhood 'type' were examined in this thesis – neighbourhood deprivation and social fragmentation. These were chosen because the review in chapter two suggested that they are well theorised correlates of individual mental health outcomes. Integral variables such as measures of the built environment, perceptions of violence and social disorder, are often modelled as more specific aspects of neighbourhood

deprivation. These would have been interesting to investigate in this thesis but data for these variables could not be obtained systematically across all the neighbourhoods used in either survey.

UK neighbourhood deprivation is calculated using the Townsend Index. This index was devised by Townsend et al. (Townsend P., 1987) to operationalise the latent construct of material disadvantage. It is comprised of four measures: unemployment as a percentage of those aged 16 and over who are economically active; the percentage of all households who do not own a car; the percentage of all households who do not own their own home; and household overcrowding (where overcrowding is the 1991 definition of more than 1 person per room). Values for unemployment and overcrowding are transformed using the natural log to take into account skew in the statistical distribution of these variables. All four components were then standardised to the same scale using the z-score method before being summed into a composite index. Deprivation is therefore relative to levels across all neighbourhood units (N=10,404) across all three countries: England, Wales and Scotland. The components of the index were collected in the 1991 Census. This was chosen over the more recent 2001 Census because it preceded all observations in the survey. Neighbourhood deprivation was analysed as quintiles. These quintiles were defined relative to all wards and postcode sectors in England, Scotland and Wales prior to being linked into the survey.

UK social fragmentation is measured using Congdon's social fragmentation score (Congdon, 1996). This purports to measure the latent construct of social fragmentation, the inverse of which is social cohesion (Congdon, 2004; Congdon, 1996). As with the Townsend Score, it is based on 1991 census data for four variables: the proportion of lone person households, non-married couples, private rented households and levels of residential migration over the previous year. To construct the score, the rates were calculated for each variable using the

population denominator (i.e. individual or household) as appropriate, standardised using the z-score method and summed to produce the Social Fragmentation Score.

The summation method used to construct the UK data means that these variables are likely to be correlated, especially owing to the nature of the individual components. This was the case and the UK social fragmentation and neighbourhood deprivation were statistically significantly correlated (Pearson's correlation coefficient = 0.46, significant at the 95% level). This meant that they should not be used simultaneously in regression models owing to the assumption that independent variables are not multicollinear. This meant that modelling was conducted separately for each variable, following the analytic strategy employed elsewhere (for example, Stafford et al. (2008a)).

The scores used to describe Canadian dissemination areas were collated by Canadian researchers using the 2001 Census but employing a methodology developed for 1996 data (Pampalon and Raymond, 2000). These authors distinguish between material and social deprivation, drawing explicitly on the work of Peter Townsend on deprivation (Pampalon and Raymond, 2000). The measures were derived with reference to six census factors which were then analysed to determine their inter-relationships. These factors included: the proportion of persons with no high school diploma; the ratio of employment to population; average income; the proportion of those in a neighbourhood living alone; the proportion who are non-married (divorced, widowed or separated); and the proportion of single parent families. The factor analysis method used by Pampalon and Raymond (2000) showed that income, employment and education variables loaded strongly on to one factor, which the authors labelled Material Deprivation while living alone, marital status and single parent families loaded strongly on a second factor, labelled neighbourhood Social Deprivation. The factor analytic method creates orthogonal factors, meaning that the Material and Social indices are necessarily uncorrelated. This meant that theoretically, the Canadian neighbourhood variables could be employed in the

same multiple regression model without risk of multi-collinearity. This was not done however, as will be clear in the analytic strategy outlined in section 3.5, to maintain comparability with the UK analyses.

The Townsend, Congdon and Pampalon measures were chosen for their comparability. The Pampalon *material* deprivation index was constructed by drawing on the Townsend (Townsend, 1988) methodology explicitly (Pampalon and Raymond, 2000). The Pampalon social deprivation index and the Congdon social fragmentation score (Congdon, 1996) are based on similar variables. Therefore, the indices are can be both nationally specific as they were designed for use in their respective countries, but they are also broadly comparable as latent constructs. Another, Canadian Index of neighbourhood deprivation could have included the neighbourhood disadvantage index used by Boyle and Lipman (2002) but this incorporated lone parent families as part of the index. This feature, although employed extensively in North America is not generally employed in UK deprivation indices (although it was employed in generalised score to more fairly redistribute resources for general practitioners in under-privileged areas, Jarman (1983, 1984)). In the UK the Carstairs Score (Carstairs and Morris, 1989) could have been used to measure neighbourhood deprivation, but given the centrality given to Townsend's concepts by Pampalon in the development of his own score, the Townsend Index was chosen.

This thesis refers to both neighbourhood deprivation indices (Townsend deprivation index and the Pampalon material deprivation Index) as neighbourhood deprivation and to the Congdon social fragmentation score and the Pampalon social deprivation index as 'Social Fragmentation'. All scores are analysed as quintiles where the lowest quintile refers to the lowest Neighbourhood Deprivation or Social Fragmentation in a neighbourhood. All quintiles used in the analysis are calculated relative to all neighbourhoods in the UK and Canada.

3.4.2.2 Residential mobility

Residential mobility was defined in the NLSCY as a change in dissemination area between any two cycles. Thus, adolescents could have been residentially mobile in NLSCY a maximum of two times.

The BYP is an annual survey. A move was defined as a change in the ward of residence between two waves. A maximum of five waves were collected for each adolescent. Therefore, between 11 and 15, an adolescent who had been sampled at every wave could have been observed to have experienced up to four residential mobility transitions between waves.

3.4.2.3 Socio-geographic mobility

Residentially mobile individuals were further divided into categories of socio-geographic mobility. Using the information about residential mobility and neighbourhood material deprivation before and after the move, four categories relating to 'deprivation mobility' were constructed:

- 'Non-movers' – does not move neighbourhood;
- 'Similarly deprived' – moves neighbourhood but neighbourhood deprivation quintile remains the same;
- 'More deprived' – moves to a higher neighbourhood deprivation quintile;
- 'Less deprived' – moves to a lower neighbourhood deprivation quintile.

A second variable was constructed using the information about social fragmentation. Four categories relating to 'fragmentation mobility' were constructed:

- 'Non-movers' – does not move neighbourhood;

- ‘Similarly fragmented’ – moves neighbourhood but social fragmentation quintile remains the same;
- ‘More fragmented’ – moves to a higher social fragmentation quintile;
- ‘Less fragmented’ – moves to a lower social fragmentation quintile.

3.4.2.4 Administrative units as neighbourhood definitions

The use of administrative boundaries to operationalise ‘neighbourhood’ is a standard technique, especially when analysing neighbourhood effects in secondary datasets. However, it is widely acknowledged that administrative boundaries only represent one component of the neighbourhood environment (Chaix et al., 2009). Administrative boundaries are likely to be important in a strict sense when considering the influence of local decision making by policy makers on health (Cockings and Martin, 2005). As these decisions are directly implemented at the ward, local authority or regional level, their influence might be expected to vary through those particular geographies primarily. However, researchers often use these units to represent neighbourhoods more generally, and some authors have argued that this could lead to misspecification of neighbourhoods, and therefore misestimation of the relationships between deprivation and health (Cockings and Martin, 2005). However, other empirical work has suggested that administrative boundaries produce similar results to naturally defined neighbourhoods (Ross et al., 2004), and automated zone defined neighbourhoods (Stafford et al., 2008b).

This Modifiable Areal Unit Problem (MAUP) identifies that the relationships between health and variables aggregated to geographical units will vary with the spatial boundaries of those geographic units (Openshaw, 1984). This problem can be addressed by specific zone design solutions (Openshaw, 1977; Openshaw and Taylor, 1979), and sensitivity analyses using a number of spatial units of analysis. Both these approaches were considered here: neither was possible in the BHPS as only specific spatial units (wards) could be linked to the survey under

the license agreement at the time. In the NLSCY, it was not within the scope of the thesis to generate zones using the Canadian Census data, as this would have involved an extensive project of zone development and testing, to produce useful zones across the whole of Canada.

3.4.3 Individual and family characteristics

A large body of psychological research has found that differences in self-esteem are partially explained by a set of key characteristics of individuals and their families. These characteristics include the potential for variations in the genetic liability of reporting low self-esteem (e.g. Kendler et al., 1998), age, sex and race/ethnicity (Baldwin and Hoffmann, 2002; Rhodes et al., 2004; Greene and Way, 2005) and parenting and other family social and socio-economic characteristics.

3.4.3.1 Demographic characteristics

Age and sex have been found in many studies to be important and interacting correlates of self-esteem (Kling et al., 1999; Major et al., 1999; Baldwin and Hoffmann, 2002). This interaction is likely to be particularly important in early adolescence where gender differences in the prevalence of depression and low self-esteem emerge (Wade et al., 2002; Baldwin and Hoffmann, 2002). Associations with ethnic origin are less well understood, some authors arguing that these are of little apparent consequence (Emler, 2001) while others find important variations associated with ethnic minority and racial markers (Greene and Way, 2005). Sex, age and ethnicity are thus included.

Age was retained in the British Youth Panel models as a categorical variable from 11-15. It was classified into 10/11, 12/13 and 14/15 in the NLSCY. This reflected that the survey was on an annual basis in the BYP and a biennial basis in the NLSCY.

Both surveys have very small proportions of ethnic minority respondents. A visible minority status variable was developed in each survey. The variable is conceptualised as identifying those who are more at risk of discrimination, or to perceive discrimination. The variable is not conceptualised to index specific cultural or racial differences, but the experience of having at least one parent who might be identified as an ethnic minority.

In the UK, a binary categorical variable was used to define adolescents in terms of visible majority and visible minority status. In the case of the UK, the majority of individuals are white, and this was taken to be indicative of 'majority' status. The BYP did not ask adolescents about ethnicity. Visible minority status of the adolescent was assigned on the basis that at least one parent identified with a category which was not white (including British Asian, Asian, Black, British Black and other categories). In the NLSCY, a variable indexing the ancestry of adolescents was used. Three groups were defined using these variables: Canadian and European heritage, Visible Minority (Asian, Black, identification with 'Other') and First Nations. Three groups were used in comparison to the UK binary dichotomisation in order to take into account of the particular status of First Nation peoples. The Visible Minority groups were selected as the conflated set of minority groups within Canada who most closely approximated the similar set in the UK. These groups are socially and culturally heterogeneous, but are relatively reliably identified as 'other' by skin tone alone which could be a marker for particular types of discrimination as in the UK. First Nation people were also identified, and are likely to suffer similar discrimination in Canada, but also have a very distinct psychosocial wellbeing profile associated with the environmental dispossession of this group (Richmond and Ross, 2009). This is thought to have expression in the very high prevalence of a wide range of social problems such as alcohol and substance abuse, teenage pregnancy and long-term, intergenerational unemployment in these groups in contemporary Canadian society (Richmond and Ross, 2009).

3.4.3.2 Adolescent perceptions of parents

Both surveys collected measures of adolescents' perceptions of their relationships with their parents. These differed in content and in measurement but correspond with positive and negative aspects of the parent-adolescent relationship.

The BYP measured four items measuring how frequently adolescents perceived that they argued with their mother or father, or talked about close things, again with each parent separately. All items were measured similarly and ranged from 1 to 5. The values represented for each of the four items: 1 - hardly ever, 2 - less than once a week, 3 - more than once a week, 4 – most days, and 5 – no mother / father (depending on whether the item referred to the mother or the father).

Using these four items, two variables were derived, measuring frequency of talking about close things and frequency of arguments. These were both derived in the same way. Where responses were available between 1 and 4 for the items referring to the mother and the father, the most positive response was taken. Thus, for the talking variable this would be the highest value (i.e. assuming that talking about close matters frequently is most desirable). For the arguments variable, this would be the lowest value (i.e. assuming that arguing infrequently with parents is more desirable). Where no response was available (as in single parent families or where the response was 5- no mother / father), the response about the other parent was used. The middle categories of more than once a week and less than once a week were then collapsed to a single category of 'regular'. This was done to allow the most clearly conceptualised categories (of hardly ever or most days) to be compared with a single category which lay between them.

The NLSCY utilised two multi-item parenting scales corresponding to nurturing and rejection. These were developed from a factor analysis of an inventory of parenting questions developed

by Schaefer et al. (1965). These scales were derived from adolescents' responses to statements starting with "My parents (or step parents or foster parents or guardians).

The nurturance scale (theoretical range = 6-30, Cronbach's alpha = 0.77) was made up of 6 items. The items are listed below. The rejection scale (range = 7-35, Cronbach's alpha = 0.59). All items were scored using a 5 point likert scale by the adolescent.

Figure 3-3: Items in parental nurturance and rejection scales in the NLSCY

Nurturance Scale	Rejection scale
…smile at me	….soon forget a rule they have made
…praise me	…nag me about little things
…make sure I know I am appreciated	… only keep rules when it suits them
…seem proud of the things I do	… threaten punishment more often than they use it
….listen to my ideas and opinions	…enforce a rule or do not enforce rule depending on their mood
…and I solve a problem together whenever we disagree about something	…hit me or threaten to do so
	…get angry and yell at me

Where the possible responses to the items in both scales were: 1, Never; 2, Rarely; 3, Sometimes; 4, Often; 5, Always; 6, Not Applicable; 7 Don't know; 8, Refusal; 9, Not Stated. Items 6-9 were recoded in analyses as *system missing*.

3.4.3.3 Relationships with friends and peers

The peer context has been shown to be an important covariate of self-esteem (DuBois and Silverthorn, 2004). This context is highly complex, with both qualitative affective and quantitative network aspects that are increasingly recognised to make up an important, non-spatial component of the social context.

The assessments of peer relationships represent an important dimension of social context, that of non-spatially bounded peer networks which are critical for adolescent development. Although imperfect proxies for a complex concept, they are important controls for variations in self-esteem as identified. As identified in chapter two, their effects may also be modified in important ways by neighbourhood context (Leventhal and Brooks-Gunn, 2000).

In the BYP peer relationships were assessed using a single item which captured whether the respondent was 'happy with their friends' with possible responses ranging from 1-completely happy, 2, 3, 4-don't know, 5, 6, 7-unhappy. These categories were conflated to happy and 'don't know or unhappy' owing to the very small proportions who reported unhappiness with family (only 3% reported any unhappiness (5-7) with friends at all).

In the NLSCY, peer relationships are operationalised using the peer relations subscale (Marsh and O'Neil, 1984). These items are self-reported by 10-15 year olds in Cycles 1-5. The items making up the scale are made up of the following statements by the adolescent: 'I have many friends', 'I get along with others my age', 'Others my age want me to be their friend', 'Most others my age like me'. These statements are then assessed by the adolescent with respect to the following possible responses - 1, False; 2, Mostly False; 3, Sometime true/Sometimes False; 4, Mostly true; 5, True. The scale ranges from 0-16, where 0 indicates that the respondent does not have positive relationships, or have many friends. While the first question measures the number of friends as opposed to the degree to which the respondent gets on with others, the scale appears to be internally consistent with Cronbach's alpha scores of 0.78 (StatCan, 2006).

3.4.3.4 Family structure

Family structure is a well known correlate of adolescent mental health in the UK and Canada (Fagg et al., 2006; Lipman et al., 2002; McMunn et al., 2001). Family types analysed here included those with two biological parents, single parent families and reconstituted families. Reconstituted families are simply defined here as those family types where two parents or guardians are present and where one or both are not the biological parents.

These family types were derived for use in the NSLCY but were not directly available in the BHPS. The variable was derived specifically for this analysis and was designed to correspond

directly with the pre-derived variable used in the NLSCY. The program written to derive this variable used the mother and father identifiers in the youth file to identify the adults in the adolescents' household who were the adolescents' carers / parents. Unique codes were created for each adolescent-mother and adolescent-father relationship, which was then used to interrogate the relationship grid of the BHPS in order to determine the nature of the relationships between the respondents in the pairs (i.e. whether parent/carer is biological, adoptive, foster, grandparent, or other adult). This information was then aggregated to the household level in order to highlight where the adolescent had two biological parents, only one single carer on file, or a reconstituted family structure.

3.4.3.5 Family functioning

Family functioning has been found consistently to be associated with mental health in young children and adolescents and may vary by neighbourhood type and with young people's mental health (Leventhal and Brooks-Gunn, 2000).

Family functioning was measured in the NLSCY by asking the adolescent the question to rate how they feel about their family on a scale of one to seven where feelings were indicated by a series of "faces expressing various types of feelings" (Taylor, 2009). This was the closest proxy that could be found which was available at all waves of the BYP.

Family functioning was measured in the NLSCY using the 12-item general subscale of the McMaster Family Assessment Device (Epstein, Baldwin and Bishop, 1983). The statements describe family behaviour and relationships and measure problem solving, communication between family members, family roles, and affective relationships within the family. The 'Person Most Knowledgeable about the child (PMK: see glossary) responded on a on a scale ranging from 1, strongly agree to 4, strongly disagree. Negatively coded responses were reverse coded, 1 was subtracted from each item, and the items then summed. Scores range

from 0 to 36, with higher scores representing greater family functioning. The alpha coefficient for this score was calculated as 0.86 over the sample.

3.4.3.6 Maternal depression

Several studies have found that maternal depression is associated with low self-esteem and depression in adolescents (Gelfand and Teti, 1990). Maternal depression is measured in the BYP using the General Health Questionnaire. Mothers were categorised as depressed or not according to the method described in the GHQ handbook (Goldberg and Williams, 1988). Each item in the scale has four response categories. Given a question such as 'Have you recently been unhappy and depressed?', a respondent can choose from four response categories: 'not at all', 'no more than usual', 'rather more than usual' or 'much more than usual'. A score from 1-12 is then derived from these answers, scoring each of the twelve symptoms (questions) as present or absent (one point for either of the latter two responses, and zero otherwise). A respondent who scores 3 or more (out of 12) is classified as a case based on previous validation studies against the Clinical Interview Schedule (Goldberg and Williams, 1988).

Maternal Depression in the NLSCY was measured using a short form of the Centre for Epidemiologic Studies Depression (CES-D) scale (Radloff, 1977). The full 20 item version of the scale ranges from 0-60, with a cut-off for depression caseness at 16. The NLSCY carries a short form of this scale (the 'NLSCY Depression Scale') which ranges from 0-36 (Somers and Willms, 2002). Mothers scoring 9 or above on this scale were classified as depressed. This cut-off was derived using a rescaling methodology described by Somers and Willms (2002).

3.4.3.7 Household socio-economic status

Household socio-economic status is operationalised with respect to two components which are measured similarly in the NLSCY and the BYP: household income and parental educational attainment. These are discussed below.

Occupational social class could not be operationalised consistently through the NLSCY (Willms and Fedick, 2003) and therefore was not considered in either analysis for comparability reasons. However, it is acknowledged as an important contributor to psychosocial health and adjustment in children (see, for example, Sacker et al., 2002).

3.4.3.8 Household income

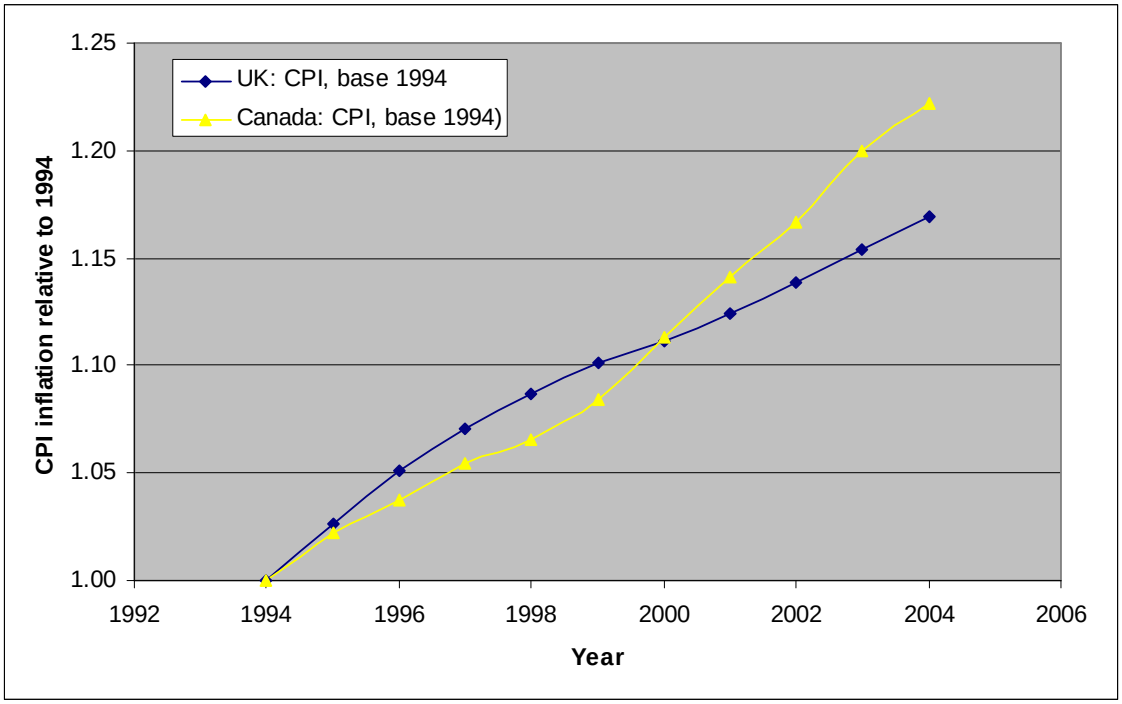
A relative measure of household income was needed in this analysis to allow comparisons over time given changes in inflation. A relative measure was also desirable in terms of placing individuals by their household income relative to the rest of the population in each country in a standardised way, allowing comparison of the effects between countries. This was constructed by comparing household income against the median income across the samples. Raw household income was adjusted for inflation and equivalised by household composition prior to calculation of relative status of households to the full sample.

Inflation adjustment for both studies was done using Consumer Price Indices (CPI) in both the UK and Canada. These are used macro-economic measure of consumer price inflation, forming the basis for UK (ONS, 2008b) and Canadian central bank monetary policy (StatCan, 1996).

Annual Average CPI figures for both countries were sourced for each year from 1994-2004 inclusive. These were originally referenced to 1987 (CPI) and 2002 (Canadian CPI). These were rescaled here to a baseline of 1994 by dividing through each value by the value for 1994. The

rescaled inflation figures for Canada and the UK are compared in Graph 3-1. This shows that both countries have followed similar inflation of consumer prices, which provides more evidence that the countries are good candidates for comparison.

Graph 3-1: CPI inflation relative to 1994 in the UK and Canada.



Housing composition was adjusted for using a scale based on the rules underlying the modified Organisation for Economic Cooperation and Development (OECD) index. This was recommended over scales such as the McClements scale when consultations of experts were undertaken by the Office for National Statistics in the UK (ONS, 2005). The derived scale created here, used information about family structure, the age of each child, and the number of children in the household in any given year, *as counted within the households in the survey.*

The calculation of the scale was done in the same way for both surveys to aid comparison. It should be noted that the values would not reflect the equivalisation scores if all the appropriate data for household structure and composition were available. For example, the number of children in the NLSCY was limited to 2 per household from the second cycle, so the

derived scale is biased downwards for large families whose number of children was not calculated. This said, households in the BYP were not constrained in terms of the number of children sampled. For this reason, the scale in the BYP may be less biased against larger households than that derived for the NLSCY. However, the scale is internally valid for comparing households within each survey, and importantly at least partially adjusts for differential spending power between survey families relative to households with no dependent children. It is also comparable between the BYP and NLSCY, and reflects current best practice (as far as possible with the data available) in income equivalisation.

The median income was calculated over the whole NLSCY and the whole of the BYP families on a year by year basis – it is thus the year-specific median income for households with at least one teenage child. Families whose inflation-adjusted equivalised income fell below 60% of the median were defined as living in relative income deprivation, those whose income was 40% above the median were categorised as relatively affluent.

3.4.3.9 Maternal education

Parental education was selected as a second marker for socio-economic status. This is important because while household income determines access to material resources, and elements of life stress, parental education is likely to be important in socialisation of adolescents. This has been noted for example, with respect to teenage aspirations for schooling and to parental involvement in the school context (Schoon, 2006). While the highest educational qualifications of both parents are likely to be important for teenage development, paternal education is systematically missing for all families with a single mother, which make up the most single parent families in the BYP and NLSCY. For this reason, models use maternal education only.

Education systems differ in the UK and Canada. In the UK, maternal education was categorised as 'Less than GCSE, GCSE equivalent, A-level equivalent and Diploma / Degree level. In Canada, a three level variable was created consisting of Less than High School, High School, and Diploma/Degree level.

3.4.3.10 Region

Models investigating neighbourhood effects should ensure that these effects are not acting in proxy for other regional geographical effects which might operate on the outcome. This study has aimed to do this by incorporating regional identifiers as confounding variables. Categorical variables index the province of residence at any point in time in Canada, and the region and country of residence in the UK. Some provinces and regions were conflated from the original categories, so the two sets of regions are listed below:

UK Regions -South, London, East of England/Midlands, North West, Rest of North, Wales, Scotland

Canadian Provinces -Ontario, Maritimes, Quebec, Manitoba, Saskatchewan, Alberta, British Columbia - where the Maritime Provinces are Newfoundland, Prince Edward Island, Nova Scotia and New Brunswick

3.4.3.11 Urban/Rural

A dummy variable specifying urban/rural status was also incorporated into the analysis. The association with health outcomes of deprivation and social fragmentation may operate differently in urban and rural areas (Riva et al., 2009).

The urban/rural variable used in the BYP defines postcodes in terms of those located in urban areas with a population of 10,000 or more. Rural areas are those where the postcode is

located in a more sparsely populated area. The 10,000 threshold was a common definition of rurality for England and Wales and for Scotland. England and Wales had a different set of more graded definitions of rurality than Scotland and so these could not be combined further. This classification utilises the urban/rural indicator developed for the Institute of Social and Economic Research who run the BHPS and BYP studies (ISER, 2008).

A similar indicator was used in the NLSCY. This was linked into the survey using the program referred to in section 3.3.2 above, which links in information about census codes. This program also provided an urban/rural indicator which was developed by (Gonthier et al., 2006). This indicator dichotomises census subdivisions into those which have a population of 10,000 or more ('Larger Urban Centres') and those which have less ('Rural and Small Towns'). This dichotomisation is used in research papers examining trends in infant health (Luo et al., 2004) and is recommended as a benchmark definition to describe the rural population of Canada on a national basis (du Plessis et al., 2001).

3.4.4 Summary of variables

This section has described the concepts used throughout this thesis and the operationalisation of those concepts as empirically observable variables. The next section considers the statistical methods which are used to model variation in these variables.

3.5 Analytic strategy

The analytic strategy aims to address the three research questions set out in section 3.1. Two broad components of these questions are addressed in the following four sections. Firstly, the samples needed to be representative of contemporary adolescents in the UK and Canada. Therefore, methods for describing these samples and their generalisability are described in section 3.5.1. Secondly, methods to address the three research questions are outlined in

section 3.5.2. Finally each of the three research questions is addressed specifically by a sequence of models, described in sections 3.5.3, 3.5.4 and 3.5.5 respectively.

3.5.1 Generating a sample of early adolescents from the UK and Canada: sample derivation and generalisability

A single sample of individuals for each of the NLSCY and the BYP was necessary in order that all analyses of each dataset were consistent in terms of the individuals analysed, and therefore the population that could be generalised to. It was also important that key aspects of the analyses were also consistent between the NLSCY and the BYP in order that the results could be qualitatively compared. The criterion for inclusion is presented below, followed by a discussion of why specific elements of the criterion are specified.

Criterion: All observations were included for adolescents who had complete data on all analysis variables for a two-year transition

Complete data was needed for at least one transition as some statistical models in Stata drop individuals on a case by case basis if there is any missing data on any variable (Long and Freese, 2003). The *transition* stipulation was added because some of the analyses conducted here examined data at two time points explicitly (see models in section 3.5.5 and 3.5.5.1 for example). Thus, in the absence of full complete data at two time points, these models would drop individuals who did not have data at both these time points. However, multilevel models *can* utilise data which is not complete under the Missing at Random (MAR) assumption (these models and this assumption are described below in section 3.5.2). Complete list-wise deletion of observations was therefore unnecessary, would reduce statistical power and introduced more bias into the datasets (Rabe-Hesketh and Skrondal., 2008). Thus, *all observations* were retained and analysed for adolescents in the sample, even if data for some variables was

missing. Finally, the first time point in a transition (t1) and the second (t2) were spaced two years apart in the definition. This was to explicitly take account of the fact that the minimum lag in the biennial NLSCY was two years, while it was one year in the BYP. In this analysis of both datasets, lags of one year in the BYP are only analysed in sensitivity analyses.

Chapter four presents 'exclusion diagrams' which illustrate how the samples are derived from the full BYP and NLSCY datasets. These diagrams show what proportions of the sample was lost due to each part of the inclusion criteria. These show that two subsamples are derived from each survey: a subsample for analysis, hereafter referred to as the 'sample', and a subsample of individuals who were not included in the analysis, referred to as the 'excluded sample'.

Chapter Four goes on to describe the samples and excluded samples. As described in sections 3.3.1 and 3.3.2 above, ISER and StatCan have provided statistical weights which adjust the samples for non-response and attrition. These sampling weights are used in the calculation of all descriptive statistics to ensure that parameters which are estimated reflect the underlying population as far as possible. Observations are not independent, but are clustered within individuals (discussed in more detail in section 3.5.2.3 below). However, all descriptives adjust confidence intervals for clustering of longitudinal responses within the individual,

The first section of the chapter compares the samples and excluded samples to describe any systematic bias which may have been introduced by the application of the inclusion criteria. This bias might be introduced because item non-response is systematically more common amongst particular groups than others. This bias is shown by presenting weighted descriptive statistics of the sample and excluded samples.

Descriptive statistics which are presented here include proportions for categorical variables and means for continuous variables. A proportion is the number of observations in a particular

level of a categorical variables (e.g. *male* in the variable sex) divided by the total number of observations (of all males *and* females). A mean is used to summarise continuous variables, and is estimated by the sum of the variable divided by the total number of observations over which it is calculated. However, as it is the population proportion and means that are of interest, it is also important to take into account sampling variation. This is done in this case by calculating a 95% confidence interval (95%CI). This is the range of values around the population mean or proportion. If the sample was redrawn at random 20 times, the 95% confidence interval calculated for each sample could be expected to include the population parameter of interest, say the population mean, at least 19 times. By corollary, 1/20 times, the confidence interval would not include the true population mean (Kirkwood and Sterne, 2003). In addition to allowing generalisability to the underlying population of interest, the confidence intervals can be used to infer the *precision* of the estimate. Narrow confidence intervals indicate that the estimate has been estimated precisely, while wide confidence intervals indicate a larger degree of uncertainty around the estimate (Kirkwood and Sterne, 2003).

The surveys used here, like the majority of population surveys, are not drawn at random, but use complex sampling strategies. In order to take account of how the survey was drawn from the wider population it is necessary to weight parameters of interest such as the mean or proportion. Details of the sampling strategy and weights for the BYP and the NLSCY are discussed above. These sampling weights are used in the calculation of all descriptive statistics to adjust the relative influence of any given observation according to the probability of selection from the underlying population (StataCorp, 2007).

Chapter four therefore addresses the assumption that the NLSCY and BYP samples are nationally representative of adolescents living in private households in the UK and Canada. The findings presented in that chapter inform the researcher about the degree to which these samples represent that population, and where potential bias may have occurred when drawing

the sample for this analysis. This information is then available, and can be used when interpreting results from the following three sections which describe methods to address each of the research questions.

3.5.2 Methods to test support for socio-economic equalisation theory in youth over the whole sample

The analysis of this thesis rested on two related types of regression models. These are described below with particular reference to the first research and second research questions. These techniques are also applied in the investigation of the third research question.

Descriptions of the techniques are discussed together where they share common features, and separately where they diverge. The application of the techniques is then discussed with reference to tables describing the sequences of models.

3.5.2.1 Modelling the relationship between neighbourhood deprivation and self-esteem: Binary and multinomial logistic regression

The first research question relates to the relationship between self-esteem and neighbourhood deprivation. Two types of self-esteem outcome are investigated, namely current low self-esteem, and change in self-esteem. Both these outcomes are categorical and must be modelled using the broad class of logistic regression models. When the variable has two categories, as with current self-esteem (low versus high), a binary logistic regression is used. When the variable has multiple categories (as with change in self-esteem), a multinomial or ordinal logistic regression is used. Multinomial logistic regression is used when the variable categories follow no particular order (nominal), while 'ordinal' logistic regression is used when the categories can be ranked meaningfully (Long and Freese, 2003). The self-esteem change

outcome is an unordered, nominal categorical outcome, and therefore most appropriately modelled using a multinomial logistic.

Logistic regression models are a subset of generalised linear models (GLM), along with Poisson models, and Ordinary Least Squares (OLS) regression. As with OLS regression, logistic models can be used to predict a dependent variable on the basis of one or more independents (Long and Freese, 2003). These dependents can be categorical or continuous. Unlike OLS regression, the assumptions of logistic regression models are generally less stringent. However, logistic regressions do have general assumptions in common with OLS regression such as independence of observations (discussed in detail below)

3.5.2.2 Estimating the magnitude and direction of the neighbourhood deprivation and self-esteem relationship

The magnitude, direction and statistical significance of the association self-esteem outcomes and neighbourhood must be estimated to test support for the competing deprivation amplification or socio-economic equalisation theories. This section considers the first two parameters specifically. Two common ways to describe the magnitude and direction of associations between a categorical outcome and an independent variable are the relative risk ratio (RRR) and the odds ratio (OR). As these two measures of association are also commonly reported as the result of binary and multinomial logistic regression models respectively, they are described below. After the separate descriptions, the extent to which the two types of ratio can be compared is considered.

Relative risk ratios can be estimated by calculating the 'risk' of an event occurring. Taking an example from this thesis, the risk of maintaining low self-esteem in deprived neighbourhoods

($Risk_1$), and of maintaining low self-esteem in affluent neighbourhoods are calculated as follows:

Equation 3-1 - Estimation of risks of maintaining low self-esteem

$$Risk_1 = \frac{mlse\,in\,deprived\,neighbourhood}{total\,in\,deprived\,neighbourhood}$$

$$Risk_2 = \frac{mlse\,in\,affluent\,neighbourhood}{total\,in\,affluent\,neighbourhood}$$

Where *mlse* is the outcome 'maintains low self-esteem' and *total* refers to the total number of individuals in deprived / affluent neighbourhoods.

The relative risk ratio is calculated by dividing $Risk_1$ by $Risk_2$. The RRR can then be used to assess the *strength* and *direction* of the association between deprivation and maintaining low self-esteem. Specifically, when RRR is equal to 1, the risk of maintaining low self-esteem is the same for individuals living in deprived or affluent neighbourhoods. When it is less than one, the risk is higher in affluent neighbourhoods. Either of these findings would support the equalisation hypothesis. When the RRR is greater than 1, the risk of maintaining low self-esteem is higher in deprived neighbourhoods than in affluent neighbourhoods. This finding would support a deprivation amplification hypothesis. The magnitude of this association would determine the strength of the support for either theory as well as the substantive importance of neighbourhood deprivation as a 'risk' to self-esteem. Simply, the further the RRR is from 1, the stronger the association between neighbourhood deprivation and the risk of maintaining low self-esteem.

The second method of assessing magnitude and direction of association is the odds ratio, and, as described below, is produced by logistic regression. This is the ratio of the odds (as opposed

to the risk) of an event occurring. The odds are directly related to the probability of an event occurring, as is highlighted in Equation 3-2. Thus, in this case, the odds of an adolescent reporting low self-esteem are estimated simply as 'the number of individuals who report low self-esteem divided by the number who do not'.

Equation 3-2: Estimation of odds (adapted from (Kirkwood and Sterne, 2003)

$$Odds = \frac{plse}{1 - plse} = \frac{lse / total}{(1 - lse / total)} = \frac{lse / total}{hse / total} = \frac{lse}{hse}$$

Where *plse* is the probability of reporting low self-esteem, *lse* is low self-esteem, *total* is the total number of people in the sample, and *hse* is high self-esteem.

The *odds ratio* (OR), is estimated by dividing the odds of reporting low self-esteem for those living in a deprived neighbourhood, by the odds of those living in an affluent neighbourhood. In terms direction of association, the odds ratio is always interpreted in the same way as the relative risk ratio. However, the magnitude of the relative risk ratio is only comparable on a like for like basis (i.e. a relative risk ratio of 1.2 means the same in substantive terms as an odds ratio of 1.2) where the outcome is *rare* in the reference group (affluent neighbourhoods in this case). All the self-esteem change outcomes were rare in this way. Thus, the magnitude of an odds ratio or a relative risk ratio would be approximately numerically equal (Kirkwood and Sterne, 2003).

3.5.2.3 Statistical significance and the importance of statistical clustering

As with the mean and proportions above, relative risk and odds ratios are sample estimates of population parameters. As described above the OR and the RRR gives the direction and magnitude of the relative risk in the sample, the precision and generalisability of the estimate is unknown. Therefore, to assess precision, 95% confidence intervals, as described

conceptually for the means and proportions above, are also calculated for these estimates. With both types of ratios, the confidence intervals can be used to infer the statistical significance of the finding, or the probability that it would have occurred by chance. When the 95%CI of a RRR spans zero, the estimate is non-significant at the 0.05 level of confidence. This draws upon the concept of the null hypothesis, which in this case postulates that any differences between the relative risks of maintaining low self-esteem in deprived and affluent neighbourhoods would be attributable to sampling variation, not a population difference between individuals living in the two types of neighbourhoods. If the confidence intervals spans zero, this null hypothesis cannot be rejected at the 95% level of confidence. The method by which the 95%CI around the RRR has important implications for both types of regression models and is described below in Equation 3-3 for both RRR and OR.

Equation 3-3 - Confidence intervals for the relative risk ratio

$$95\%\,CI\,(RRR) = RRR / EF \ldots RRR * EF\,,$$
$$where\ EF = \exp[1.96 * s.e.(\log RRR)]$$
$$and\ s.e.(\log RRR) = \sqrt{[1/mlse_d - 1/total_d + 1/mlse_a - 1/total_a]}$$

The confidence interval for the RRR ranges from the RRR divided by the error factor (EF) to the RRR multiplied by the error factor. As one of the properties of relative risk ratios is that they cannot be less than zero, the standard formula for confidence intervals presented for means above cannot be used directly, but must be applied after obtaining the logarithm of the relative risk ratio (log RRR) and its standard error s.e.(log RRR). The confidence intervals for the RRR are then obtained by taking the antilog, by exponentiating, the log of the confidence intervals. Thus, the error factor is calculated by exponentiating the product of 1.96 and the standard error of the natural logarithm for the relative risk ratio (i.e. 1.96*s.e. (log RRR).

The confidence interval for the odds ratio is calculated in a similar way to that of the relative risk ratio (see Equation 3-4).

Equation 3-4 - Confidence interval for the odds ratio

$$95\%\,CI\,(OR) = OR / EF \ldots OR * EF,$$
$$where\, EF = \exp[1.96 * s.e.(\log OR)]$$
$$and\ s.e.(\log OR) = \sqrt{[1/mlse_d - 1/mhse_d + 1/mlse_a - 1/mhse_a]}$$

The derivation of the confidence interval is broadly similar to that of the relative risk ratio. The key difference is in the calculation of the standard error. Instead of the proportion of individuals reporting that they maintain low self-esteem being divided by the total population of each type of neighbourhood, it is divided by the proportion of people maintaining high self-esteem. This makes it clear why the OR and RRR are numerically approximate for rare outcomes as the total population and the number who do not report the outcome are close.

An additional measure, the p value, is also used to assess the statistical significance of the RRR. In the case of the p value, the *smaller* the p value is, the *stronger* the evidence for *rejecting* the null hypothesis (Kirkwood and Sterne, 2003). The p value is particularly useful for highlighting where a finding is marginal, for example at a significance level of 0.05, an estimate with a p value of 0.06 would be marginally nonsignificant, and indicative of a trend, especially in cases where the underlying data were not particularly powerful. The reverse case, where the p value of 0.04 is found indicates that the estimate is only marginally significant. Where large samples are available to observe relationships, and these are only marginally significant, the validity of a trend should also be questioned as the probability of finding a significant relationship in larger samples is higher by virtue of the larger statistical power (Kirkwood and Sterne, 2003). To derive a p value, a z statistic must be calculated (see Equation 3-5)

Equation 3-5 – z statistics of relative risk ratio and odds ratio

$$zRRR = logRRR / s.e.(logRRR)$$

$$zOR = logOR / s.e.(logOR)$$

Where zRRR and zOR are the z statistics for the relative risk and odds ratios respectively. These can be compared with a look up table to derive a p value, and subsequently interpreted as described above. The logOR and logRRR are the natural logarithm of the odds ratio and reative risk ratios respectively. S.e. (logRRR) and s.e. (log OR) are the standard error of the log of the relative risk ratio and odds ratio respectively. This highlights that all inference about statistical significance of associations is conditional on the size of standard error.

As mentioned above, logistic regression assumes that the observations in the sample are independent. However, survey data often do not meet this assumption but are clustered (Merlo et al., 2005). As discussed in chapter two with reference to the *between-neighbourhood variation,* observations in a dataset can cluster within neighbourhoods, leading to between-neighbourhood variation. However, clustering can also be thought of in psychological terms, if individuals are asked the same questions repeatedly, observations cluster within individuals, leading to between-individual variation. This related phenomenon can be interpreted in substantive psychological terms, such as the (in)stability of a particular trait such as self-esteem (Baldwin and Hoffmann, 2002), or in terms of the reliability of the test instrument which is being used (Rabe-Hesketh and Skrondal., 2008).

As mentioned above, any form of clustering of observations violates the independence assumption of regression models, which assumes that all the observations in the sample are drawn randomly from the population of interest (Rabe-Hesketh and Skrondal., 2008). The violation of this assumption is important statistically because the standard errors of the

coefficients reported by 'naïve' regression models (those which do not take account of clustering which is present) are under-estimated in clustered data. This means that the inference about statistical significance will be more likely to be incorrect (as the standard errors are central to the estimation of confidence intervals and p-values) and to falsely reject the null hypothesis when it is in fact true. In the case of this thesis, it may be that a *statistically significant* gradient (in either direction) in self-esteem by deprivation will be inferred as a property of the population when the gradient is actually due to sampling variation. It is important to note that the point estimates (i.e. the magnitude and direction of the odds ratios and relative risk ratios) are not impacted on by this phenomenon, just the statistical significance (the standard error is not utilised in the calculation of those parameters).

The implication of this is that logistic regression models must be adjusted to take account of this phenomenon, *when it is present* and likely to *substantively affect inference* of statistical significance.

Clustering can be handled in a variety of ways. One way, described below is to explicitly assess the degree and significance of clustering is to model it using multilevel models (discussed in the following section). These models are described in the following section. A second approach *adjusts* the way that regression models calculate standard errors to allow robust conclusions about the statistical significance of associations in the model (but not about the magnitude of the clustering itself).

The methodology employed here was to investigate whether clustering was apparent in the data due to either its longitudinal or multilevel structure and to adjust model accordingly. This was done using a three level (multilevel) binary logistic regression model described below.

3.5.2.4 Assessment of nature of clustering and other regression assumptions in samples and models

Multilevel logistic regression is used in this thesis to examine the relative importance of between-neighbourhood and between-individual clustering as these effects may bias inference about the statistical significance of socio-economic gradients in health.

In a multilevel model, the between-individual variation and between-neighbourhood variation present in the NLSCY and BYP (see section 3.3) can be modelled explicitly. In multilevel longitudinal data, a three level multilevel logistic model is used. This partitions the variation into three parts, that due to variation within individuals over time, between individuals, and between neighbourhoods. Equation 3-6 describes the model below. The model assumes that the observations of self-esteem are nested within individuals and that individuals are nested within neighbourhoods in a hierarchical manner. This assumption is problematic as some individuals may move and neighbourhood during this time. The effects of fitting a hierarchical structure to data in this way can bias variance estimates downwards and these effects are ideally modelled using multiple membership models (Browne et al., 2001). However, this was not done for three reasons. Firstly, the data in question are likely to be too sparse to fit these models in a robust way. Secondly, any improvements to the estimates of the standard errors would not be likely to impact on whether associations between neighbourhood deprivation and self-esteem were statistically significant or not based on recent research which investigates random variation in detail (Leckie, 2009).

Equation 3-6 – Null, three level binary logistic regression model with no 'fixed' explanatory variables such as neighbourhood deprivation

$$\log(p_{ijk}/(1-pijk) = \beta_0 + \upsilon_k + \mu_{jk}$$

The model is a multilevel binary logistic regression. The logistic part of the model is derived from the application of the logit link (denoted by 'log') which transforms the odds (p_{ijk}/ (1- p_{ijk})) into a linear outcome which can be modelled as a linear function. This model estimates the outcome (the log odds of low self-esteem) as a function of the overall probability (β_0), the between-individual variation (μjk) and the between-neighbourhood variation for individuals (υ_k) around that overall probability.

The relative contribution of the between-individual and between-neighbourhood characteristics is calculated using the *intra class correlation*. This measures the proportion of the variation attributable to the between-neighbourhood variation and the between-individual variation. However, in multilevel binary logistic regression variation at the first level is estimated on a different scale (the dichotomous scale) to that of the higher levels (the probability scale). For this reason, a threshold method model is used to estimate the intra class correlation (Snijders and Bosker, 1999). This is illustrated for the between-neighbourhood ICC by the following equation:

Equation 3-7: Proportion of variation attributable to between-neighbourhood variation using threshold method model (Snijders and Bosker, 1999)

$$\text{Neighbourhood ICC} = \upsilon_k \ / (\mu_{jk} + \upsilon_k \ + (\pi^2/3))$$

Where ICC is the intra-class correlation coefficient, υ_k is the between-neighbourhood variance, μ_{jk} is the between-individual variance. The underlying distribution of a logistic regression is that the mean is zero and the variation is $\pi^2/3$, where π represents the mathematic constant, pi. Therefore this part of the equation is also a constant, equal (at 2 significant figures), to 3.29.

The magnitude of the ICC gives an assessment of the amount of variation that is attributable to the clustering effect. Thus, Equation 3-7 gives the between-neighbourhood ICC, and by changing the numerator from the between-neighbourhood variance to the individual-variance

and holding the denominator constant, the same equation would give the between-individual ICC. The relative magnitude of the two can then be compared.

A second measure of clustering, the median odds ratio (MOR), translates the variance models onto an odds ratio scale so that the neighbourhood effect can be compared in terms of magnitude with fixed effects such as those attributable to neighbourhood deprivation (Larsen and Merlo, 2005). This is a useful way of assessing magnitude which is perhaps more intuitive than the ICC.

The MOR is defined as the median value of the odds ratio between the neighbourhood at highest risk and the neighbourhood at lowest risk when randomly comparing two pairs of neighbourhoods within a dataset. As such, the MOR can be conceptualised as the increased risk that (in median) moving to another neighbourhood in the dataset would have. The MOR is described by Equation 3-8.

Equation 3-8: Calculation of the median odds ratio (Larsen and Merlo, 2005)

$$MOR = \exp\left\{\sqrt{2\psi\phi(3/4)}\right\}$$

Where, σ^2 is the neighbourhood variance (the standard deviation squared), $\Phi^{-1}(3/4)$ is the 75th centile of the cumulative distribution function of the normal distribution with mean = 0 and variance = 1 (Merlo et al., 2006).

The statistical significance of either the between-neighbourhood or between-individual variation can be tested by assessing the difference between models which account for clustering and those which don't. Multilevel models are estimated using maximum likelihood estimation. Differences between models can be judged used a likelihood ratio test, also known as the *deviance test* (Hox, 2002), described below in Equation 3-9.

Equation 3-9: Formula for likelihood ratio test

$$d = 2(l_1 - l_0)$$

Where d is the *deviance*, and l_1 gives the log likelihood for the more complex model. For example, when evaluating the significance of the third level in a three level model, that model can be compared with the two level model which does not include the third level. Models which are significantly different (assessed using a p value), when clustering is included at a given level (either neighbourhood, or individual, or both) are improved in terms of fit by that adjustment for clustering.

The log likelihood value is also used in the calculation of whether fit is parsimonious. Akaike's Information Criteria (Akaike, 1974), the AIC, adjusts the difference in log likelihood value examined in the likelihood ratio test, for the increased complexity of the model which is introduced by the addition of statistical parameters such as between-neighbourhood, or between-indivdiual variation, or fixed parameters such as neighbourhood deprivation. This measure is recommended for use with multilevel models as a general fit index (Hox, 2002). Reductions in the criteria indicate a more parsimonious fit of the model to the data, increases indicate that fit has been increased sufficiently given the increase in the complexity of the model on a statistical basis.

Equation 3-10: Formula for AIC (Akaike, 1974)

$$AIC = d + 2q$$

Where *d* is minus two times the log likelihood value is the number of parameters in the model. Adding a random intercept term to the model involves adding one parameter, as does adding sex. Adding a categorical variable involves adding c – 1 parameters where c is equal to the

number of categories in the variable. Thus for neighbourhood deprivation quintiles c=5, and c-1=4 parameters. Higher numbers of parameters indicate a higher degree of complexity.

To summarise, the statistical significance of associations between neighbourhood deprivation and low self-esteem may be influenced by the degree of clustering of observations within neighbourhoods, or within individuals, or both. An empty multilevel model is used to assess this clustering to determine whether both levels must be adjusted for in analyses. The judgement of the relative importance of the clustering will be made on the basis of the statistical significance of the between-neighbourhood or between-individual variation. If it is not statistically significant, then adjusting for this level will not impact on the standard errors calculated for the model and therefore adds an unnecessary level of complexity to the modelling procedure which will not aid in inference about the statistical significance of the relationship between neighbourhood deprivation and low self-esteem.

As to other regression assumptions, logistic regression has less stringent statistical assumptions than Ordinary Least Squares regression. Specifically, it does not assume that variables are distributed normally, or that the variance around the outcome is constant for all values of each predictor variable (homoscedacity). However, logistic regression which includes more than one independent variable, assumes that variables are not highly inter-correlated. It is therefore good practice to check for multi-collinearity prior to the development of multiple regression models. Highly correlated predictors may give the impression that none of the variables in the model are associated with the outcome, even when the each predictor exhibits a strong relationship individually (Bagley, White and Golomb, 2001). Multi-collinearity was tested using a variance inflation factor (VIF) test. The VIF is an index which measures how much the variance of a coefficient is increased because of collinearity .Several rules of thumb exist when interpreting the VIF index, but a value of five for any given coefficient is considered

a relatively conservative threshold (StataCorp, 2007). VIF was calculated for the variables in the models used in the thesis and none exceeded 2.

Finally, as with most secondary datasets, there are substantial amounts of missing data. There are two ways of dealing with this. Firstly, any individual who has missing data at any point on any variable can be deleted (list wise deletion). While common practice, this can bias estimates, especially where the dataset has considerable 'missingness' (data is missing). Multilevel models handle missing data under the Missing at Random (MAR) assumption. MAR assumes that missing data is generated in a way which is related to other *observed variables* in the dataset but not the *missing data* itself. Bio-statisticians suggest that MAR is appropriate in the majority of circumstances and that multilevel models handle this missing data process by virtue of the maximum likelihood estimation methods that they use (Rabe-Hesketh and Skrondal., 2008).

3.5.3 Analysis sequence testing the equalisation hypothesis

As discussed above, this thesis is concerned primarily with addressing whether self-esteem is associated with neighbourhood deprivation. However, West et al. (2004) propose that there is likely to be equalisation in both household socio-economic status and neighbourhood deprivation. It is therefore necessary to evaluate an individual model prior to testing the neighbourhood deprivation models. This individual model tests whether family socio-economic status measured by maternal education and family income poverty is associated with low self-esteem on an unadjusted and adjusted basis.

Self-esteem research emphasises the importance of demographic and social variables in explanations of variation in self-esteem. In particular this body of research emphasises the influence of demographic factors such as age and sex, the importance of adolescents' perceptions of their social relationships. These factors are therefore considered separately

prior to testing a fully adjusted model of individual and family variables which are likely to be important for low self-esteem.

The analytic sequence to test these four concerns (relationships between low self-esteem and unadjusted family SES, adjusted family SES, adolescent demographics, and adolescent perceptions) is outlined precisely below in Table 3-4 below.

The first model (M1: Equation 3-6), assesses the relative importance and statistical significance of the between-neighbourhood and between-individual variation in low self-esteem. The findings from this model are anticipated in this table, as it shows that between-neighbourhood variation made up only a small and not statistically significant proportion of the variation in self-esteem. In contrast, between-individual clustering was an important source of bias in the standard errors of association. A two level model null model (M2) which modelled this between-individual variation with no covariates was required as a reference point to assess the fit of models with covariates.

Equation 3-11 – Null, two level binary logistic regression model with no 'fixed' explanatory variables such as neighbourhood deprivation

$$\log(p_{ij}/(1-pij) = \beta_0 + \mu_j$$

This equation differs from the three level model by the removal of the between-neighbourhood variance term. The log odds of self-esteem are now modelled at the individual level only but the model continues to estimate the proportion of the variation attributable to the within and the between-individual variation (μ_j).

M3 is a distinct modelling stage and represents not one but fifteen models (M3a, M3b…M3k) of each individual and family covariate on an unadjusted basis.

The β symbol denotes the logit coefficients of association produced by the logistic regression. This is difficult to interpret, so these are exponentiated to produce odds ratios, 95% confidence intervals and p values (the interpretation of which is discussed above).

Owing to the theoretical importance of individual and family factors to self-esteem, an individual level model, culminating in M6 was built up. Three distinct models were analysed as part of this process, reflecting the complexity of the individual and family model, notably the demographic characteristics of the respondents (M4), the perceptions of their relationships with parents and friends (M5), and the association between self-esteem and independently-measured family characteristics relating to socio-economic status, family composition and functioning (M6).

Equation 3-12 – M4: Demographic model

$$\log(p_{ij}/(1-pij) = \beta_0 + \beta_1 Age_{ij} + \beta_2 Sex_j + \beta_3 Ethnicity_j + \beta_4 Year_{ij} + \mu_j$$

Where the coefficients for age ($\beta_1 Age_{ij}$) and year ($\beta_2 Year_{ij}$) are entered as time-varying attributes, denoted by the *ij* suffix, while the coefficients for sex ($\beta_2 Sex_j$) and ethnicity ($\beta_3 Ethnicity_j$) are entered as time-constant for individuals, denoted by the *j* suffix only.

Equation 3-13 – M5: Perceptions model

$$\log(p_{ij}/(1-pij) = \beta_0 + \beta_1 Age_{ij} \ldots + \beta_4 Year_{ij} + \beta_5 Parents_{ij} + \beta_6 Friends_{ij} + \mu_j$$

Where the set of coefficients includes all those from model 4 (i.e. $\beta_1 Age_{ij}$ to $\beta_2 Year_{ij}$) and coefficients relating to perceptions of parents and friends, all entered into the model as time-varying.

Equation 3-14 – M6: Family model

$$\log(p_{ij}/(1-pij) = \beta_0 + \beta_1 Age_{ij} \ldots + \beta_6 Friends_{ij} + \beta_7 Funct_{ij} + \beta_8 FamStr_{ij} + \beta_9 HhInc_{ij} + \beta_{10} MatEdu + \beta_{11} MatDep_{ij} + \mu_j$$

Where the coefficients include all those from model 5 and coefficients relating to family functioning ($\beta_7 Func_{ij}$), family structure ($\beta_8 FamStr_{ij}$), Household income ($\beta_9 HhInc_{ij}$), maternal education ($\beta_9 MatEdu_{ij}$) and maternal depression ($\beta_9 MatDep_{ij}$). All are hypothesised to vary over time and are therefore entered as time-varying

Interpretation of the odds ratios is quite particular to multilevel logistic regression models. Consider, for instance, the variable "maternal depression". Under a 'naïve' logistic regression model, the odds ratio represents the averaged odds of reporting low self-esteem of the sub-group "mother is depressed" compared to the subgroup "mother is not depressed". Under the multilevel model, the odds ratio represents the odds ratios of the outcome (low self-esteem) for a adolescent whose mother is depressed, compared to the *same* adolescent whose mother is not depressed (Carrière and Bouyer, 2002).

Table 3-4 – Sequence of models establishing degree of between-neighbourhood and between-individual clustering and associations between individual and family characteristics and low self-esteem.

Model parameters	M1 Null 3 level	M2 Null 2 level	M3x Unadjusted	M4 Demographic	M5 Perception	M6 Family
Age			M3a	x	x	x
Sex			M3b	x	x	x
Ethnicity			M3c	x	x	x
Year of measurement			M3d	x	x	x
Perceptions of parents			M3e		x	x
Perceptions of friends			M3f		x	x
Family functioning			M3g			x
Family structure			M3h			x
Household income			M3i			x
Maternal education			M3j			x
Maternal depression			M3k			x
Between-neighbourhood variation	x	…	…	…	…	…
Between-individual variation	x	x	x	x	x	X

'x' denotes variable in model, …. Where variable is removed from model. In column M3x, 11 separate models (M3a to M3k) are fitted to test the unadjusted relationships between each variable and low self-esteem. Low self-esteem is measured at the same point in time as covariates.

Empirically, a bivariate analysis tested whether neighbourhood deprivation or social fragmentation were associated with low self-esteem on an unadjusted basis (M1a and M1b respectively in Table 3-5). The models for the bivariate relationships between neighbourhood deprivation and social fragmentation are described by Equation 3-15 and Equation 3-16 respectively.

Equation 3-15: Bivariate relationship between neighbourhood deprivation and low self-esteem

$$\log(p_{ij}/(1-pij) = \beta_0 + \beta_1 Ndep_{ij} + \mu_j$$

Where, the log odds of self-esteem equal the overall probability of reporting low self-esteem (β0), the between-individual variation in self-esteem (μ_j), the fixed effect of neighbourhood deprivation in 1991 ($\beta_1 Ndep_{ij}$) entered at each time point to take account of the fact that individuals who moved may have been exposed to different levels of deprivation following the move.

Equation 3-16 – Bivariate relationship between social fragmentation and low self-esteem

$$\log(p_{ij}/(1-pij) = \beta_0 + \beta_1 Socfrag_{ij} + \mu_j$$

Where the terms are the same as for Equation 3-15, but social fragmentation $\beta_1 Socfrag_{ij}$ is substituted for neighbourhood deprivation.

The individual and family model could then be used to examine whether variations in low self-esteem by neighbourhood type (deprivation or social fragmentation) were independent of the characteristics modelled by the individual and family model. This analytic sequence is similar to other work conducted in this field (Subramanian et al., 2005). The individual and family variables, and wider regional variables (urban/rural status and region / province of residence)

were added to a second set of models (M2 and M3 in Table 3-6) to assess whether neighbourhood deprivation and social fragmentation were independently associated with low self-esteem. These final models provide a second test (in addition to the bivariate models) of the deprivation amplification or equivalisation theories for low self-esteem. They are described by Equation 3-17 and Equation 3-18 respectively.

Equation 3-17 – Adjusted neighbourhood deprivation model

$$\log(p_{ij}/(1-pij) = \beta_0 + \beta_1 Age_{ij} \ldots + \beta_{12} Urban + \beta_{13} NDep_{ij} + \mu_j$$

Where the model is the same as M6, except that a coefficient is added for neighbourhood deprivation (β13NDepij)

Equation 3-18 – Adjusted social fragmentation model

$$\log(p_{ij}/(1-pij) = \beta_0 + \beta_1 Age_{ij} \ldots + \beta_{12} Urban + \beta_{13} SocFrag_{ij} + \mu_j$$

Where the model is identical to M7a, except that social fragmentation (β13SocFragij) is substituted for neighbourhood deprivation

Table 3-5 – Sequence of models establishing associations between neighbourhood type (neighbourhood deprivation and social fragmentation) and low self-esteem.

Model parameters	M1x Unadjusted	M2 Neighbourhood deprivation	M3 Social fragmentation
Individual and family factors	Previously estimated	x	x
Neighbourhood deprivation	M1a	x	
Social fragmentation	M1b		x
Urban/rural	M1c	x	x
Region	M1d	x	x
Between-neighbourhood variation			
Between-individual variation	x	x	X

3.5.3.1 Analysis strategy for change in self-esteem

The analysis strategy for change in self-esteem is similar to that for low self-esteem. However, some key differences in models must be noted. Firstly, as discussed in section 3.5.2, change in self-esteem as operationalised here, is a nominal category. Therefore, the basic model used was a multinomial logistic as opposed to a binary logistic regression. Multinomial logistic regression builds on the principles developed above for binary logistic regression. Thus, multinomial logistic regression models estimate logits (log odds) simultaneously for all comparisons among the dependent categories (Long and Freese, 2003). The multinomial models used for this thesis to examine change in self-esteem: comparing those who maintained low (coded 1), reported an improvement (lo-hi, coded 2), and reported a decline (hi-lo, coded 3), against those who maintained high self-esteem over two consecutive time points (the reference group, coded 0). The multinomial model is a multi-equation model, but all the equations are estimated simultaneously. The basic equations are presented below in Equation 3-19.

Equation 3-19: Multinomial model for self-esteem change

$$\log odds(m|b(x)) = \frac{\Pr(y = m|x)}{\Pr(y = b|x)} = x\beta_{m|b} \quad for\ m = 1\ to\ J$$

Where J is the number of outcomes (4 in this case), and where *m* is each outcome (maintain low self-esteem,improvement, decline) and *b* is the reference category (maintaining high self-esteem). χ is a vector of covariates, and $\chi\beta_{m|b}$ is a vector of logits for each independent covariate calculated for each outcome calculated simultaneously (Long and Freese, 2003).

The coefficients in the model are exponentiated as in the binary logistic regression models to produce relative risk ratios as discussed above. 95% confidence intervals and p values are also produced and presented (Long and Freese, 2003). The magnitude of the relative risk ratios of each of the three outcomes (maintain low,improvement and decline) are numerically equivalent to odds ratios as each of the outcomes are rare (each representing less than 5% of the sample).

The multinomial models employed here examine the transitions in self-esteem that individuals follow from one wave in the survey to the next. In the NLSCY this is two years, and in the BYP these transitions have also been constructed to be equivalent. Each respondent in the NLSCY therefore follow a maximum of two transitions, one from 11-13 and a second from 13-15. In the BYP a respondent may have three transitions from 11-13, 12-14, 13-15. These transitions are clearly likely to be clustered within individuals and so, as with the binary logistic regression models, the independence assumption of the models is violated. In this case, standard errors were adjusted for between-individual variation using techniques developed by Rogers (1993). These techniques treat clustering as a statistical property to be controlled for, and do not explicitly model the between-individual variation as in the binary logistic models described above. The 'vce (cluster)' option in Stata specifies in the model that the observations are independent across clusters (i.e. between neighbourhoods OR between individuals), but they are not independent within those clusters, by default it then calculates robust standard errors, also known as Huber, White, or sandwich standard errors for the observations within the clusters (Long and Freese, 2003). These methods adjust for the clustering of a single higher

level, but it is not possible to specify clustering for two separate data structures or more complex higher level dependence using these procedures in Stata (StataCorp, 2001). However, cluster-adjusted models are useful because they are statistically and computationally efficient *if* there is only one level of clustering in the data. As the null three level models for low self-esteem demonstrated that there was little to no statistically significant between-neighbourhood variation in low self-esteem, this assumption was considered to be reasonable for the change in self-esteem outcome.

As with the binary logistic regression models, continuous or categorical independent covariates can be included in multinomial models and associated with changes in self-esteem. The analytic sequence of these models is simpler, owing to the number of parameters produced by the multinomial logistic regression models, and interrogates the research question directly. Therefore, as Table 3-6 shows, these models test the bivariate and fully adjusted associations between change in self-esteem and the two neighbourhood type variables. M1 describes the unadjusted relative risk ratios for the independent variables including neighbourhood deprivation and social fragmentation with change in self-esteem. Taking neighbourhood deprivation as an example, this is represented in Equation 3-20.

Equation 3-20 – M1: Unadjusted multinomial model of neighbourhood deprivation and change in self-esteem.

$$\log odds_{ML|MH}(x_i) = \beta_{0,ML|MH} + \beta_{1,ML|MH} NDep$$
$$\log odds_{PT|MH}(x_i) = \beta_{0,PT|MH} + \beta_{1,PTMH} NDep$$
$$\log odds_{NT|MH}(x_i) = \beta_{0,NT|MH} + \beta_{1,NT|MH} NDep$$

Where log*odds*$_{ML|MH}$ is the logit of maintaining low self-esteem relative to maintaining high self-esteem given the set of covariates in the model (χ_i), as a function of the intercept for that outcome ($\beta_{0,ML|MH}$) and levels of neighbourhood deprivation ($\beta_{1,ML|MH}$*NDep*). The other two equations represent the same model but for theimprovement (PT) and decline (NT) outcomes.

Maintaining high self-esteem (MH) is the reference category for all three equations, which are estimated simultaneously across the whole sample to avoid the redundancy associated with estimation of three binary logistic regressions of the same outcome (Long and Freese, 2003).

M2, M2a and M2b in Table 3-6 represent the fully adjusted relative risk ratios for the association between change in self-esteem and neighbourhood deprivation over the whole sample, boys and girls. These models are analogous to the fully adjusted binary logistic models presented above. The model for the overall sample (M2) is represented by Equation 3-21.

Equation 3-21 – M2: Fully adjusted multinomial model of neighbourhood deprivation and change in self-esteem

$$\log odds_{ML|MH}(x_i) = \beta_{0,ML|MH} + \beta_{1,ML|MH} Age... + \beta_{12,ML|MH} Urban + \beta_{13,ML|MH} NDep$$
$$\log odds_{PT|MH}(x_i) = \beta_{0,PT|MH} + \beta_{1,PT|MH} Age... + \beta_{12,PT|MH} Urban + \beta_{13,PT|MH} NDep$$
$$\log odds_{NT|MH}(x_i) = \beta_{0,NT|MH} + \beta_{1,NT|MH} Age... + \beta_{12,NT|MH} Urban + \beta_{13,NT|MH} NDep$$

Where the majority of terms are identical to those described for Equation 3-20 directly above. These equations adjust for all individual, family characteristics and urban/rural and region of residence as indicated by the coefficients $\beta_1, \beta_2 \ldots \beta_{14}$ in each equation (Long and Freese, 2003).

Table 3-6 –Sequence of models of association between neighbourhood type and change in self-esteem..

		Neighbourhood deprivation models			Social fragmentation models		
Covariates at t1	**M1: Unadj**	**M2: Adjusted**	**M2boys: Adjusted**	**M2girls: Adjusted**	**M3: Adjusted**	**M3boys: Adjusted**	**M3girls: Adjusted**
Age	M1a	x	x	x	x	x	x
Sex	M1b	x	x	x	x	x	x
Ethnicity	M1c	x	x	x	x	x	x
Year of measurement	M1e	x	x	x	x	x	x
Perceptions of parents	M1f	x	x	x	x	x	x
Perceptions of friends	M1g	x	x	x	x	x	x
Family functioning	M1h	x	x	x	x	x	x
Family structure	M1i	x	x	x	x	x	x
Household income	M1j	x	x	x	x	x	x
Maternal education	M1k	x	x	x	x	x	x
Maternal depression	M1l	x	x	x	x	x	x
Neighbourhood deprivation	M1m	x	x	x			
Social fragmentation	M1n				x	x	x
Urban/rural	M1o	x	x	x	x	x	x
Region	M1p	x	x	x	x	x	X

Change in self-esteem is from t1-t2. Reference category is 'maintaining high self-esteem' in all models. Each model presents three sets of relative risk ratios corresponding to associations with maintain low,improvement and decline

3.5.3.2 Summary

This section has outlined the general methodologies used in this thesis and described how they are used to address the central research question of whether there is support for neighbourhood deprivation equalisation or amplification in adolescent self-esteem. However, as the literature review highlighted, a robust examination of the importance of the roles of these theories would consider whether they were equally salient across key subgroups of adolescents. The next section addresses the method which is used for both the bivariate and multinomial logistic regression models to investigate this question.

3.5.4 Testing whether relationships between neighbourhood deprivation and self-esteem over all Canadian and UK adolescents can be generalised across all sub-groups

3.5.4.1 A priori sub-group interactions

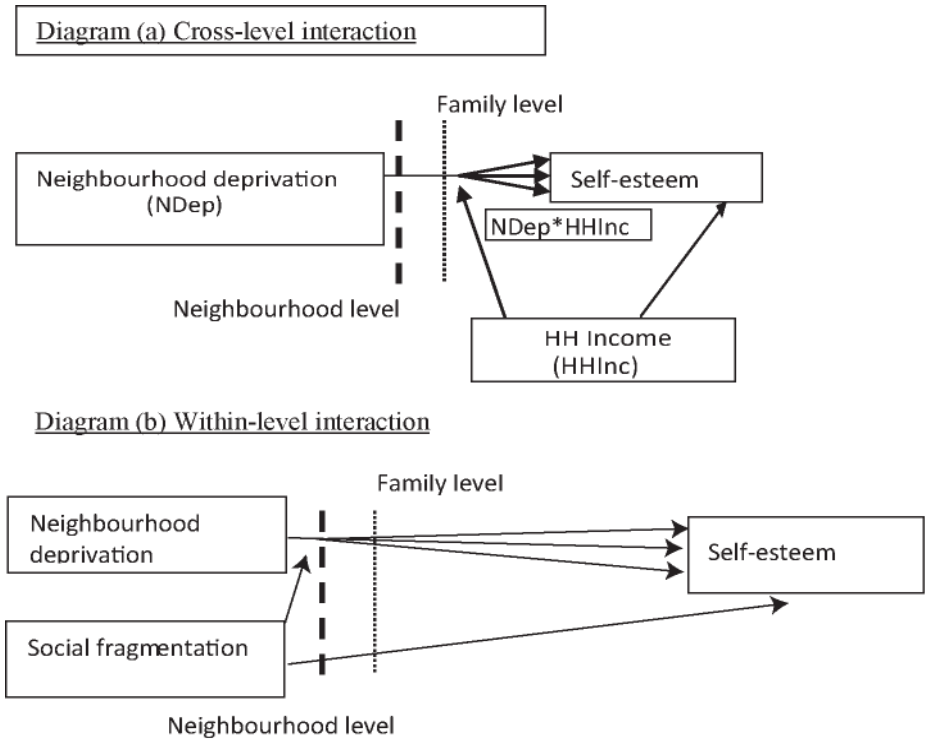
The first step for examining whether self-esteem varied between sub-groups was to identify, in the literature, *a priori* pathways which would explain *why* the relationship between neighbourhood deprivation might *not* be consistent for particular subgroups defined by the independent covariates in the model. These arguments are presented in chapter two in section 2.5 above. Specifically, associations between self-esteem and age, sex, ethnicity, friends and parents, family functioning, family structure, household socio-economic status, maternal depression, maternal education and urban/rural residence might be expected to vary with levels of neighbourhood deprivation. The review also identified that associations between self-esteem and the family and household variables identified above would also be expected to vary with adolescent sex and age in this period. The review therefore effectively identified forty four potential a priori interactions (see Table 3-7).

Table 3-7: A priori interactions identified by review in chapter two. Crosses indicate where interactions were tested in the analysis of low self-esteem for the NLSCY and BYP.

Sub-group	Age	Sex	Neighbourhood deprivation	Social fragmentation
Age	…	X	X	X
Sex	X	…	X	X
Ethnicity	X	X	X	X
Parenting	X	X	X	X
Friends	X	X	X	X
Family functioning	X	X	X	X
Family structure	X	X	X	X
Household SES	X	X	X	X
Maternal education	X	X	X	X
Maternal depression	X	X	X	X
Urban/Rural status	X	X	X	X
Province (NSLCY) / region (BYP)	n/f	n/f	X	X

Within this a priori framework, two broad types of theoretical interaction are operating, cross-level interactions, and within-level interactions. These are illustrated in the diagrams below, drawing on conceptual diagrams adapted from Ivory (2009). In the cross-level interaction (diagram a in Figure 3-4), neighbourhood deprivation is conceptualised to interact with family income in its relationship with self-esteem. That could be conceptualised as a moderating effect whereby levels of neighbourhood deprivation influence the relationship between family income and self-esteem. Thus the same family income may be perceived as high in poor neighbourhoods (and protective of self-esteem) but low in rich neighbourhoods (and therefore detrimental to self-esteem). Diagram b in the figure illustrates a within-level interaction, or more specifically, a within-neighbourhood interaction and shows how neighbourhood deprivation might impact differentially for different levels of social fragmentation (as discussed in section 2.5.4). It is important to note, to use epidemiological terminology, the main effects of the interaction terms (for example household income and sex) must remain in the model, and that the interaction must be interpreted *as a system* with both constituent main effects (discussed in more depth below).

Figure 3-4: Cross-level interaction and within-level interaction



3.5.4.2 Statistical interactions

The large number of interactions identified by the review highlights a common problem experienced in the interface between theoretical and empirical work. While there are very plausible theoretical and empirical reasons for all of the forty four potential interactions, the *multiple comparison problem* (Oxman and Guyatt, 1992) means that at least two of these interactions would be expected to be statistically significant at the 95% level simply by chance. There is no simple solution to this problem, but it is recommended that sub-group analyses be conducted when there is a good a priori rationale for conducting them, as presented in chapter two. A second safeguard employed here, was to test the interactions in two slightly separate situations – firstly in the context of the fully adjusted model with all covariates but no other interactions (as in models M1a, M1b…M1i in Table 3-8). Those interactions which were significant on this basis were then tested in a single model, again adjusting for all direct

relationships. As this was conditional on the interactions which were significant in the first test, this is not shown here directly.

The same sequence of interactions was fitted for both low self-esteem and change in self-esteem in both datasets. The sequence was also tested separately for both neighbourhood deprivation and social fragmentation in both cases. It is important to note that the rarity of the change outcomes meant that some interactions could not be empirically tested for the change outcomes. The threshold for this was 5 *expected* observations as this determines whether a chi-squared test of significance can be conducted (Cochran, 1952 in Greenwood and Nikulin, 1996).

Table 3-8 – Sequence of models testing two-way interactions between age, sex and neighbourhood deprivation and covariates of low self-esteem.

Model parameters	**Interactions between age, sex, neighbourhood deprivation and covariates**		
	M1 - Age*'x'	**M2: Sex*' x'**	**M3: Neighbourhood deprivation*'x'**
'Main effect' terms			
All individual and family factors	X	X	X
Neighbourhood deprivation	X	X	X
Social fragmentation	-	-	M3k only
Urban/rural and region	X	X	X
Between-individual variation	X	X	X
Interaction terms			
Age	…	M2a	M3a
Sex	M1a	…	M3b
Ethnicity	M1b	M2b	M3c
Parenting	M1c	M2c	M3d
Friends	M1d	M2d	M3e
Family functioning	M1e	M2e	M3f
Household income	M1f	M2f	M3g
Maternal education	M1g	M2g	M3h
Maternal depression	M1h	M2h	M3i
Urban/Rural	M1i	M2i	M3j
Social Fragmentation	-	-	M3k

Key: X = parameter or set of parameters included in all models in column. – = not included in any model in column. … = not applicable (i.e. sex*sex).

Interactions must be interpreted as a system (Rabe-Hesketh and Skrondal., 2008). In the case of an interaction between sex and neighbourhood deprivation in their associations with low

self-esteem (see Equation 3-22). On inclusion of the product term (ß$_3$x*x), sex will be interpreted as the association of sex with self-esteem in the most affluent neighbourhoods (the reference category of neighbourhood deprivation) while the association neighbourhood deprivation is interpreted as that relationship for boys (the reference category of sex in these models). The product term is interpreted as the association of neighbourhood deprivation with the self-esteem of girls relative to the self-esteem of boys in affluent neighbourhoods.

Equation 3-22 –Adjusted model of neighbourhood deprivation and low self-esteem with an interaction between sex and neighbourhood deprivation (corresponding to M3b in Table 3-8 above)

$$\log(p_{ij}/(1-pij) = \beta_0 + \beta_1 Age_{ij} + \beta_1 Sex_j \ldots + \beta_{13} NDep_{ij} + \beta_{14} NDep_{ij} * Sex_j + \mu_j$$

Where the log odds of low self-esteem ($\log(p_{ij}/(1-pij)$) are a function of the overall intercept (β_0), all independent variables ($\beta_1 Age_{ij} + \beta_1 Sex_j \ldots + \beta_{13} NDep_{ij}$), the interaction resulting from the product of sex and neighbourhood deprivation ($\beta_{14} NDep_{ij} * Sex_j$), and then between-individual random intercept around the overall intercept (μ_j).

3.5.4.3 Stratification of samples by sex

Terms at all levels might interact with sex in meaningful ways. As discussed in the literature review, the salience of sex for an individual's relationship with their neighbourhood environment and their self-esteem, it was anticipated that models may have to be stratified by sex. This anticipated that there would be multiple interactions between sex and the other covariates in the model which, if interpreted in one model of the overall sample, would present problems for interpretation. The final step taken in the analyses of both low self-esteem and change in self-esteem was to stratify models by sex. Where interactions which

weren't based around sex were also identified, these were retained in the sex-stratified models. This provides a final indication of the magnitude and strength of the interaction.

3.5.5 Examination of associations between residential and socio-geographic mobility with adolescent self-esteem

The next section describes how the relationship between teenage self-esteem and neighbourhood deprivation might evolve over time as a function of residential and socio-geographic mobility. Methodologically this uses both binary and multinomial logistic regression models. The first set of models considers residential and socio-geographic mobility as a risk to self-esteem. The second set of models considers how the self-esteem of adolescents and the health and social circumstances of their family might influence their residential and socio-geographic transitions.

3.5.5.1 Socio-geographic mobility processes

Two sequences of models are illustrated in Table 3-9 below. The first examines the role of a change in the deprivation of the neighbourhood following a residential move. The second examines the role of a change in social fragmentation of the neighbourhood following a residential move.

Each set of models is fitted for low self-esteem at time 2, and for change in self-esteem from time 1 to time 2. In effect, the analysis considers how change in neighbourhood of residence is associated first with self-esteem with no adjustment for baseline self-esteem, while the second captures how this relationship operates when baseline self-esteem is controlled.

Each set of models consider the unadjusted and adjusted models, where the adjustment takes account of individual, family, urban/rural and regional residence at time 1.

3.5.5.2 Analysis of risks self-esteem associated with residential and socio-geographic mobility

In these analyses the exposure of interest was socio-geographic mobility between t1 and t2. Adjustment was made for all individual and family factors at t1 following the analytic strategy employed by Curtis et al. (2009). The models used to assess these relationships are described in brackets.

3.5.5.3 Health Selection

This analysis simply reverses the conceptualisation of the relationship between self-esteem and residential and socio-geographic mobility and replicates analyses described in chapter two and undertaken by South and Crowder (1998). Unadjusted and adjusted relationships are tested with respect to socio-geographic mobility using multinomial logistic regression models with neighbourhood deprivation (M2 and M2a) and social fragmentation mobility as outcomes (M3 and M3a). These models examine the covariates associated with moves to more deprived, similarly deprived, or less deprived neighbourhoods by families of early adolescents.

Table 3-9 - Analytic sequence for examining associations between socio-geographic mobility and self-esteem

Outcomes	Low self-esteem at t2		Change in self-esteem from t1 to t2	
Covariates	M1: Unadjusted	M2: Adjusted	M3:Unadjusted	M3: Adjusted
Individual and family factors (t1)		X		X
Deprivation mobility (t1-t2)	X	X	X	X
Fragmentation mobility (t1-t2)	X	X	X	X

Table 3-10 - Analytic sequence for examining health selection

	Deprivation mobility		Fragmentation mobility	
Covariates at t1	M1:Unadjusted	M1a: Adjusted	M2: Unadjusted	M2a: Adjusted
Individual and family factors		X		X
Low self-esteem	X	X	X	X

3.6 Chapter Summary

This chapter has set out the research questions which arose during the literature review, and has described the methodological approaches adopted in this study to investigate these questions. The following empirical chapters can be read as an analysis of three different perspectives on associations between neighbourhood characteristics and variation in self-esteem, bringing together analysis of contextual variation in self-esteem, prospective analysis of neighbourhood on changes in self-esteem, and an analysis considering the residential and socio-geographic mobility of individuals.

The following four chapters set out the findings from each of these sets of analyses. Specifically, chapter four discusses the derivation of samples and describes these using the methods discussed in section 3.5.1 above. Chapter five analyses the odds of reporting low self-esteem by levels of neighbourhood deprivation and social fragmentation to test the competing theories of equalisation and deprivation amplification for explaining these relationships. The chapter then goes on to test sub-group interactions, and to stratify by sex to test whether these findings are generalisable across sub-groups within the UK and Canadian populations of adolescents. Chapter six replicates this analysis, but concentrates on change in self-esteem. Chapter seven analyses both outcomes but considers how processes of residential mobility, socio-geographic mobility and health selection may be related to self-esteem.

CHAPTER 4 – DESCRIPTION OF CANADIAN AND UK ADOLESCENTS

4.1 Introduction

This chapter considers how the samples used in this analysis relate to the wider NSLCY and BYP datasets. The NLSCY and BYP are designed to be representative of contemporary Canadian and UK adolescents. Therefore, the degree to which the samples differ from the full datasets determines how far they can be understood to represent the underlying population. In addition to considering the issue of generalisability, this chapter also provides a comprehensive description of all the variables in the sample by age and sex.

The chapter also considers key features of relationships between individual and family variables and neighbourhood characteristics to determine the crude bivariate relationships within the dataset. This determines whether individual and family variables are simply explanatory variables for self-esteem, or whether they might also confound the neighbourhood context and self-esteem relationship.

Finally, the chapter presents null models which determine the relative importance of between-neighbourhood and between-individual variation in the NLSCY and BYP. This informs the decisions made about modelling strategies for chapters 5-7.

4.2 NLSCY sample

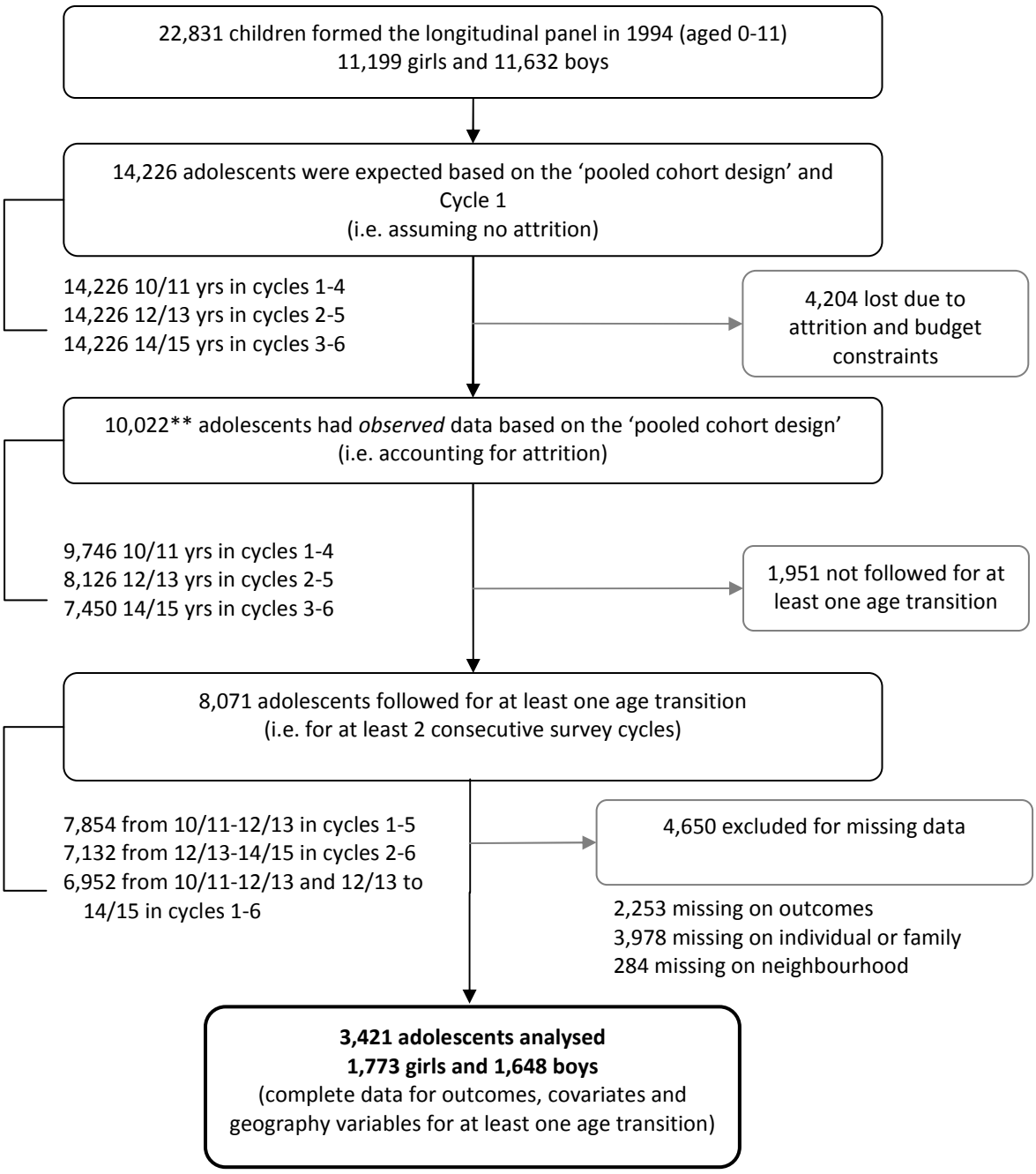
4.2.1 NLSCY sample derivation

The extraction of the NLSCY sample is illustrated below in Figure 4-1. When the survey was started in 1994, 22,831 children aged 0-11 were sampled. Of these children, under the pooled cohort design discussed above (see section 3.3.2), 14,226 might theoretically be sampled at ages 10/11, 12/13 and 14/15 and so be eligible for extraction. However, in 1996, 5,934 adolescents were dropped from the longitudinal panel due to constraints on the NLSCY budget. Among households containing greater than two adolescents, two adolescents were selected at random from the household and retained in the survey while the other adolescents were dropped. This amounts to a 26 % loss in the total size of the longitudinal panel. Data are not available to trace adolescents lost due to budget cuts and those lost to normal study attrition. 10,022 is the maximum number of children that could have been analysed longitudinally (i.e. after accounting for NLSCY attrition).

The diagram goes on to show that the stipulation that respondents must have one transition (i.e. be present at least two consecutive cycles) effectively excluded 1,951 adolescents. This left 8,071 adolescents who were sampled for one transition.

The final aspect of inclusion involved complete data on one transition. 4,650 respondents were excluded on this basis. This represents a large proportion of the sample, but is not unexpected as respondents (and interviewers, and subsequently, survey coders) must respond without error, accurately on a large number of questions, for at least two cycles. This unfortunately reduces the potential statistical power of analyses and increases the likelihood of systematic bias being introduced. However, it is argued that in order to maintain consistency in the analysis sample throughout the thesis, this step was necessary.

Figure 4-1: Pooled cohort sample construction of 10-15 year olds in cycles 1-6 of the National Longitudinal Survey of Children and Youth.



4.2.2 NLSCY non-response

The final sample of 3,421 represents around a third of the potential sample of 10,022

respondents for whom weights have been calculated (the longitudinal weighting schemes were adjusted to take account of the budgetary change and exclusion at cycle 2). Therefore, there is a possibility that the extraction process introduced considerable bias to the NLSCY sample and its ability to represent the 1994 population of Canadian children.

Table 4-1 presents descriptive data for those included in the sample (N=3421) while Table 4-2 presents data for those who were excluded from the analysis (N=6601). Similarities and differences between these two tables are summarized below. Proportions and means are judged to be statistically different when the associated weighted 95% confidence intervals do not overlap.

Demographic differences observable in the proportions of the samples by age and year are due to the inclusion criterion which specifies that respondents must belong to one of four cohorts who were aged 10/11 in 1994, 1996, 1998 and 2000. There are no observable systematic differences by visible minority status.

These demographic differences do not appear to have introduced substantial systematic bias to the responses from the adolescents themselves in terms of the outcomes. Age and sex patterns are similar for respondents and non-respondents across proportions of low self-esteem and change in self-esteem.

When considering perceptions of parental nurturance and friendship quality, both initial levels and patterns of change by age and sex are similar. Perceptions of parental rejection are slightly, but not statistically significantly higher among those who were excluded from the analysis, but trends by age and sex in this covariate are the same.

There are also few systematic differences in terms of family environment. The data suggest that fewer excluded adolescents live in intact families, and by corollary, more live in single and

reconstituted families, but these differences are not statistically significant. There are no differences in family functioning, or in trends in functioning over age. There seems to be a statistically significant difference between the proportions of the respondents who live in a 'High income household' (greater than 140% of median national income for a given year) at ages 14/15. While only 16% of non-respondents live in such households at age 15, 23% of responding households do. This difference is not present at earlier ages. There are no statistically significant differences in maternal education or depression.

Geographically, those respondents in the analysis tend to live in similar types of areas to those who were excluded. There are no differences by urban/rural status, province, neighbourhood deprivation or neighbourhood social fragmentation. In terms of residential mobility there are no differences, either in residential mobility, or deprivation or social fragmentation mobility.

Overall, respondents in the analysis sample are not substantially different, in terms of their distribution on the variables used in this analysis, from those who were excluded.

4.2.3 Description of NLSCY sample

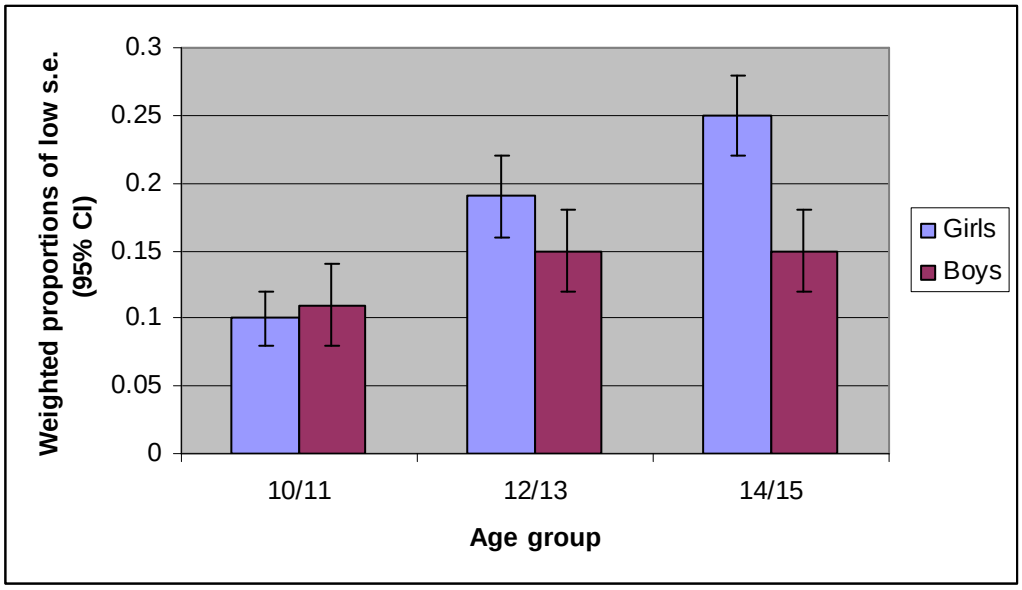
The majority of the literature suggests that low self-esteem is likely to be more common in girls than boys and that this gap becomes more pronounced over the course of early adolescence. The descriptive data for the NLCY replicates this commonly observed pattern.

Figure 4-2 shows that, overall, girls report lower self-esteem than boys. It also indicates that this pattern appears to widen with the increasing age of the sample, indicative of an age by sex interactive effect.

Similar age by sex interactions are observed when considering the longitudinal patterns of change in self-esteem. While there are no significant sex differences in persistent high self-esteem from the age periods 10/11-12/13, proportionally fewer girls report this

outcome than boys from 12/13 to 14/15. These differences are not statistically significant for the other self-esteem transitions.

Figure 4-2: Weighted proportions of low self-esteem (95% confidence intervals in brackets) by age and sex (NLSCY, N=3421)



In terms of visible ethnic minority status, the most common ancestry is European (68% of girls, 65% of boys). A minority report 'Canadian' ancestry (18% of girls and 19% of boys). 10% of girls and 13% of boys are from First Nation ancestry and only a small minority report 'other ancestry' (5% of girls and 3% of boys) relating to visible minorities from Asia and Black groups. These findings, although counter-intuitive in terms of the Canadian ancestry, are expected and consistent with other studies which have utilised this survey and coded the variable in a similar way (Georgiades et al., 2007).

The sample is broadly equally distributed by year of entry, although there are proportionally more boys and girls from the initial survey year in 1994.

There are interesting trends with increasing age in perceptions of parental nurturance. For both boys and girls, the relationship appears curvilinear, with lower levels at ages 10/11 and

14/15 and the highest levels at ages 12/13. These differences are statistically significant for girls and boys. A different trend is noticeable for parental rejection. For both boys and girls a statistically significant increase is observed. In terms of friendships, mean levels increase with age for both boys and girls.

There is no observable trend with age or by sex for family functioning, family structure or depression. Interestingly, slightly more adolescents are exposed to family level HH low income at age 14/15 (21% of girls and 19% of boys) than at age 10/11 (17% of girls and 14% of boys).

The sample is predominantly urban (77% of girls live in urban areas). 65% of girls in the sample live in the provinces of Ontario and Quebec. A further 19% of girls live in one of the Prairie Provinces (Manitoba, Saskatchewan and Alberta), 11% live in British Columbia, and 7% live in one of the Maritime Provinces (New Brunswick, Prince Edward Island, Nova Scotia and Newfoundland and Labrador). The three Territories (Yukon, Northwest Territory and Nunavut) were excluded by the original NLSCY design and so are not represented in this analysis.

In terms of neighbourhood characteristics, the sample is distributed rather differently by neighbourhood deprivation and social fragmentation. Similar proportions of the sample are resident in all the neighbourhood deprivation quintiles. This indicates that the sample is broadly representative of the wider Canadian situation for neighbourhood deprivation as the quintiles are calculated relative to all dissemination areas in Canada. In contrast, significantly higher proportions of the sample live in areas which are observed to be socially cohesive (26% of boys) than socially deprived (13% of boys). This difference is statistically significant. This means that the sample disproportionally represents more cohesive communities at the expense of more socially fragmented communities.

There is a considerable degree of residential mobility between any two cycles (18% of girls, 19% of boys). This rate is high but consistent with annual residential mobility rates

reported in Canada in previous work for this age group (DeWit et al., 1998). In terms of deprivation mobility, similar proportions (approximately 5-8%) move to neighbourhoods of similar deprivation, neighbourhoods which are more deprived or neighbourhoods which are less deprived. The same was true for fragmentation mobility.

Table 4-1: Population weighted means, proportions and 95% confidence intervals of outcomes and covariates by sex and age for 10-15 year olds in cycles 1-6 of the NLSCY that have been included in the analysis sample. N = 3421.

Table 4-1	Girls (N =1773, 5192 observations)			Boys (N =1648, 4850 observations)		
Variables	10/11 yrs	12/13 yrs	14/15 yrs	10/11 yrs	12/13 yrs	14/15 yrs
Self-Esteem						
Low Self-Esteem	0.10 [0.08,0.12]	0.19 [0.16,0.22]	0.25 [0.22,0.28]	0.11 [0.09,0.14]	0.15 [0.13,0.18]	0.15 [0.12,0.18]
High Self-Esteem	0.90 [0.88,0.92]	0.81 [0.78,0.84]	0.75 [0.72,0.78]	0.89 [0.86,0.91]	0.85 [0.82,0.87]	0.85 [0.82,0.88]
Self-Esteem change						
Maintain High	…	0.74 [0.71,0.78]	0.67 [0.63,0.70]	…	0.78 [0.75,0.81]	0.76 [0.73,0.79]
Improvement	…	0.15 [0.13,0.18]	0.14 [0.11,0.16]	…	0.11 [0.08,0.13]	0.09 [0.06,0.11]
Decline	…	0.06 [0.04,0.08]	0.08 [0.07,0.10]	…	0.07 [0.05,0.09]	0.09 [0.07,0.11]
Maintain Low	…	0.04 [0.03,0.05]	0.11 [0.08,0.13]	…	0.05 [0.03,0.06]	0.07 [0.05,0.09]
Ethnicity						
Canadian	0.18 [0.15,0.20]	0.17 [0.15,0.20]	0.17 [0.14,0.20]	0.19 [0.17,0.22]	0.19 [0.16,0.22]	0.19 [0.16,0.22]
European	0.68 [0.64,0.71]	0.68 [0.64,0.71]	0.68 [0.64,0.71]	0.65 [0.61,0.69]	0.66 [0.63,0.70]	0.65 [0.62,0.69]
First Nations	0.10 [0.07,0.12]	0.10 [0.08,0.13]	0.10 [0.08,0.13]	0.13 [0.10,0.15]	0.12 [0.09,0.14]	0.12 [0.10,0.15]
Other Visible	0.05 [0.03,0.07]	0.05 [0.03,0.07]	0.05 [0.03,0.07]	0.03 [0.02,0.04]	0.03 [0.02,0.04]	0.03 [0.02,0.04]
Year						
1994	0.32 [0.29,0.36]	…	…	0.32 [0.29,0.36]	…	…
1996	0.24 [0.21,0.28]	0.32 [0.28,0.35]	…	0.29 [0.26,0.33]	0.32 [0.29,0.36]	…
1998	0.23 [0.20,0.26]	0.25 [0.21,0.28]	0.32 [0.28,0.35]	0.22 [0.19,0.25]	0.29 [0.26,0.33]	0.32 [0.29,0.36]
2000	0.20 [0.17,0.24]	0.23 [0.20,0.27]	0.24 [0.21,0.28]	0.16 [0.14,0.19]	0.22 [0.19,0.25]	0.29 [0.26,0.33]
2002	…	0.20 [0.17,0.24]	0.24 [0.20,0.27]	…	0.16[0.14,0.19]	0.22 [0.19,0.25]
2004	….	….	0.20 [0.17,0.24]	…	…	0.16 [0.14,0.19]
Parental Nurture	15.22 [14.93,15.50]	15.97 [15.72,16.21]	15.10 [14.77,15.43]	14.50 [14.18,14.82]	15.44 [15.16,15.73]	14.56 [14.21,14.91]
Parental Rejection	5.73 [5.38,6.07]	7.65 [7.37,7.93]	8.74 [8.37,9.10]	6.66 [6.33,6.99]	8.51 [8.20,8.82]	9.48 [9.10,9.86]
Friendship Quality	13.07 [12.85,13.29]	13.55 [13.37,13.74]	13.56 [13.36,13.76]	12.26 [12.02,12.50]	12.66 [12.45,12.87]	13.33 [13.12,13.54]
Family Functioning	7.69 [7.58,7.80]	7.65 [7.54,7.76]	7.50 [7.39,7.62]	7.77 [7.68,7.87]	7.62 [7.52,7.71]	7.49 [7.37,7.60]

Table 4-1	Girls (N =1773, 5192 observations)			Boys (N =1648, 4850 observations)		
Variables	10/11 yrs	12/13 yrs	14/15 yrs	10/11 yrs	12/13 yrs	14/15 yrs
Family Structure						
Intact	0.75 [0.72,0.79]	0.74 [0.70,0.77]	0.71 [0.67,0.74]	0.76 [0.73,0.79]	0.74 [0.71,0.78]	0.71 [0.68,0.75]
Reconstituted	0.09 [0.07,0.11]	0.09 [0.07,0.12]	0.11 [0.08,0.13]	0.11 [0.08,0.13]	0.12 [0.10,0.15]	0.12 [0.09,0.14]
Single Parent	0.15 [0.12,0.19]	0.17 [0.14,0.20]	0.18 [0.15,0.22]	0.13 [0.11,0.16]	0.14 [0.11,0.16]	0.17 [0.14,0.20]
Household income						
Average	0.53 [0.49,0.57]	0.52 [0.48,0.56]	0.56 [0.52,0.60]	0.49 [0.45,0.53]	0.49 [0.45,0.53]	0.56 [0.52,0.60]
High	0.30 [0.27,0.34]	0.32 [0.29,0.36]	0.23 [0.19,0.26]	0.37 [0.33,0.41]	0.36 [0.32,0.40]	0.25 [0.21,0.28]
Low	0.17 [0.14,0.20]	0.16 [0.13,0.19]	0.21 [0.17,0.24]	0.14 [0.12,0.17]	0.15 [0.12,0.18]	0.19 [0.16,0.22]
Maternal Education						
< High School	0.21 [0.18,0.25]	0.19 [0.16,0.21]	0.18 [0.15,0.21]	0.21 [0.18,0.24]	0.20 [0.16,0.23]	0.20 [0.17,0.23]
High School	0.63 [0.59,0.67]	0.65 [0.61,0.68]	0.64 [0.60,0.68]	0.61 [0.57,0.65]	0.61 [0.57,0.65]	0.59 [0.55,0.63]
Diploma or Degree	0.16 [0.13,0.18]	0.17 [0.14,0.19]	0.18 [0.15,0.21]	0.18 [0.15,0.21]	0.19 [0.16,0.22]	0.21 [0.17,0.24]
Maternal Depression						
Not depressed	0.82 [0.79,0.86]	0.83 [0.80,0.86]	0.84 [0.81,0.88]	0.87 [0.84,0.89]	0.87 [0.84,0.90]	0.83 [0.80,0.87]
Depressed	0.18 [0.14,0.21]	0.17 [0.14,0.20]	0.16 [0.12,0.19]	0.13 [0.11,0.16]	0.13 [0.10,0.16]	0.17 [0.13,0.20]
Rurality						
Rural	0.23 [0.20,0.25]	0.24 [0.21,0.27]	0.25 [0.22,0.28]	0.24 [0.22,0.27]	0.27 [0.24,0.30]	0.27 [0.24,0.30]
Urban	0.77 [0.75,0.80]	0.76 [0.73,0.79]	0.75 [0.72,0.78]	0.76 [0.73,0.78]	0.73 [0.70,0.76]	0.73 [0.70,0.76]
Province						
Maritimes*	0.07 [0.06,0.08]	0.08 [0.07,0.09]	0.08 [0.07,0.09]	0.08 [0.06,0.09]	0.08 [0.07,0.09]	0.08 [0.07,0.09]
Quebec	0.27 [0.23,0.30]	0.26 [0.23,0.29]	0.26 [0.23,0.30]	0.26 [0.23,0.30]	0.25 [0.22,0.29]	0.25 [0.22,0.29]
Ontario	0.38 [0.34,0.42]	0.38 [0.34,0.42]	0.38 [0.34,0.42]	0.37 [0.33,0.41]	0.38 [0.34,0.41]	0.37 [0.33,0.41]
Manitoba	0.03 [0.02,0.04]	0.03 [0.03,0.04]	0.03 [0.02,0.04]	0.04 [0.03,0.05]	0.04 [0.03,0.05]	0.04 [0.03,0.05]
Saskatchewan	0.04 [0.03,0.04]	0.04 [0.03,0.04]	0.04 [0.03,0.04]	0.04 [0.03,0.05]	0.04 [0.03,0.05]	0.04 [0.03,0.05]
Alberta	0.10 [0.08,0.12]	0.11 [0.09,0.13]	0.11 [0.09,0.13]	0.10 [0.08,0.12]	0.10 [0.08,0.12]	0.10 [0.08,0.12]
British Columbia	0.11 [0.09,0.13]	0.11 [0.09,0.13]	0.11 [0.09,0.13]	0.11 [0.09,0.14]	0.11 [0.09,0.14]	0.11 [0.09,0.14]
Neighbourhood deprivation						
Least Deprived (Q1)	0.19 [0.15,0.22]	0.19 [0.16,0.22]	0.21 [0.17,0.24]	0.18 [0.15,0.22]	0.19 [0.16,0.22]	0.18 [0.15,0.21]

Table 4-1	Girls (N =1773, 5192 observations)			Boys (N =1648, 4850 observations)		
Variables	10/11 yrs	12/13 yrs	14/15 yrs	10/11 yrs	12/13 yrs	14/15 yrs
Q2	0.20 [0.17,0.23]	0.21 [0.18,0.25]	0.21 [0.18,0.24]	0.20 [0.17,0.23]	0.19 [0.16,0.22]	0.20 [0.17,0.23]
Average	0.23 [0.20,0.27]	0.22 [0.19,0.25]	0.21 [0.18,0.24]	0.22 [0.18,0.25]	0.21 [0.18,0.25]	0.21 [0.18,0.24]
Q4	0.20 [0.17,0.23]	0.20 [0.17,0.23]	0.21 [0.17,0.24]	0.21 [0.18,0.24]	0.20 [0.18,0.23]	0.22 [0.19,0.25]
Most Deprived (Q5)	0.18 [0.15,0.21]	0.18 [0.15,0.20]	0.17 [0.14,0.20]	0.19 [0.16,0.22]	0.20 [0.17,0.23]	0.19 [0.16,0.22]
Social fragmentation						
Least fragmented (Q1)	0.25 [0.21,0.29]	0.26 [0.22,0.29]	0.25 [0.21,0.28]	0.27 [0.22,0.29]	0.28 [0.24,0.31]	0.27 [0.23,0.30]
Q2	0.20 [0.17,0.23]	0.21 [0.18,0.24]	0.20 [0.17,0.23]	0.22 [0.19,0.25]	0.24 [0.21,0.27]	0.23 [0.20,0.26]
Average (Q3)	0.21 [0.18,0.24]	0.23 [0.19,0.26]	0.23 [0.20,0.27]	0.22 [0.18,0.25]	0.20 [0.17,0.23]	0.22 [0.19,0.26]
Q4	0.19 [0.16,0.21]	0.18 [0.16,0.21]	0.18 [0.15,0.21]	0.18 [0.15,0.21]	0.16 [0.14,0.19]	0.17 [0.14,0.19]
Most fragmented (Q5)	0.15 [0.12,0.18]	0.13 [0.10,0.15]	0.14 [0.11,0.17]	0.13 [0.10,0.15]	0.11 [0.09,0.14]	0.12 [0.09,0.14]
Moves Residence						
Non-Mover	…	0.82 [0.79,0.85]	0.82 [0.78,0.85]	…	0.81 [0.78,0.84]	0.84 [0.81,0.87]
Mover	…	0.18 [0.15,0.21]	0.18 [0.15,0.22]	…	0.19 [0.16,0.22]	0.16 [0.13,0.19]
Deprivation mobility						
Non-Mover	…	0.85 [0.82,0.88]	0.82 [0.78,0.85]	…	0.84 [0.81,0.87]	0.84 [0.81,0.87]
Moves to Same	…	0.04 [0.03,0.06]	0.06 [0.04,0.08]	…	0.05 [0.03,0.07]	0.06 [0.04,0.08]
Moves to Better	…	0.04 [0.03,0.05]	0.06 [0.03,0.08]	…	0.05 [0.03,0.07]	0.04 [0.03,0.06]
Moves to Worse	…	0.07 [0.05,0.09]	0.07 [0.05,0.09]	…	0.06 [0.04,0.08]	0.06 [0.03,0.08]
Fragmentation mobility						
Non-Mover	…	0.85 [0.82,0.88]	0.82 [0.78,0.85]	…	0.84 [0.81,0.87]	0.84 [0.81,0.87]
Moves to Same	…	0.03 [0.02,0.05]	0.06 [0.04,0.09]	…	0.05 [0.03,0.06]	0.04 [0.02,0.05]
Moves to Better	…	0.05 [0.03,0.06]	0.07 [0.05,0.09]	…	0.04 [0.03,0.05]	0.07 [0.05,0.09]
Moves to Worse	…	0.07 [0.05,0.09]	0.05 [0.04,0.07]	…	0.08 [0.05,0.10]	0.05 [0.03,0.07]

Table 4-2. Population weighted means, proportions and 95% confidence intervals of outcomes and covariates by age and sex for 10-15 year olds in cycles 1-6 of the NLSCY that have been excluded from the analysis sample. N = 6601.

Table 4-2	**Girls (N =3206, 7401 observations)**			**Boys (N =3395, 7879 observations)**		
Variables	**10/11 yrs**	**12/13 yrs**	**14/15 yrs**	**10/11 yrs**	**12/13 yrs**	**14/15 yrs**
Self-Esteem						
Low Self-Esteem	0.12 [0.09,0.14]	0.13 [0.11,0.16]	0.21 [0.18,0.24]	0.10 [0.08,0.12]	0.10 [0.08,0.12]	0.13 [0.10,0.15]
High Self-Esteem	0.88 [0.86,0.91]	0.87 [0.84,0.89]	0.79 [0.76,0.82]	0.90 [0.88,0.92]	0.90 [0.88,0.92]	0.87 [0.85,0.90]
Self-Esteem change						
Maintain High	…	0.79 [0.76,0.82]	0.72 [0.69,0.75]	…	0.82 [0.80,0.85]	0.81 [0.79,0.84]
Improvement	…	0.10 [0.08,0.12]	0.15 [0.12,0.17]	…	0.07 [0.05,0.09]	0.08 [0.06,0.11]
Decline	…	0.07 [0.05,0.09]	0.07 [0.05,0.09]	…	0.07 [0.05,0.09]	0.06 [0.04,0.07]
Maintain Low	…	0.04 [0.02,0.05]	0.07 [0.05,0.08]	…	0.03 [0.02,0.04]	0.04 [0.03,0.06]
Ethnicity						
Canadian	0.21 [0.18,0.23]	0.20 [0.18,0.23]	0.20 [0.17,0.23]	0.19 [0.17,0.21]	0.19 [0.16,0.21]	0.19 [0.17,0.21]
European	0.63 [0.60,0.67]	0.64 [0.60,0.67]	0.64 [0.60,0.67]	0.66 [0.63,0.69]	0.65 [0.62,0.69]	0.64 [0.61,0.68]
First Nations	0.11 [0.08,0.14]	0.11 [0.08,0.13]	0.11 [0.08,0.14]	0.11 [0.09,0.14]	0.12 [0.09,0.15]	0.12 [0.10,0.15]
Other Visible	0.05 [0.03,0.06]	0.05 [0.04,0.06]	0.05 [0.04,0.06]	0.04 [0.03,0.05]	0.04 [0.03,0.05]	0.04 [0.03,0.05]
Year						
1994	0.23 [0.20,0.25]	…	…	0.22 [0.19,0.24]	…	…
1996	0.21 [0.19,0.24]	0.21 [0.18,0.24]	…	0.25 [0.22,0.28]	0.20 [0.17,0.22]	…
1998	0.25 [0.22,0.28]	0.21 [0.19,0.24]	0.21 [0.18,0.23]	0.24 [0.21,0.27]	0.25 [0.22,0.28]	0.21 [0.18,0.23]
2000	0.31 [0.28,0.35]	0.25 [0.22,0.28]	0.21 [0.18,0.23]	0.29 [0.26,0.33]	0.24 [0.21,0.27]	0.24 [0.22,0.27]
2002	…	0.33 [0.29,0.36]	0.26 [0.23,0.29]	…	0.31 [0.28,0.35]	0.25 [0.21,0.28]
2004	…	…	0.33 [0.29,0.36]	…	…	0.30 [0.27,0.34]
Parental Nurture	15.44 [15,15.74]	15.67 [15.35,15.99]	14.68 [14.35,15.00]	15.10 [14.80,15.39]	15.50 [15.16,15.84]	14.55 [14.25,14.84]
Parental Rejection	6.36 [6.07,6.65]	7.87 [7.48,8.25]	9.08 [8.75,9.40]	6.76 [6.44,7.08]	8.56 [8.16,8.97]	9.62 [9.26,9.99]
Friendship Quality	12.86 [12.62,13.11]	13.55 [13.35,13.76]	13.58 [13.35,13.80]	12.72 [12.52,12.93]	12.94 [12.74,13.14]	13.11 [12.91,13.31]

Table 4-2	**Girls (N =3206, 7401 observations)**			**Boys (N =3395, 7879 observations)**		
Variables	**10/11 yrs**	**12/13 yrs**	**14/15 yrs**	**10/11 yrs**	**12/13 yrs**	**14/15 yrs**
Family Functioning	7.62 [7.52,7.71]	7.54 [7.45,7.64]	7.45 [7.37,7.54]	7.56 [7.47,7.66]	7.55 [7.46,7.65]	7.49 [7.38,7.59]
Family Structure						
Intact	0.71 [0.68,0.74]	0.68 [0.65,0.72]	0.65 [0.61,0.68]	0.72 [0.68,0.75]	0.68 [0.65,0.71]	0.66 [0.63,0.69]
Reconstituted	0.10 [0.08,0.12]	0.11 [0.09,0.13]	0.11 [0.10,0.13]	0.09 [0.08,0.11]	0.11 [0.09,0.13]	0.12 [0.10,0.14]
Single Parent	0.19 [0.16,0.22]	0.20 [0.17,0.23]	0.24 [0.21,0.27]	0.19 [0.16,0.22]	0.21 [0.18,0.24]	0.23 [0.20,0.26]
Household income						
Average	0.54 [0.50,0.57]	0.53 [0.50,0.57]	0.63 [0.59,0.66]	0.52 [0.49,0.55]	0.55 [0.52,0.59]	0.62 [0.59,0.66]
High	0.30 [0.27,0.34]	0.30 [0.26,0.33]	0.16 [0.13,0.18]	0.28 [0.25,0.31]	0.26 [0.23,0.29]	0.15 [0.13,0.18]
Low	0.16 [0.13,0.18]	0.17 [0.14,0.20]	0.22 [0.19,0.25]	0.20 [0.17,0.23]	0.18 [0.16,0.21]	0.22 [0.19,0.25]
Maternal Education						
< High School	0.20 [0.17,0.23]	0.18 [0.16,0.21]	0.19 [0.16,0.22]	0.23 [0.20,0.26]	0.21 [0.18,0.24]	0.23 [0.20,0.26]
High School	0.64 [0.61,0.68]	0.62 [0.59,0.66]	0.60 [0.56,0.64]	0.61 [0.58,0.65]	0.60 [0.57,0.64]	0.57 [0.53,0.61]
Diploma or Degree	0.16 [0.13,0.19]	0.19 [0.16,0.23]	0.21 [0.17,0.24]	0.16 [0.13,0.19]	0.18 [0.15,0.22]	0.20 [0.16,0.23]
Maternal Depression						
Not depressed	0.86 [0.83,0.88]	0.84 [0.81,0.86]	0.83 [0.80,0.86]	0.84 [0.81,0.86]	0.83 [0.80,0.86]	0.84 [0.81,0.86]
Depressed	0.14 [0.12,0.17]	0.16 [0.14,0.19]	0.17 [0.14,0.20]	0.16 [0.14,0.19]	0.17 [0.14,0.20]	0.16 [0.14,0.19]
Rurality						
Rural	0.21 [0.19,0.24]	0.24 [0.22,0.27]	0.24 [0.22,0.26]	0.22 [0.20,0.24]	0.26 [0.24,0.29]	0.25 [0.23,0.27]
Urban	0.79 [0.76,0.81]	0.76 [0.73,0.78]	0.76 [0.74,0.78]	0.78 [0.76,0.80]	0.74 [0.71,0.76]	0.75 [0.73,0.77]
Province						
Maritimes*	0.08 [0.07,0.09]	0.08 [0.07,0.09]	0.08 [0.07,0.09]	0.07 [0.06,0.08]	0.08 [0.07,0.09]	0.08 [0.07,0.09]
Quebec	0.22 [0.19,0.25]	0.23 [0.19,0.26]	0.21 [0.19,0.24]	0.23 [0.20,0.26]	0.22 [0.19,0.25]	0.23 [0.20,0.25]
Ontario	0.37 [0.33,0.40]	0.35 [0.32,0.39]	0.37 [0.33,0.40]	0.36 [0.32,0.39]	0.36 [0.32,0.39]	0.36 [0.33,0.40]
Manitoba	0.04 [0.03,0.05]	0.04 [0.03,0.05]	0.04 [0.03,0.05]	0.04 [0.03,0.05]	0.04 [0.03,0.05]	0.04 [0.03,0.05]
Saskatchewan	0.04 [0.03,0.05]	0.04 [0.03,0.05]	0.04 [0.03,0.05]	0.04 [0.03,0.05]	0.04 [0.03,0.05]	0.04 [0.03,0.05]
Alberta	0.11 [0.09,0.13]	0.11 [0.09,0.13]	0.11 [0.10,0.13]	0.12 [0.11,0.14]	0.13 [0.11,0.15]	0.13 [0.11,0.14]
British Columbia	0.15 [0.12,0.17]	0.14 [0.11,0.17]	0.14 [0.11,0.16]	0.13 [0.11,0.16]	0.13 [0.10,0.15]	0.13 [0.11,0.16]
Neighbourhood deprivation						

Table 4-2	**Girls (N =3206, 7401 observations)**			**Boys (N =3395, 7879 observations)**		
Variables	**10/11 yrs**	**12/13 yrs**	**14/15 yrs**	**10/11 yrs**	**12/13 yrs**	**14/15 yrs**
Least Deprived (Q1)	0.19 [0.16,0.22]	0.18 [0.15,0.21]	0.19 [0.16,0.22]	0.20 [0.17,0.23]	0.21 [0.17,0.24]	0.21 [0.18,0.24]
Q2	0.22 [0.19,0.25]	0.19 [0.17,0.22]	0.19 [0.17,0.22]	0.20 [0.17,0.23]	0.20 [0.17,0.23]	0.21 [0.18,0.24]
Average	0.22 [0.19,0.26]	0.22 [0.19,0.26]	0.22 [0.19,0.25]	0.21 [0.18,0.24]	0.20 [0.17,0.22]	0.20 [0.18,0.23]
Q4	0.18 [0.16,0.21]	0.21 [0.18,0.24]	0.21 [0.18,0.23]	0.21 [0.19,0.24]	0.20 [0.18,0.23]	0.20 [0.17,0.22]
Most Deprived (Q5)	0.19 [0.16,0.22]	0.20 [0.17,0.23]	0.19 [0.16,0.22]	0.18 [0.15,0.20]	0.19 [0.16,0.21]	0.18 [0.16,0.21]
Social fragmentation						
Least fragmented (Q1)	0.19 [0.17,0.22]	0.21 [0.18,0.23]	0.20 [0.17,0.22]	0.24 [0.21,0.27]	0.26 [0.23,0.29]	0.25 [0.22,0.28]
Q2	0.23 [0.20,0.27]	0.23 [0.20,0.26]	0.22 [0.19,0.25]	0.17 [0.15,0.20]	0.19 [0.16,0.22]	0.19 [0.17,0.22]
Average (Q3)	0.25 [0.22,0.28]	0.24 [0.21,0.27]	0.24 [0.21,0.27]	0.22 [0.19,0.25]	0.22 [0.20,0.25]	0.22 [0.19,0.24]
Q4	0.18 [0.15,0.20]	0.18 [0.16,0.21]	0.20 [0.17,0.23]	0.23 [0.19,0.26]	0.20 [0.17,0.23]	0.20 [0.17,0.23]
Most fragmented (Q5)	0.15 [0.12,0.18]	0.14 [0.12,0.17]	0.14 [0.12,0.17]	0.14 [0.11,0.16]	0.13 [0.10,0.15]	0.14 [0.11,0.16]
Moves Residence						
Non-Mover	…	0.82 [0.80,0.84]	0.86 [0.84,0.88]	…	0.81 [0.78,0.84]	0.83 [0.81,0.86]
Mover	…	0.18 [0.16,0.20]	0.14 [0.12,0.16]	…	0.19 [0.16,0.22]	0.17 [0.14,0.19]
Deprivation mobility						
Non-Mover	…	0.85 [0.83,0.88]	0.86 [0.84,0.88]	…	0.84 [0.82,0.87]	0.84 [0.82,0.87]
Moves to Same	…	0.04 [0.03,0.05]	0.04 [0.03,0.06]		0.05 [0.03,0.06]	0.05 [0.03,0.06]
Moves to Better	…	0.06 [0.04,0.07]	0.04	…	0.05 [0.03,0.06]	0.05 [0.04,0.06]
Moves to Worse	…	0.05 [0.03,0.06]	0.05 [0.04,0.07]	…	0.06 [0.04,0.09]	0.06 [0.04,0.08]
Fragmentation mobility						
Non-Mover	…	0.85 [0.83,0.88]	0.86 [0.84,0.88]	…	0.84 [0.82,0.87]	0.84 [0.82,0.87]
Moves to Same	…	0.04 [0.03,0.06]	0.03 [0.02,0.04]	…	0.05 [0.03,0.07]	0.04 [0.03,0.05]
Moves to Better	…	0.05 [0.04,0.07]	0.06 [0.04,0.08]	…	0.05 [0.03,0.06]	0.06 [0.05,0.08]
Moves to Worse	…	0.05 [0.03,0.06]	0.05 [0.04,0.06]	…	0.06 [0.04,0.07]	0.05 [0.04,0.07]

4.3 BYP sample

4.3.1 BYP sample derivation

Between 1994 and 2004, 3930 adolescents were surveyed as part of the BYP youth panel. Similar numbers of girls and boys were surveyed. Of these, 1,690 were not surveyed for one two-year transition (at both ages 11 and 13, 12 and 14 or 13 and 15).

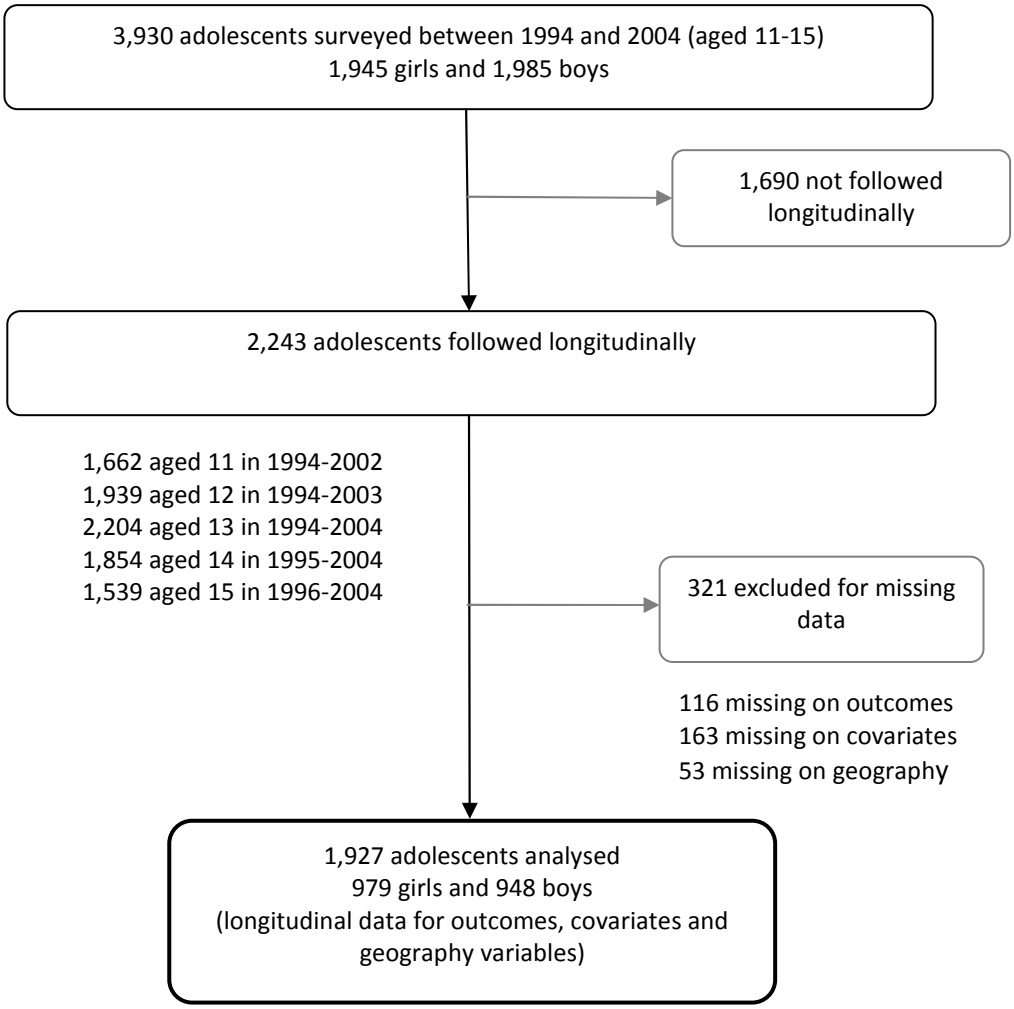
Breaking the remaining 2,243 adolescents down by age, it is clear that the design introduces a strong bias to the age structure of the observations. This is due to the unbalanced design of the youth panel as a whole. Most adolescents in the sample were surveyed at age 13 (2,204 out of 2,243). This is all adolescents who were in the sample when they were 13 could (at least potentially) have been surveyed two years previously, or, be followed up two years afterwards. Thus, most of the 2,243 adolescents have contributed a transition at either 11-13 or 13-15 or both. 43 contributed a transition at ages 12-14 only. This situation is not the same for any other age. There are relatively fewer at age 12, because adolescents age 12 in 2004 could not be followed up, and 14 year olds in 1994 could not have been surveyed previously. There are relatively fewer still at age 11 because adolescents aged 11 in 2003 and 2004 could not be followed up, and those aged 15 in 1994 and 1995 could not have been surveyed previously. This design effect stipulates that 13 year olds are the best represented proportionally by the analysis sample while the other ages, and 11 and 15 in particular, are less well represented. It also suggests that the sample represents the general adolescent population slightly more accurately for the years 1996-2002 more accurately, under-representing younger adolescents disproportionately in 1994, 1995 and older adolescents in 2003 and 2004.

Of those followed over a two year transition, only 321 were excluded for missing data. This maybe reflects the lower response burden of the BYP, which has a far lower number of

questions for adolescents than the NLSCY (which used multi-item scales), for almost all covariates. This introduces less opportunity for non-response and subsequent administrative error.

Thus, the final BYP sample consists of 1,922 adolescents with roughly equal numbers of boys and girls.

Figure 4-3: Pooled cohort sample construction of 11-15 year olds in waves 4-15 of the British Youth Panel.



4.3.2 BYP non-response

The descriptive statistics for the BYP are, like the NLSCY, broken down by age and sex. However, the different sexes are presented in separate tables for space reasons. The text below summarises the similarities and differences between the data presented in all four tables (Table 4-3, Table 4-4, Table 4-5 and Table 4-6).

In terms of self-esteem, those included in the analysis report lower proportions by age and sex, than those who are excluded. These differences are non-significant in terms of the overlap of the 95% confidence intervals. In terms of self-esteem transitions, girls who are included are more likely to report persistently high self-esteem, than excluded girls. This difference is only statistically significant at age 13, but the trend is evident at all ages. In contrast, included and excluded boys have similar proportions on all transitions.

As with the NLSCY, there is a strong interaction between year of entry and age. For example, there are large differences in proportions of 11 year olds in 2004. This is a direct and expected impact of the exclusion criteria, as 11 year olds in that year cannot be followed up.

There are proportionally less visible minority respondents included than excluded although this difference is non-significant.

In terms of perceptions of relationships with parents, included and excluded adolescents are similar. There are also few differences between residences in different family environments. There is a marginal difference in family structure; proportionally more included adolescents live in intact families, and less in single parent families, than excluded adolescents. Included and excluded adolescents are similar in terms of maternal education and depression.

Geographically, there are no important differences between the samples in terms of region of residence or urban and rural residence. However, there are important differences between the derived sample and those who were excluded from the analysis. Similar proportions of the sample and those respondents who were excluded reside in the most deprived neighbourhoods (Quintile five (Q5)). The sample over-represents the most affluent and average neighbourhoods (Q1 and Q3) while under-representing medium affluent and medium deprived areas (Q2 and Q4), both relative to those who were excluded.

A comparable but distinct picture emerges for social fragmentation. In this case, the sample is similar to the excluded group for the least fragmented neighbourhoods (Q1), and those with average levels of social fragmentation (Q3). However, significantly lower proportions were included in the sample from medium cohesive neighbourhoods (Q2), and medium fragmented neighbourhoods (Q4), while significantly more were represented from the most fragmented neighbourhoods (Q5).

There are clear differences between the sample and those excluded from the sample in residential mobility and socio-geographic mobility. In the sample around 96 to 97% of boys and girls remain in the same neighbourhood between any two waves, while 3 to 4% move neighbourhood. Among the non-respondents estimates are much less consistent ranging from movers making up 2 to 14%. This reflects the fact that there is a large amount of missing data for the non-respondents who were excluded precisely because they were not followed up over two time periods or did not have geographical information linked in to construct the mover variables. This sample therefore provides an estimate of residential mobility, but it cannot be verified how generalisable this estimate is as a rate of mobility of families of adolescents in the UK population. The same is true of the deprivation mobility and social fragmentation mobility variables as these are derived from the residential mobility variable.

Overall, there are key differences in the outcomes and neighbourhood variables, suggesting that the excluded individuals might be slightly more likely to report low self-esteem and to reside in different types of neighbourhoods from those included in the sample. These differences are also evident in terms of change in self-esteem t1 to t2.

4.3.3 Description of BYP sample

The BYP analysis sample (N=1922) is summarised below for girls and boys by Table 4-5 and Table 4-6. These descriptive data highlight that age and sex appear to have an interactive relationship with self-esteem. Mean self-esteem is roughly similar for girls with increasing age, but increases in boys. This highlights a widening with increasing age between the sexes. Interestingly this pattern is also shown when considering low self-esteem but, in this case, the proportions of girls with low self-esteem increases over time, but the proportions of boys with low self-esteem stays the same. In terms of transitions, more boys report persistently high self-esteem over two transitions than girls, although this is only significant for those transitions from age 13-15, again reflecting a widening of outcomes at the later age. Only very small proportions of both boys and girls report persistently low self-esteem (2-4% of girls at each transition, and 0-2% of boys).

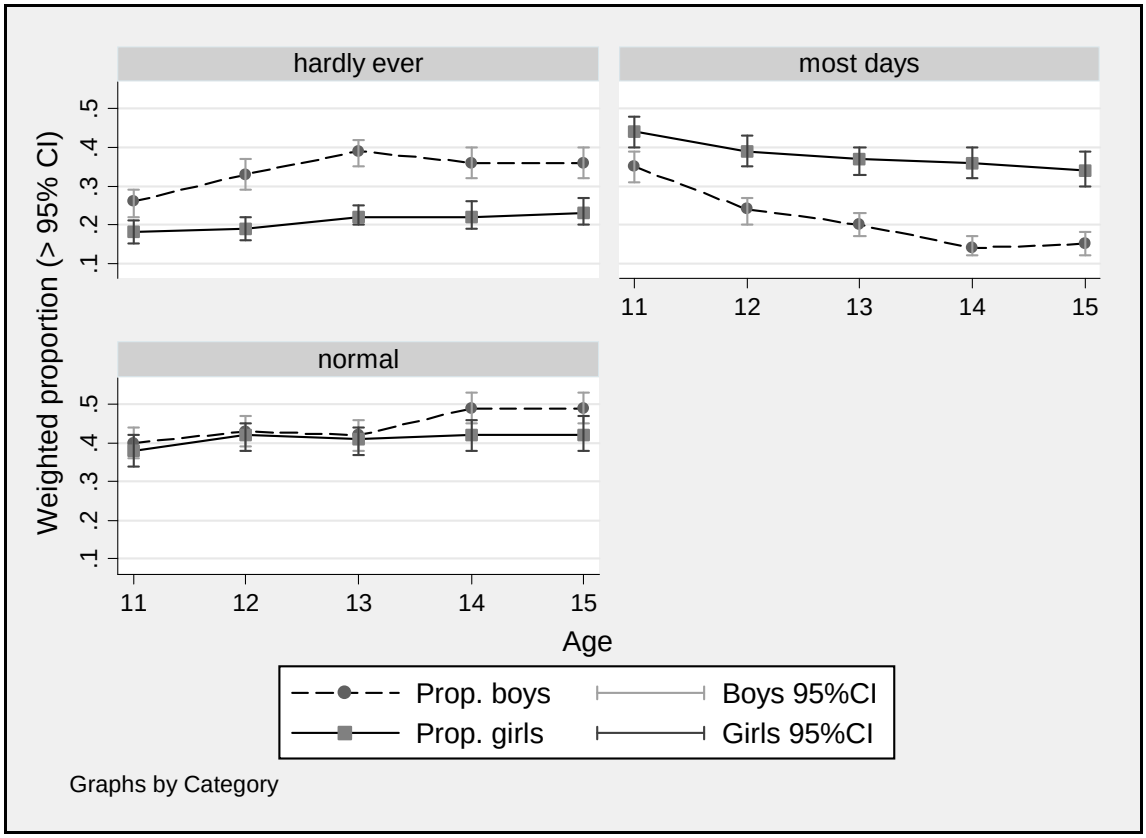
Only a very small proportion (e.g. 5% of girls aged 11) of the sample come from visible minority backgrounds (have at least one parent who is self-defined as 'Asian', 'Black' or 'Mixed').

In terms of the year of entry, proportionally more adolescents entered after 2000 (i.e. 2000, 2001, 2002, 2003 and 2004). This may reflect booster sampling of Scotland and Wales added in 1999.

Overall, adolescents as a population reported warm relationships with parents; low proportions hardly ever talked about close things. There were no differences by sex and age, or sex-based age trends in these proportions. In terms of arguing with parents there were distinct differences by age and sex (see Graph 4-1). The youngest in the sample did not report frequent arguments with parents, and this was not differentiated by sex. However, a gender

difference emerged at age 12 and remained such that girls reported frequent arguments with parents, while boys reported this proportionality less.

Graph 4-1: Age and sex patterns in arguments with parents



In terms of happiness with friends, the vast majority of both girls and boys report being happy with their friends at all ages (from 94-97%). Similarly, most adolescents report being happy with their family although this perception appears more subject to change with age than happiness with friends. In particular, proportionally more girls report unhappiness with families with increasing age (5% at age 11, 11% at age 15).

Other than youth perceptions of happiness with family, the family environment is proportionally stable with increasing age. Most children (around 70%) live in intact families (both biological parents), with similar proportions living in either single parent or reconstituted families. More adolescents live in relative affluence (30%) than families who have incomes less

than 60% of the national median income (20%). A significant proportion (generally estimated at around 36%) of this sample's mothers or maternal carers reported having no qualifications. However, a relatively large proportion (24%) hold a post-secondary diploma or degree level qualifications. Approximately 30% of mothers report depressive symptoms consistent with case status on the GHQ scale.

The sample is predominantly urban (76% of girls at age 11 live in settlements of greater than 10,000 people). Regionally, the South of England is the most heavily represented (33% of girls and 25% of boys at age 11), followed by the East of England and the Midlands (21% of girls and 22% of boys).

In terms of neighbourhood characteristics, if the sample was representative of neighbourhood deprivation relative to Scotland, England and Wales, 20% of the sample would reside in each quintile. Proportions calculated across the whole sample show that the sample systematically, and statistically significantly under-represents the most affluent neighbourhoods (in quintiles 1 and 2) in the country, while over-representing average to deprived neighbourhoods (quintiles 3-5).

Around 3-4% of girls or boys were residentially mobile in this sample between any two waves. These estimates are reasonably robust and seem, as expected, consistent by age and sex. However, as the absolute numbers of person-wave transitions representing a move is low (324 out of 4064), when these are broken down by the types of transitions made, no type of socio-geographical move represents more than 1% of the population. In addition, many of the estimates of proportions are imprecisely estimated (confidence intervals are wide, or span zero). This suggests that socio-geographic mobility analyses will be subject to problems with statistical power and also generalisability to the population of adolescents in the UK.

Table 4-3. Population weighted proportions and 95% confidence intervals of all variables for included BYP girls in sample (BYP, N=979, obs =4101)

Table 4-3	Included girls (N =979, 4,101 observations)				
Age	**11**	**12**	**13**	**14**	**15**
Variables	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**
Self-Esteem					
Low Self-Esteem	0.92 [0.90,0.94]	0.89 [0.86,0.91]	0.88 [0.86,0.90]	0.86 [0.83,0.89]	0.85 [0.81,0.88]
High Self-Esteem	0.08 [0.06,0.10]	0.11 [0.09,0.14]	0.12 [0.10,0.14]	0.14 [0.11,0.17]	0.15 [0.12,0.19]
Self-Esteem change					
Maintain High	…		0.82 [0.78,0.85]	0.80 [0.76,0.84]	0.78 [0.74,0.82]
Improvement	…		0.09 [0.07,0.12]	0.09 [0.07,0.12]	0.11 [0.08,0.14]
Decline	…		0.07 [0.05,0.09]	0.06 [0.04,0.08]	0.07 [0.05,0.09]
Maintain Low	…		0.02 [0.01,0.03]	0.04 [0.03,0.06]	0.04 [0.03,0.06]
Ethnicity					
White	0.95 [0.93,0.97]	0.96 [0.94,0.98]	0.96 [0.94,0.97]	0.96 [0.94,0.97]	0.96 [0.94,0.98]
Visible minority	0.05 [0.03,0.07]	0.04 [0.02,0.06]	0.04 [0.03,0.06]	0.04 [0.03,0.06]	0.04 [0.02,0.06]
Year					
1994	0.09 [0.07,0.11]	0.07 [0.05,0.09]	0.06 [0.04,0.07]	…	…
1995	0.10 [0.07,0.12]	0.08 [0.06,0.10]	0.06 [0.05,0.08]	0.07 [0.05,0.08]	…
1996	0.09 [0.07,0.11]	0.08 [0.06,0.10]	0.08 [0.06,0.09]	0.07 [0.05,0.08]	0.07 [0.05,0.09]
1997	0.08 [0.06,0.11]	0.08 [0.06,0.10]	0.07 [0.05,0.08]	0.08 [0.06,0.09]	0.08 [0.06,0.10]
1998	0.11 [0.08,0.13]	0.09 [0.07,0.11]	0.09 [0.07,0.11]	0.07 [0.05,0.09]	0.10 [0.08,0.12]
1999	0.11 [0.09,0.14]	0.09 [0.07,0.10]	0.08 [0.06,0.10]	0.08 [0.06,0.11]	0.09 [0.06,0.11]
2000	0.15 [0.12,0.18]	0.15 [0.12,0.18]	0.12 [0.09,0.14]	0.12 [0.09,0.15]	0.13 [0.10,0.16]
2001	0.15 [0.11,0.18]	0.13 [0.10,0.16]	0.13 [0.10,0.15]	0.13 [0.10,0.16]	0.13 [0.10,0.16]
2002	0.12 [0.09,0.14]	0.14 [0.11,0.17]	0.11 [0.09,0.14]	0.12 [0.10,0.15]	0.13 [0.10,0.16]
2003	…	0.10 [0.08,0.12]	0.11 [0.08,0.13]	0.12 [0.10,0.15]	0.13 [0.10,0.15]
2004	…	…	0.10 [0.08,0.12]	0.14 [0.11,0.17]	0.15 [0.12,0.18]
Talks to parents about ‘close things’					
Hardly ever	0.51 [0.46,0.55]	0.49 [0.45,0.52]	0.43 [0.40,0.47]	0.38 [0.34,0.42]	0.37 [0.33,0.42]
Regularly	0.38 [0.34,0.42]	0.41 [0.37,0.45]	0.44 [0.40,0.48]	0.49 [0.44,0.53]	0.48 [0.44,0.53]
Most days	0.12 [0.09,0.14]	0.1 [0.08,0.13]	0.12 [0.10,0.15]	0.14 [0.11,0.16]	0.14 [0.11,0.17]
Argues with parents					

Table 4-3	Included girls (N =979, 4,101 observations)				
Age	**11**	**12**	**13**	**14**	**15**
Variables	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**
Hardly ever	0.18 [0.15,0.21]	0.19 [0.16,0.22]	0.22 [0.20,0.25]	0.22 [0.19,0.26]	0.23 [0.20,0.27]
Regularly	0.38 [0.34,0.42]	0.42 [0.38,0.45]	0.41 [0.37,0.44]	0.42 [0.38,0.46]	0.42 [0.38,0.47]
Most days	0.44 [0.40,0.48]	0.39 [0.35,0.43]	0.37 [0.33,0.40]	0.36 [0.32,0.40]	0.34 [0.30,0.39]
Friendship Quality					
Happy with friends	0.96 [0.94,0.97]	0.96 [0.94,0.97]	0.94 [0.93,0.96]	0.94 [0.92,0.96]	0.93 [0.91,0.95]
Unhappy with friends	0.04 [0.03,0.06]	0.04 [0.03,0.06]	0.06 [0.04,0.07]	0.06 [0.04,0.08]	0.07 [0.05,0.09]
Family functioning					
Happy	0.95 [0.94,0.97]	0.97 [0.95,0.98]	0.93 [0.91,0.95]	0.90 [0.87,0.92]	0.89 [0.86,0.92]
Unhappy	0.05 [0.03,0.06]	0.03 [0.02,0.05]	0.07 [0.05,0.09]	0.10 [0.08,0.13]	0.11 [0.08,0.14]
Family Structure					
Intact	0.70 [0.66,0.73]	0.68 [0.65,0.72]	0.66 [0.63,0.70]	0.65 [0.61,0.69]	0.65 [0.61,0.69]
Reconstituted	0.12 [0.10,0.15]	0.14 [0.11,0.16]	0.14 [0.12,0.16]	0.15 [0.12,0.17]	0.15 [0.12,0.18]
Single Parent	0.18 [0.15,0.21]	0.18 [0.15,0.21]	0.20 [0.17,0.23]	0.20 [0.17,0.24]	0.20 [0.16,0.23]
Relative income					
Average	0.50 [0.46,0.54]	0.50 [0.46,0.54]	0.49 [0.45,0.52]	0.53 [0.49,0.57]	0.51 [0.47,0.56]
High	0.30 [0.26,0.33]	0.31 [0.27,0.35]	0.34 [0.30,0.37]	0.27 [0.23,0.30]	0.30 [0.26,0.34]
Low	0.20 [0.17,0.24]	0.19 [0.16,0.22]	0.17 [0.15,0.20]	0.20 [0.17,0.23]	0.19 [0.15,0.22]
Maternal Education					
< GCSE	0.36 [0.32,0.40]	0.37 [0.34,0.41]	0.37 [0.33,0.40]	0.38 [0.34,0.42]	0.37 [0.32,0.41]
GCSE	0.32 [0.28,0.36]	0.30 [0.27,0.34]	0.30 [0.27,0.34]	0.30 [0.26,0.34]	0.30 [0.26,0.34]
A-level	0.09 [0.07,0.11]	0.09 [0.07,0.11]	0.09 [0.07,0.11]	0.09 [0.06,0.11]	0.08 [0.06,0.11]
Diploma or Degree	0.24 [0.21,0.28]	0.23 [0.20,0.26]	0.24 [0.21,0.27]	0.23 [0.20,0.26]	0.25 [0.21,0.29]
Maternal Depression					
Not depressed	0.69 [0.65,0.73]	0.68 [0.64,0.71]	0.67 [0.64,0.71]	0.66 [0.62,0.70]	0.70 [0.66,0.74]
Depressed	0.31 [0.27,0.35]	0.32 [0.29,0.36]	0.33 [0.29,0.36]	0.34 [0.30,0.38]	0.30 [0.26,0.34]
Urban / Rural					
Rural	0.24 [0.21,0.28]	0.24 [0.21,0.28]	0.23 [0.20,0.26]	0.21 [0.18,0.24]	0.21 [0.18,0.25]
Urban	0.76 [0.72,0.79]	0.76 [0.72,0.79]	0.77 [0.74,0.80]	0.79 [0.76,0.82]	0.79 [0.75,0.82]
Region					
Midlands/East of England	0.21 [0.18,0.25]	0.22 [0.19,0.26]	0.22 [0.18,0.25]	0.22 [0.19,0.26]	0.23 [0.19,0.26]
London	0.09 [0.07,0.12]	0.09 [0.07,0.12]	0.10 [0.07,0.12]	0.10 [0.07,0.12]	0.09 [0.06,0.12]

Table 4-3		Included girls (N =979, 4,101 observations)			
Age	**11**	**12**	**13**	**14**	**15**
Variables	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**
North West of England	0.10 [0.07,0.12]	0.09 [0.07,0.12]	0.10 [0.08,0.12]	0.10 [0.08,0.13]	0.11 [0.08,0.14]
North of England	0.13 [0.10,0.16]	0.14 [0.11,0.17]	0.14 [0.11,0.16]	0.13 [0.11,0.16]	0.14 [0.11,0.17]
Northern Ireland	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]
Scotland	0.07 [0.05,0.09]	0.07 [0.06,0.09]	0.07 [0.06,0.09]	0.07 [0.05,0.08]	0.06 [0.04,0.07]
South of England	0.33 [0.29,0.37]	0.32 [0.29,0.36]	0.32 [0.29,0.36]	0.33 [0.29,0.36]	0.34 [0.30,0.38]
Wales	0.06 [0.04,0.07]	0.06 [0.04,0.07]	0.05 [0.04,0.06]	0.05 [0.04,0.06]	0.04 [0.03,0.05]
Neighbourhood deprivation					
Least Deprived (Q1)	0.11 [0.08,0.13]	0.11 [0.09,0.13]	0.11 [0.09,0.13]	0.11 [0.09,0.14]	0.11 [0.08,0.14]
Q2	0.17 [0.14,0.20]	0.18 [0.15,0.21]	0.17 [0.14,0.20]	0.17 [0.14,0.20]	0.18 [0.15,0.22]
Average	0.25 [0.21,0.28]	0.25 [0.22,0.29]	0.25 [0.22,0.28]	0.24 [0.21,0.28]	0.26 [0.22,0.30]
Q4	0.26 [0.22,0.30]	0.24 [0.21,0.28]	0.25 [0.22,0.28]	0.23 [0.20,0.27]	0.23 [0.19,0.27]
Most Deprived (Q5)	0.21 [0.18,0.25]	0.22 [0.18,0.25]	0.23 [0.20,0.26]	0.24 [0.21,0.27]	0.22 [0.18,0.26]
Social fragmentation					
Least fragmented (Q1)	0.16 [0.13,0.19]	0.17 [0.14,0.20]	0.16 [0.13,0.19]	0.16 [0.13,0.20]	
Q2	0.24 [0.20,0.28]	0.23 [0.20,0.26]	0.23 [0.20,0.26]	0.22 [0.19,0.25]	0.24 [0.20,0.28]
Average (Q3)	0.18 [0.14,0.21]	0.18 [0.15,0.21]	0.17 [0.14,0.20]	0.16 [0.13,0.19]	0.15 [0.12,0.18]
Q4	0.20 [0.17,0.24]	0.20 [0.17,0.23]	0.20 [0.17,0.23]	0.20 [0.17,0.23]	0.20 [0.17,0.23]
Most fragmented (Q5)	0.22 [0.19,0.26]	0.22 [0.19,0.26]	0.24 [0.21,0.27]	0.26 [0.22,0.29]	0.24 [0.21,0.28]
Moves Residence					
Non-Mover	…	0.96 [0.95,0.98]	0.96 [0.94,0.97]	0.96 [0.95,0.98]	0.97 [0.95,0.98]
Mover	…	0.04 [0.02,0.05]	0.04 [0.03,0.06]	0.04 [0.02,0.05]	0.03 [0.02,0.05]
Deprivation mobility					
Non-Mover	…	0.96 [0.95,0.98]	0.96 [0.94,0.97]	0.96 [0.95,0.98]	0.97 [0.95,0.98]
Moves to Same	…	0.01 [-0.00,0.02	0.01 [0.01,0.02]	0.01 [0.00,0.01]	0.01 [0.00,0.02]
Moves to Better	…	0.01 [-0.00,0.02	0.02 [0.01,0.03]	0.01 [0.00,0.02]	0.02 [0.01,0.03]
Moves to Worse	…	0.02 [0.01,0.03]	0.00 [0.00,0.01]	0.02 [0.01,0.03]	0.00 [-0.00,0.01
Fragmentation mobility					
Non-Mover	…	0.96 [0.95,0.98]	0.96 [0.94,0.97]	0.96 [0.95,0.98]	0.97 [0.95,0.98]
Moves to Same	…	0.01 [0.00,0.02]	0.01 [0.00,0.02]	0.02 [0.01,0.02]	0.02 [0.00,0.03]
Moves to Better	…	0.01 [0.00,0.02]	0.02 [0.01,0.03]	0.01 [0.00,0.02]	0.00 [-0.00,0.01
Moves to Worse	…	0.01 [0.00,0.02]	0.01 [0.00,0.02]	0.01 [0.00,0.02]	0.01 [0.00,0.02]

Table 4-4. Population weighted proportions and 95% confidence intervals for included BYP boys by age (N = 948, obs. 3961).

Table 4-4	Included boys (N =948, 3,961 observations)				
Age	**11**	**12**	**13**	**14**	**15**
Variables	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**
Self-Esteem					
Low Self-Esteem	0.92 [0.90,0.94]	0.91 [0.88,0.93]	0.93 [0.91,0.95]	0.92 [0.90,0.94]	0.95 [0.93,0.97]
High Self-Esteem	0.08 [0.06,0.10]	0.09 [0.07,0.12]	0.07 [0.05,0.09]	0.08 [0.06,0.10]	0.05 [0.03,0.07]
Self-Esteem change					
Maintain High	…	…	0.87 [0.84,0.90]	0.86 [0.82,0.89]	0.91 [0.88,0.94]
Improvement	…	…	0.05 [0.03,0.07]	0.06 [0.04,0.08]	0.04 [0.02,0.06]
Decline	…	…	0.06 [0.04,0.08]	0.06 [0.04,0.08]	0.04 [0.02,0.06]
Maintain Low	…	…	0.02 [0.00,0.03]	0.02 [0.01,0.03]	0.01 [0.00,0.02]
Ethnicity					
White	0.95 [0.94,0.97]	0.95 [0.93,0.97]	0.95 [0.93,0.96]	0.95 [0.93,0.96]	0.93 [0.91,0.96]
Visible minority	0.05 [0.03,0.06]	0.05 [0.03,0.07]	0.05 [0.04,0.07]	0.05 [0.04,0.07]	0.07 [0.04,0.09]
Year					
1994	0.08 [0.06,0.10]	0.08 [0.06,0.09]	0.05 [0.04,0.07]	…	…
1995	0.1 [0.08,0.12]	0.07 [0.05,0.09]	0.07 [0.05,0.08]	0.06 [0.04,0.08]	…
1996	0.09 [0.07,0.11]	0.08 [0.06,0.10]	0.06 [0.05,0.08]	0.08 [0.06,0.09]	0.07 [0.05,0.09]
1997	0.09 [0.07,0.11]	0.07 [0.05,0.09]	0.07 [0.05,0.09]	0.07 [0.05,0.09]	0.08 [0.06,0.10]
1998	0.11 [0.09,0.14]	0.10 [0.07,0.12]	0.08 [0.06,0.10]	0.09 [0.07,0.11]	0.08 [0.06,0.10]
1999	0.12 [0.09,0.15]	0.09 [0.07,0.11]	0.08 [0.06,0.10]	0.09 [0.07,0.11]	0.10 [0.07,0.12]
2000	0.14 [0.11,0.17]	0.15 [0.12,0.18]	0.12 [0.09,0.14]	0.12 [0.09,0.15]	0.13 [0.10,0.16]
2001	0.14 [0.11,0.18]	0.13 [0.10,0.15]	0.13 [0.10,0.16]	0.13 [0.10,0.15]	0.13 [0.10,0.16]
2002	0.12 [0.09,0.15]	0.13 [0.10,0.16]	0.12 [0.09,0.14]	0.13 [0.09,0.16]	0.13 [0.10,0.16]
2003	…	0.11 [0.08,0.13]	0.11 [0.08,0.14]	0.12 [0.09,0.14]	0.13 [0.10,0.17]
2004	…	…	0.11 [0.08,0.14]	0.13 [0.10,0.16]	0.15 [0.12,0.18]
Talks to parents about ‘close things’					
Hardly ever	0.52 [0.48,0.57]	0.48 [0.43,0.52]	0.49 [0.45,0.52]	0.47 [0.43,0.51]	0.47 [0.43,0.51]
Regularly	0.38 [0.34,0.42]	0.42 [0.38,0.46]	0.43 [0.39,0.47]	0.44 [0.40,0.48]	0.45 [0.41,0.49]
Most days	0.10 [0.07,0.12]	0.10 [0.08,0.13]	0.08 [0.06,0.11]	0.09 [0.06,0.11]	0.08 [0.06,0.10]
Argues with parents					

Table 4-4	Included boys (N =948, 3,961 observations)				
Age	**11**	**12**	**13**	**14**	**15**
Variables	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**
Hardly ever	0.26 [0.22,0.29]	0.33 [0.29,0.37]	0.39 [0.35,0.42]	0.36 [0.32,0.40]	0.36 [0.32,0.40]
Regularly	0.40 [0.36,0.44]	0.43 [0.39,0.47]	0.42 [0.38,0.46]	0.49 [0.45,0.53]	0.49 [0.45,0.53]
Most days	0.35 [0.31,0.39]	0.24 [0.20,0.27]	0.2 [0.17,0.23]	0.14 [0.12,0.17]	0.15 [0.12,0.18]
Friendship Quality					
Happy with friends	0.94 [0.92,0.96]	0.96 [0.95,0.98]	0.95 [0.93,0.97]	0.95 [0.93,0.97]	0.97 [0.96,0.99]
Unhappy with friends	0.06 [0.04,0.08]	0.04 [0.02,0.05]	0.05 [0.03,0.07]	0.05 [0.03,0.07]	0.03 [0.01,0.04]
Family functioning					
Happy	0.97 [0.95,0.98]	0.95 [0.93,0.96]	0.95 [0.93,0.96]	0.92 [0.89,0.94]	0.92 [0.89,0.94]
Unhappy	0.03 [0.02,0.05]	0.05 [0.04,0.07]	0.05 [0.04,0.07]	0.08 [0.06,0.11]	0.08 [0.06,0.11]
Family Structure					
Intact	0.70 [0.66,0.73]	0.65 [0.62,0.69]	0.65 [0.61,0.68]	0.65 [0.61,0.69]	0.63 [0.59,0.68]
Reconstituted	0.14 [0.11,0.16]	0.15 [0.12,0.17]	0.16 [0.13,0.18]	0.15 [0.13,0.18]	0.15 [0.12,0.18]
Single Parent	0.17 [0.14,0.20]	0.20 [0.17,0.23]	0.20 [0.17,0.23]	0.19 [0.16,0.23]	0.22 [0.18,0.25]
Relative income					
Average	0.53 [0.48,0.57]	0.51 [0.47,0.55]	0.51 [0.47,0.55]	0.53 [0.49,0.57]	0.53 [0.49,0.58]
High	0.30 [0.26,0.34]	0.31 [0.27,0.35]	0.32 [0.29,0.36]	0.28 [0.25,0.32]	0.31 [0.26,0.35]
Low	0.17 [0.14,0.21]	0.18 [0.15,0.21]	0.17 [0.14,0.20]	0.19 [0.15,0.22]	0.16 [0.13,0.19]
Maternal Education					
< GCSE	0.35 [0.31,0.39]	0.36 [0.32,0.39]	0.36 [0.32,0.40]	0.35 [0.31,0.39]	0.36 [0.32,0.40]
GCSE	0.33 [0.29,0.37]	0.32 [0.28,0.36]	0.32 [0.29,0.36]	0.33 [0.29,0.37]	0.32 [0.28,0.36]
A-level	0.10 [0.08,0.13]	0.10 [0.08,0.13]	0.10 [0.07,0.12]	0.10 [0.07,0.12]	0.08 [0.06,0.11]
Diploma or Degree	0.23 [0.19,0.26]	0.22 [0.19,0.26]	0.22 [0.19,0.25]	0.22 [0.19,0.26]	0.24 [0.20,0.27]
Maternal Depression					
Not depressed	0.71 [0.67,0.75]	0.67 [0.63,0.71]	0.68 [0.64,0.71]	0.67 [0.64,0.71]	0.66 [0.62,0.70]
Depressed	0.29 [0.25,0.33]	0.33 [0.29,0.37]	0.32 [0.29,0.36]	0.33 [0.29,0.36]	0.34 [0.30,0.38]
Urban / Rural					
Rural	0.17 [0.14,0.20]	0.18 [0.15,0.21]	0.18 [0.16,0.21]	0.20 [0.17,0.23]	0.21 [0.17,0.24]
Urban	0.83 [0.80,0.86]	0.82 [0.79,0.85]	0.82 [0.79,0.84]	0.80 [0.77,0.83]	0.79 [0.76,0.83]
Region					
Midlands/East of England	0.22 [0.18,0.25]	0.22 [0.19,0.26]	0.23 [0.19,0.26]	0.22 [0.19,0.25]	0.22 [0.19,0.26]
London	0.09 [0.06,0.11]	0.09 [0.06,0.12]	0.09 [0.07,0.12]	0.08 [0.06,0.11]	0.09 [0.06,0.11]

Table 4-4		Included boys (N =948, 3,961 observations)			
Age	**11**	**12**	**13**	**14**	**15**
Variables	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**
North West of England	0.15 [0.11,0.18]	0.14 [0.11,0.17]	0.14 [0.11,0.17]	0.13 [0.10,0.16]	0.13 [0.10,0.16]
North of England	0.18 [0.15,0.21]	0.18 [0.15,0.21]	0.17 [0.15,0.20]	0.19 [0.15,0.22]	0.19 [0.16,0.23]
Northern Ireland	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]
Scotland	0.08 [0.06,0.10]	0.08 [0.06,0.10]	0.07 [0.06,0.09]	0.07 [0.05,0.08]	0.05 [0.04,0.06]
South of England	0.25 [0.22,0.29]	0.24 [0.21,0.28]	0.25 [0.22,0.29]	0.27 [0.23,0.31]	0.28 [0.24,0.32]
Wales	0.04 [0.03,0.05]	0.05 [0.03,0.06]	0.04 [0.03,0.05]	0.04 [0.03,0.05]	0.04 [0.02,0.05]
Neighbourhood deprivation					
Least Deprived (Q1)	0.09 [0.07,0.12]	0.10 [0.08,0.13]	0.10 [0.08,0.12]	0.11 [0.08,0.13]	0.09 [0.07,0.12]
Q2	0.17 [0.14,0.20]	0.16 [0.13,0.19]	0.15 [0.13,0.18]	0.17 [0.14,0.20]	0.17 [0.14,0.21]
Average	0.21 [0.18,0.24]	0.21 [0.18,0.24]	0.22 [0.19,0.25]	0.23 [0.19,0.26]	0.23 [0.20,0.27]
Q4	0.29 [0.25,0.32]	0.27 [0.24,0.31]	0.27 [0.24,0.31]	0.25 [0.22,0.29]	0.27 [0.23,0.31]
Most Deprived (Q5)	0.24 [0.21,0.28]	0.26 [0.22,0.29]	0.25 [0.21,0.28]	0.25 [0.21,0.28]	0.23 [0.20,0.27]
Social fragmentation					
Least fragmented (Q1)	0.15 [0.12,0.18]	0.15 [0.13,0.18]	0.16 [0.13,0.19]	0.17 [0.14,0.20]	0.17 [0.13,0.20]
Q2	0.21 [0.17,0.24]	0.22 [0.19,0.25]	0.21 [0.18,0.24]	0.21 [0.18,0.24]	0.21 [0.17,0.24]
Average (Q3)	0.17 [0.14,0.21]	0.18 [0.15,0.21]	0.18 [0.15,0.20]	0.20 [0.16,0.23]	0.20 [0.17,0.24]
Q4	0.22 [0.19,0.26]	0.21 [0.18,0.24]	0.21 [0.18,0.24]	0.20 [0.17,0.23]	0.20 [0.17,0.24]
Most fragmented (Q5)	0.24 [0.20,0.28]	0.24 [0.20,0.28]	0.24 [0.21,0.28]	0.22 [0.19,0.26]	0.22 [0.18,0.26]
Moves Residence					
Non-Mover	…	0.96 [0.95,0.98]	0.97 [0.95,0.98]	0.97 [0.96,0.98]	0.96 [0.95,0.98]
Mover	…	0.04 [0.02,0.05]	0.03 [0.02,0.05]	0.03 [0.02,0.04]	0.04 [0.02,0.05]
Deprivation mobility					
Non-Mover	…	0.96 [0.95,0.98]	0.97 [0.95,0.98]	0.97 [0.96,0.98]	0.96 [0.95,0.98]
Moves to Same	…	0.01 [0.00,0.02]	0.01 [0.00,0.02]	0.01 [0.00,0.01]	0.01 [0.00,0.02]
Moves to Better	…	0.01 [0.00,0.02]	0.01 [0.00,0.01]	0.01 [0.00,0.02]	0.01 [0.00,0.02]
Moves to Worse	…	0.02 [0.01,0.03]	0.02 [0.01,0.03]	0.01 [0.00,0.02]	0.01 [0.00,0.02]
Fragmentation mobility					
Non-Mover	…	0.96 [0.95,0.98]	0.97 [0.95,0.98]	0.97 [0.96,0.98]	0.96 [0.95,0.98]
Moves to Same	…	0.00 [0.00,0.01]	0.01 [0.00,0.02]	0.01 [-0.00,0.01	0.02 [0.00,0.03]
Moves to Better	…	0.02 [0.00,0.03]	0.01 [0.00,0.01]	0.01 [0.00,0.02]	0.01 [0.00,0.02]
Moves to Worse	…	0.02 [0.01,0.03]	0.01 [0.00,0.02]	0.01 [0.00,0.02]	0.01 [0.00,0.02]

Table 4-5: Population weighted proportions and 95% confidence intervals for excluded BYP girls by age (N = 968, obs. 1886).

Table 4-5	Excluded girls (N = 968, 1,648 observations)				
Age	**11 yrs**	**12 yrs**	**13 yrs**	**14 yrs**	**15 yrs**
Variables	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**
Self-Esteem					
Low Self-Esteem	0.88 [0.84,0.92]	0.85 [0.78,0.91]	0.77 [0.69,0.85]	0.83 [0.78,0.88]	0.81 [0.76,0.86]
High Self-Esteem	0.12 [0.08,0.16]	0.15 [0.09,0.22]	0.23 [0.15,0.31]	0.17 [0.12,0.22]	0.19 [0.14,0.24]
Self-Esteem change					
Maintain High	…	…	0.61 [0.47,0.74]	0.69 [0.53,0.84]	0.72 [0.57,0.86]
Improvement	…	…	0.14 [0.05,0.23]	0.12 [0.02,0.23]	0.14 [0.02,0.25]
Decline	…	…	0.13 [0.03,0.22]	0.11 [0.02,0.21]	0.03 [-0.01,0.08
Maintain Low	…	…	0.12 [0.04,0.21]	0.07 [-0.02,0.17	0.11 [0.02,0.21]
Ethnicity					
White	0.87 [0.82,0.91]	0.88 [0.83,0.93]	0.79 [0.71,0.88]	0.90 [0.84,0.95]	0.93 [0.89,0.97]
Visible minority	0.13 [0.09,0.18]	0.12 [0.07,0.17]	0.21 [0.12,0.29]	0.10 [0.05,0.16]	0.07 [0.03,0.11]
Year					
1994	0.02 [0.01,0.04]	0.05 [0.02,0.07]	0.13 [0.08,0.19]	0.35 [0.28,0.41]	0.24 [0.19,0.29]
1995	0.01 [-0.00,0.02	0.01 [-0.00,0.01	0.08 [0.03,0.14]	0.07 [0.03,0.10]	0.24 [0.19,0.29]
1996	0.03 [0.01,0.04]	0.01 [-0.00,0.02	0.01 [-0.01,0.02	0.05 [0.02,0.07]	0.05 [0.03,0.08]
1997	0.02 [0.01,0.04]	0.01 [-0.00,0.02	0.02 [-0.00,0.05	0.00 [-0.00,0.01	0.03 [0.01,0.04]
1998	0.04 [0.02,0.06]	0.04 [0.02,0.07]	0.08 [0.03,0.13]	0.10 [0.07,0.14]	0.03 [0.02,0.05]
1999	0.02 [0.01,0.04]	0.07 [0.04,0.11]	0.05 [0.01,0.10]	0.06 [0.03,0.10]	0.08 [0.05,0.12]
2000	0.07 [0.04,0.10]	0.05 [0.02,0.08]	0.15 [0.08,0.22]	0.14 [0.09,0.18]	0.10 [0.06,0.13]
2001	0.08 [0.05,0.12]	0.10 [0.06,0.15]	0.08 [0.03,0.12]	0.08 [0.04,0.13]	0.09 [0.06,0.13]
2002	0.10 [0.07,0.14]	0.04 [0.02,0.06]	0.08 [0.02,0.13]	0.06 [0.02,0.09]	0.05 [0.02,0.08]
2003	0.28 [0.22,0.35]	0.13 [0.09,0.18]	0.07 [0.03,0.10]	0.03 [0.00,0.06]	0.04 [0.02,0.07]
2004	0.32 [0.25,0.38]	0.49 [0.40,0.57]	0.26 [0.18,0.34]	0.06 [0.03,0.08]	0.04 [0.01,0.06]
Talks to parents about ‘close things’					
Hardly ever	0.47 [0.40,0.53]	0.48 [0.39,0.56]	0.39 [0.30,0.48]	0.34 [0.27,0.41]	0.34 [0.29,0.40]
Regularly	0.40 [0.33,0.46]	0.38 [0.30,0.47]	0.38 [0.29,0.47]	0.49 [0.42,0.56]	0.50 [0.44,0.56]
Most days	0.13 [0.09,0.18]	0.14 [0.09,0.19]	0.22 [0.15,0.30]	0.17 [0.12,0.22]	0.16 [0.11,0.20]
Argues with parents					

Table 4-5		Excluded girls (N = 968, 1,648 observations)			
Age	**11 yrs**	**12 yrs**	**13 yrs**	**14 yrs**	**15 yrs**
Variables	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**
Hardly ever	0.16 [0.11,0.20]	0.26 [0.18,0.33]	0.32 [0.24,0.41]	0.21 [0.16,0.27]	0.29 [0.23,0.34]
Regularly	0.42 [0.36,0.49]	0.36 [0.28,0.44]	0.39 [0.30,0.48]	0.45 [0.39,0.52]	0.41 [0.35,0.47]
Most days	0.42 [0.35,0.48]	0.38 [0.31,0.46]	0.29 [0.21,0.37]	0.33 [0.27,0.40]	0.3 [0.25,0.35]
Friendship Quality					
Happy with friends	0.95 [0.92,0.98]	0.95 [0.91,0.98]	0.94 [0.90,0.98]	0.94 [0.91,0.98]	0.92 [0.89,0.95]
Unhappy with friends	0.05 [0.02,0.08]	0.05 [0.02,0.09]	0.06 [0.02,0.10]	0.06 [0.02,0.09]	0.08 [0.05,0.11]
Family functioning					
Happy	0.98 [0.97,0.99]	0.89 [0.83,0.95]	0.89 [0.84,0.95]	0.87 [0.82,0.92]	0.84 [0.79,0.88]
Unhappy	0.02 [0.01,0.03]	0.11 [0.05,0.17]	0.11 [0.05,0.16]	0.13 [0.08,0.18]	0.16 [0.12,0.21]
Family Structure					
Intact	0.62 [0.56,0.69]	0.59 [0.51,0.67]	0.59 [0.50,0.68]	0.65 [0.58,0.71]	0.64 [0.59,0.70]
Reconstituted	0.12 [0.08,0.16]	0.17 [0.12,0.23]	0.15 [0.10,0.21]	0.13 [0.09,0.18]	0.12 [0.08,0.16]
Single Parent	0.26 [0.20,0.31]	0.24 [0.16,0.31]	0.26 [0.18,0.34]	0.22 [0.16,0.28]	0.23 [0.18,0.28]
Relative income					
Average	0.56 [0.50,0.63]	0.60 [0.52,0.68]	0.51 [0.42,0.61]	0.52 [0.45,0.59]	0.53 [0.47,0.59]
High	0.26 [0.20,0.32]	0.22 [0.15,0.29]	0.26 [0.17,0.34]	0.28 [0.21,0.34]	0.25 [0.19,0.30]
Low	0.17 [0.13,0.22]	0.18 [0.12,0.24]	0.23 [0.15,0.31]	0.21 [0.15,0.26]	0.22 [0.17,0.27]
Maternal Education					
< GCSE	0.39 [0.32,0.46]	0.37 [0.29,0.46]	0.42 [0.32,0.53]	0.40 [0.33,0.47]	0.44 [0.38,0.50]
GCSE	0.27 [0.21,0.33]	0.25 [0.17,0.33]	0.25 [0.16,0.34]	0.33 [0.26,0.40]	0.28 [0.23,0.34]
A-level	0.11 [0.07,0.16]	0.10 [0.05,0.16]	0.11 [0.04,0.17]	0.09 [0.05,0.13]	0.09 [0.06,0.12]
Diploma or Degree	0.23 [0.17,0.29]	0.27 [0.19,0.35]	0.22 [0.14,0.30]	0.18 [0.13,0.24]	0.19 [0.14,0.24]
Maternal Depression					
Not depressed	0.74 [0.67,0.80]	0.70 [0.62,0.79]	0.61 [0.50,0.72]	0.65 [0.58,0.72]	0.67 [0.62,0.73]
Depressed	0.26 [0.20,0.33]	0.30 [0.21,0.38]	0.39 [0.28,0.50]	0.35 [0.28,0.42]	0.33 [0.27,0.38]
Urban / Rural					
Rural	0.18 [0.13,0.22]	0.16 [0.11,0.22]	0.20 [0.13,0.28]	0.26 [0.20,0.32]	0.27 [0.22,0.32]
Urban	0.82 [0.78,0.87]	0.84 [0.78,0.89]	0.80 [0.72,0.87]	0.74 [0.68,0.80]	0.73 [0.68,0.78]
Region					
Midlands/East of England	0.24 [0.18,0.30]	0.22 [0.15,0.29]	0.26 [0.17,0.35]	0.20 [0.14,0.26]	0.23 [0.18,0.28]
London	0.11 [0.06,0.15]	0.10 [0.05,0.15]	0.13 [0.06,0.19]	0.08 [0.05,0.12]	0.08 [0.05,0.11]

Table 4-5		Excluded girls (N = 968, 1,648 observations)			
Age	**11 yrs**	**12 yrs**	**13 yrs**	**14 yrs**	**15 yrs**
Variables	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**
North West of England	0.11 [0.06,0.15]	0.10 [0.04,0.15]	0.10 [0.03,0.16]	0.11 [0.06,0.15]	0.09 [0.06,0.13]
North of England	0.14 [0.09,0.19]	0.13 [0.07,0.19]	0.08 [0.03,0.14]	0.11 [0.06,0.16]	0.11 [0.07,0.14]
Northern Ireland	0.01 [0.01,0.01]	0.02 [0.01,0.02]	0.01 [0.01,0.02]	0.01 [0.01,0.02]	0.01 [0.01,0.02]
Scotland	0.09 [0.07,0.12]	0.11 [0.07,0.14]	0.09 [0.05,0.13]	0.15 [0.11,0.20]	0.17 [0.13,0.21]
South of England	0.25 [0.19,0.31]	0.26 [0.19,0.34]	0.23 [0.15,0.31]	0.23 [0.17,0.30]	0.24 [0.18,0.29]
Wales	0.06 [0.03,0.08]	0.07 [0.04,0.10]	0.10 [0.05,0.15]	0.10 [0.07,0.14]	0.07 [0.05,0.10]
Neighbourhood deprivation					
Least Deprived (Q1)	0.08 [0.05,0.12]	0.06 [0.03,0.10]	0.10 [0.04,0.16]	0.16 [0.10,0.21]	0.13 [0.09,0.17]
Q2	0.12 [0.08,0.17]	0.15 [0.09,0.22]	0.09 [0.04,0.14]	0.13 [0.09,0.17]	0.15 [0.11,0.19]
Average	0.24 [0.18,0.30]	0.20 [0.13,0.26]	0.14 [0.08,0.21]	0.16 [0.11,0.21]	0.21 [0.16,0.26]
Q4	0.24 [0.18,0.29]	0.25 [0.17,0.32]	0.24 [0.16,0.32]	0.22 [0.17,0.28]	0.21 [0.16,0.25]
Most Deprived (Q5)	0.32 [0.25,0.38]	0.34 [0.27,0.42]	0.43 [0.33,0.52]	0.33 [0.27,0.40]	0.30 [0.24,0.35]
Social fragmentation					
Least fragmented (Q1)	0.20 [0.14,0.25]	0.22 [0.14,0.30]	0.13 [0.06,0.19]	0.14 [0.09,0.19]	0.14 [0.10,0.18]
Q2	0.18 [0.13,0.23]	0.15 [0.09,0.21]	0.11 [0.05,0.17]	0.19 [0.14,0.25]	0.17 [0.13,0.22]
Average (Q3)	0.15 [0.11,0.20]	0.17 [0.11,0.23]	0.22 [0.14,0.30]	0.20 [0.15,0.25]	0.20 [0.15,0.25]
Q4	0.20 [0.15,0.26]	0.14 [0.09,0.20]	0.17 [0.10,0.24]	0.19 [0.14,0.25]	0.21 [0.16,0.26]
Most fragmented (Q5)	0.27 [0.21,0.33]	0.32 [0.24,0.39]	0.38 [0.29,0.48]	0.27 [0.21,0.34]	0.27 [0.21,0.33]
Moves Residence					
Non-Mover	…	0.97 [0.94,1.00]	0.86 [0.79,0.93]	0.98 [0.97,1.00]	0.95 [0.91,0.98]
Mover	…	0.03 [0.00,0.06]	0.14 [0.07,0.21]	0.02 [-0.00,0.03	0.05 [0.02,0.09]
Deprivation mobility					
Non-Mover	…	0.97 [0.94,1.00]	0.86 [0.79,0.93]	0.98 [0.97,1.00]	0.95 [0.91,0.98]
Moves to Same	…	0.02 [-0.01,0.05	0.06 [0.01,0.10]	0.01 [-0.01,0.02	0.01 [-0.00,0.03
Moves to Better	…	0.00 [-0.00,0.00	0.03 [-0.00,0.06	0.00 [-0.00,0.01	0.02 [-0.00,0.04
Moves to Worse	…	0.01 [-0.00,0.02	0.05 [0.01,0.10]	0.01 [-0.01,0.02	0.02 [0.00,0.04]
Fragmentation mobility					
Non-Mover	…	0.97 [0.94,1.00]	0.86 [0.79,0.93]	0.98 [0.97,1.00]	0.95 [0.91,0.98]
Moves to Same	…	0.02 [-0.01,0.04	0.01 [-0.01,0.04	0.02 [-0.00,0.03	0.02 [-0.00,0.04
Moves to Better	…	0.00 [-0.00,0.00	0.05 [0.01,0.09]	0.00 [0.00,0.00]	0.01 [-0.01,0.03
Moves to Worse	…	0.01 [-0.01,0.03	0.08 [0.02,0.13]	0.00 [0.00,0.00]	0.02 [0.00,0.04]

Table 4-6. Population weighted proportions and 95% confidence intervals for excluded BYP boys by age (N = 1038, obs. 1886).

Table 4-6	Excluded boys (N = 1038, observations=1886)				
Age	**11 yrs**	**12 yrs**	**13 yrs**	**14 yrs**	**15 yrs**
Variables	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**
Self-Esteem					
Low Self-Esteem	0.86 [0.83,0.90]	0.90 [0.86,0.94]	0.92 [0.87,0.97]	0.89 [0.85,0.94]	0.94 [0.92,0.97]
High Self-Esteem	0.14 [0.10,0.17]	0.10 [0.06,0.14]	0.08 [0.03,0.13]	0.11 [0.06,0.15]	0.06 [0.03,0.08]
Self-Esteem change					
Maintain High	…	…	0.89 [0.81,0.96]	0.79 [0.66,0.91]	0.96 [0.92,1.00]
Improvement	…	…	0.06 [-0.00,0.12	0.13 [0.02,0.23]	0.00 [-0.00,0.01
Decline	…	…	0.05 [0.01,0.10]	0.09 [-0.00,0.18	0.03 [-0.01,0.07
Maintain Low	…	…	0.00 [0.00,0.00]	0.00 [0.00,0.00]	0.00 [0.00,0.00]
Ethnicity					
White	0.91 [0.88,0.95]	0.91 [0.87,0.96]	0.89 [0.83,0.95]	0.88 [0.83,0.93]	0.89 [0.85,0.94]
Visible minority	0.09 [0.05,0.12]	0.09 [0.04,0.13]	0.11 [0.05,0.17]	0.12 [0.07,0.17]	0.11 [0.06,0.15]
Year					
1994	0.04 [0.02,0.06]	0.04 [0.02,0.06]	0.15 [0.09,0.21]	0.30 [0.24,0.36]	0.23 [0.18,0.28]
1995	0.01 [0.00,0.02]	0.05 [0.02,0.07]	0.05 [0.02,0.09]	0.09 [0.05,0.13]	0.23 [0.18,0.28]
1996	0.03 [0.01,0.05]	0.02 [0.00,0.04]	0.06 [0.03,0.10]	0.04 [0.01,0.06]	0.06 [0.03,0.08]
1997	0.03 [0.01,0.04]	0.03 [0.01,0.05]	0.03 [0.00,0.05]	0.04 [0.01,0.06]	0.02 [0.01,0.04]
1998	0.05 [0.03,0.07]	0.05 [0.02,0.08]	0.07 [0.03,0.11]	0.07 [0.04,0.10]	0.07 [0.04,0.10]
1999	0.04 [0.01,0.06]	0.05 [0.03,0.07]	0.07 [0.03,0.11]	0.05 [0.03,0.08]	0.04 [0.02,0.06]
2000	0.09 [0.06,0.12]	0.07 [0.03,0.10]	0.14 [0.09,0.20]	0.12 [0.08,0.16]	0.10 [0.07,0.14]
2001	0.09 [0.05,0.12]	0.12 [0.08,0.16]	0.10 [0.04,0.16]	0.10 [0.06,0.14]	0.10 [0.06,0.14]
2002	0.08 [0.05,0.11]	0.06 [0.03,0.10]	0.07 [0.03,0.11]	0.05 [0.02,0.09]	0.07 [0.04,0.10]
2003	0.26 [0.20,0.31]	0.11 [0.07,0.15]	0.08 [0.03,0.12]	0.05 [0.02,0.09]	0.04 [0.01,0.06]
2004	0.29 [0.24,0.35]	0.40 [0.33,0.47]	0.17 [0.11,0.24]	0.08 [0.04,0.12]	0.04 [0.02,0.07]
Talks to parents about ‘close things’					
Hardly ever	0.47 [0.41,0.53]	0.53 [0.46,0.59]	0.48 [0.40,0.57]	0.51 [0.45,0.57]	0.47 [0.41,0.53]
Regularly	0.36 [0.30,0.42]	0.34 [0.27,0.40]	0.38 [0.30,0.46]	0.35 [0.29,0.41]	0.4 [0.34,0.45]
Most days	0.17 [0.12,0.21]	0.13 [0.09,0.18]	0.14 [0.08,0.20]	0.14 [0.09,0.19]	0.13 [0.09,0.18]
Argues with parents					

Table 4-6		Excluded boys (N = 1038, observations=1886)			
Age	**11 yrs**	**12 yrs**	**13 yrs**	**14 yrs**	**15 yrs**
Variables	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**
Hardly ever	0.25 [0.20,0.30]	0.29 [0.23,0.35]	0.4 [0.32,0.48]	0.34 [0.28,0.40]	0.34 [0.29,0.40]
Regularly	0.36 [0.30,0.41]	0.4 [0.33,0.47]	0.39 [0.31,0.48]	0.46 [0.40,0.53]	0.45 [0.39,0.51]
Most days	0.39 [0.34,0.45]	0.31 [0.25,0.37]	0.2 [0.14,0.27]	0.19 [0.14,0.25]	0.21 [0.16,0.25]
Friendship Quality					
Happy with friends	0.95 [0.92,0.98]	0.97 [0.95,0.99]	0.98 [0.96,1.00]	0.94 [0.91,0.97]	0.95 [0.92,0.97]
Unhappy with friends	0.05 [0.02,0.08]	0.03 [0.01,0.05]	0.02 [0.00,0.04]	0.06 [0.03,0.09]	0.05 [0.03,0.08]
Family functioning					
Happy	0.96 [0.94,0.98]	0.98 [0.97,1.00]	0.95 [0.92,0.98]	0.90 [0.86,0.93]	0.92 [0.90,0.95]
Unhappy	0.04 [0.02,0.06]	0.02 [0.00,0.03]	0.05 [0.02,0.08]	0.10 [0.07,0.14]	0.08 [0.05,0.10]
Family Structure					
Intact	0.59 [0.54,0.65]	0.55 [0.49,0.62]	0.57 [0.48,0.65]	0.60 [0.53,0.66]	0.58 [0.52,0.64]
Reconstituted	0.16 [0.12,0.20]	0.18 [0.13,0.22]	0.10 [0.06,0.15]	0.10 [0.07,0.13]	0.12 [0.09,0.16]
Single Parent	0.25 [0.20,0.30]	0.27 [0.21,0.33]	0.33 [0.25,0.41]	0.30 [0.24,0.37]	0.29 [0.24,0.35]
Relative income					
Average	0.51 [0.45,0.57]	0.54 [0.47,0.60]	0.48 [0.39,0.56]	0.52 [0.46,0.59]	0.46 [0.40,0.52]
High	0.28 [0.23,0.34]	0.26 [0.21,0.32]	0.31 [0.23,0.38]	0.19 [0.14,0.24]	0.28 [0.22,0.33]
Low	0.21 [0.16,0.25]	0.20 [0.14,0.25]	0.22 [0.15,0.28]	0.28 [0.22,0.34]	0.26 [0.21,0.31]
Maternal Education					
< GCSE	0.34 [0.28,0.40]	0.35 [0.28,0.42]	0.42 [0.32,0.52]	0.44 [0.37,0.51]	0.42 [0.36,0.48]
GCSE	0.28 [0.22,0.34]	0.31 [0.24,0.38]	0.27 [0.19,0.36]	0.24 [0.18,0.29]	0.30 [0.24,0.36]
A-level	0.11 [0.07,0.14]	0.12 [0.07,0.16]	0.12 [0.06,0.18]	0.08 [0.05,0.12]	0.07 [0.04,0.09]
Diploma or Degree	0.27 [0.21,0.33]	0.22 [0.16,0.28]	0.19 [0.11,0.27]	0.24 [0.18,0.30]	0.21 [0.17,0.26]
Maternal Depression					
Not depressed	0.65 [0.59,0.71]	0.72 [0.65,0.79]	0.71 [0.62,0.80]	0.68 [0.61,0.75]	0.69 [0.63,0.75]
Depressed	0.35 [0.29,0.41]	0.28 [0.21,0.35]	0.29 [0.20,0.38]	0.32 [0.25,0.39]	0.31 [0.25,0.37]
Urban / Rural					
Rural	0.23 [0.18,0.28]	0.27 [0.21,0.32]	0.31 [0.23,0.39]	0.29 [0.23,0.35]	0.29 [0.24,0.34]
Urban	0.77 [0.72,0.82]	0.73 [0.68,0.79]	0.69 [0.61,0.77]	0.71 [0.65,0.77]	0.71 [0.66,0.76]
Region					
Midlands/East of England	0.24 [0.19,0.29]	0.25 [0.19,0.31]	0.21 [0.15,0.28]	0.21 [0.16,0.26]	0.22 [0.17,0.26]
London	0.08 [0.04,0.11]	0.10 [0.05,0.14]	0.13 [0.06,0.19]	0.13 [0.07,0.18]	0.09 [0.05,0.14]

Table 4-6		Excluded boys (N = 1038, observations=1886)			
Age	**11 yrs**	**12 yrs**	**13 yrs**	**14 yrs**	**15 yrs**
Variables	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**	**Prop [95% CI]**
North West of England	0.12 [0.08,0.16]	0.10 [0.06,0.14]	0.09 [0.04,0.15]	0.10 [0.06,0.14]	0.10 [0.07,0.14]
North of England	0.15 [0.11,0.20]	0.13 [0.08,0.18]	0.08 [0.04,0.13]	0.09 [0.06,0.13]	0.13 [0.09,0.17]
Northern Ireland	0.01 [0.00,0.01]	0.01 [0.01,0.02]	0.02 [0.01,0.03]	0.02 [0.01,0.02]	0.01 [0.00,0.01]
Scotland	0.09 [0.07,0.12]	0.11 [0.08,0.14]	0.15 [0.10,0.20]	0.16 [0.12,0.20]	0.14 [0.11,0.18]
South of England	0.26 [0.21,0.31]	0.24 [0.18,0.30]	0.26 [0.19,0.34]	0.23 [0.17,0.28]	0.25 [0.20,0.30]
Wales	0.05 [0.03,0.07]	0.06 [0.04,0.08]	0.05 [0.03,0.07]	0.07 [0.04,0.09]	0.05 [0.04,0.07]
Neighbourhood deprivation					
Least Deprived (Q1)	0.10 [0.06,0.13]	0.11 [0.07,0.16]	0.13 [0.06,0.19]	0.12 [0.08,0.16]	0.10 [0.06,0.14]
Q2	0.15 [0.11,0.20]	0.15 [0.10,0.20]	0.13 [0.08,0.19]	0.14 [0.09,0.18]	0.18 [0.13,0.22]
Average	0.24 [0.19,0.29]	0.23 [0.17,0.29]	0.25 [0.17,0.33]	0.23 [0.17,0.28]	0.24 [0.20,0.29]
Q4	0.23 [0.18,0.28]	0.22 [0.16,0.27]	0.24 [0.17,0.31]	0.24 [0.18,0.29]	0.24 [0.19,0.29]
Most Deprived (Q5)	0.28 [0.22,0.33]	0.29 [0.23,0.35]	0.25 [0.18,0.33]	0.28 [0.22,0.34]	0.24 [0.19,0.29]
Social fragmentation					
Least fragmented (Q1)	0.16 [0.12,0.21]	0.15 [0.10,0.20]	0.16 [0.09,0.23]	0.15 [0.10,0.20]	0.14 [0.10,0.18]
Q2	0.18 [0.14,0.23]	0.22 [0.16,0.28]	0.15 [0.10,0.21]	0.19 [0.15,0.24]	0.20 [0.16,0.25]
Average (Q3)	0.18 [0.13,0.22]	0.17 [0.12,0.23]	0.12 [0.07,0.17]	0.16 [0.11,0.20]	0.15 [0.11,0.19]
Q4	0.20 [0.15,0.24]	0.21 [0.16,0.27]	0.29 [0.21,0.37]	0.21 [0.15,0.26]	0.25 [0.20,0.30]
Most fragmented (Q5)	0.28 [0.22,0.33]	0.25 [0.19,0.31]	0.27 [0.19,0.35]	0.29 [0.23,0.36]	0.26 [0.20,0.31]
Moves Residence					
Non-Mover	…	0.92 [0.88,0.96]	0.94 [0.90,0.98]	0.94 [0.89,0.98]	0.94 [0.91,0.98]
Mover	…	0.08 [0.04,0.12]	0.06 [0.02,0.10]	0.06 [0.02,0.11]	0.06 [0.02,0.09]
Deprivation mobility					
Non-Mover	…	0.92 [0.88,0.96]	0.94 [0.90,0.98]	0.94 [0.89,0.98]	0.94 [0.91,0.98]
Moves to Same	…	0.02 [-0.00,0.04	0.01 [-0.01,0.04	0.04 [-0.00,0.08	0.01 [-0.00,0.01
Moves to Better	…	0.02 [-0.00,0.04	0.02 [-0.00,0.05	0.01 [-0.00,0.03	0.02 [0.00,0.04]
Moves to Worse	…	0.04 [0.01,0.08]	0.02 [-0.00,0.05	0.01 [-0.00,0.02	0.03 [0.00,0.05]
Fragmentation mobility					
Non-Mover	…	0.92 [0.88,0.96]	0.94 [0.90,0.98]	0.94 [0.89,0.98]	0.94 [0.91,0.98]
Moves to Same	…	0.01 [-0.00,0.03	0.01 [-0.01,0.04	0.03 [-0.01,0.07	0.01 [-0.00,0.02
Moves to Better	…	0.01 [-0.01,0.03	0.02 [-0.01,0.04	0.02 [-0.00,0.05	0.02 [0.00,0.04]
Moves to Worse	…	0.05 [0.02,0.09]	0.03 [-0.00,0.05	0.01 [-0.00,0.02	0.03 [0.00,0.05]

4.4 Individuals and families in NLSCY and BYP neighbourhoods

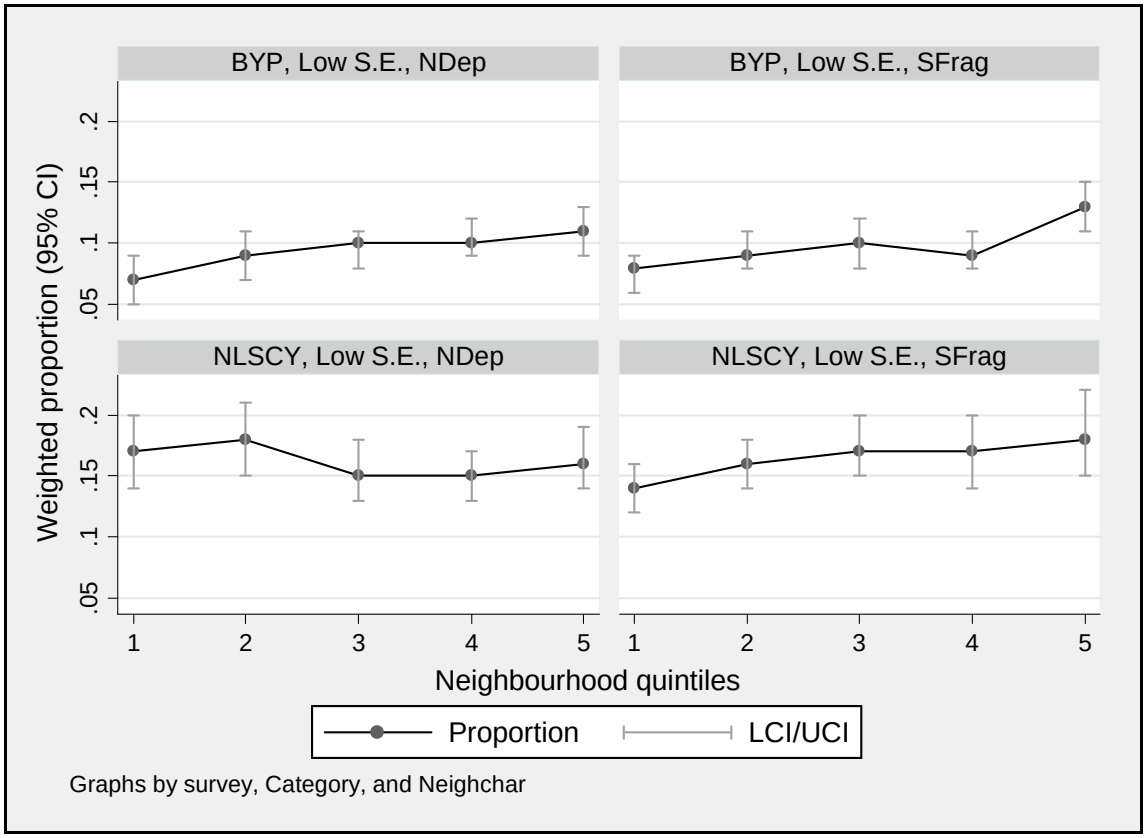
This section discusses the distribution of self-esteem and the other individual and family variables by levels of neighbourhood deprivation and social fragmentation in the two samples. Chi square statistics are used to highlight where neighbourhood characteristics quintiles are associated statistically with each variable.

4.4.1 Neighbourhood characteristics and self-esteem

A simple description of low self-esteem plotted against neighbourhood deprivation supports the equalisation hypothesis for the NLSCY data and weakly supports the deprivation amplification hypothesis in the BYP. Specifically, there is a very weak inverse gradient between current low self-esteem and neighbourhood deprivation in the BYP, but no discernible pattern in the NLSCY data.

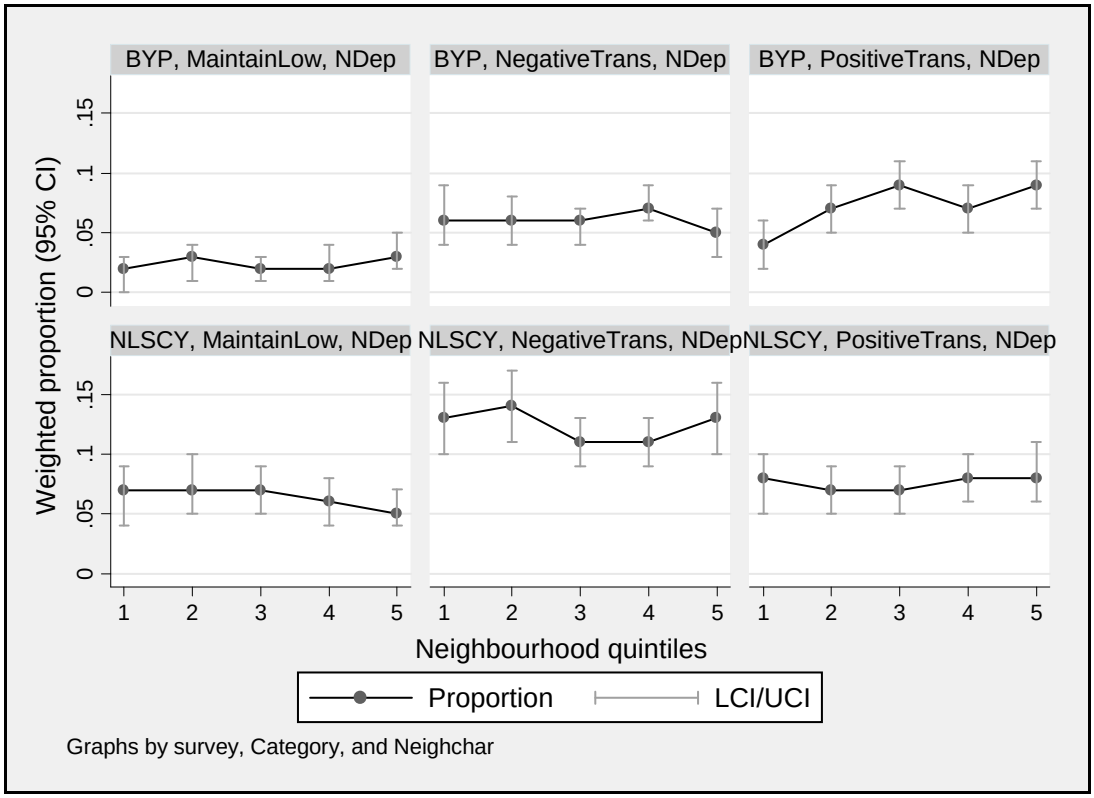
The plots with social fragmentation appear to mirror this finding, a higher proportion of adolescents report low self-esteem in the most fragmented neighbourhoods in the UK relative to the least fragmented. Again, this pattern is not observed in the NLSCY.

Graph 4-2: Weighted proportions of low self-esteem by quintiles of neighbourhood deprivation



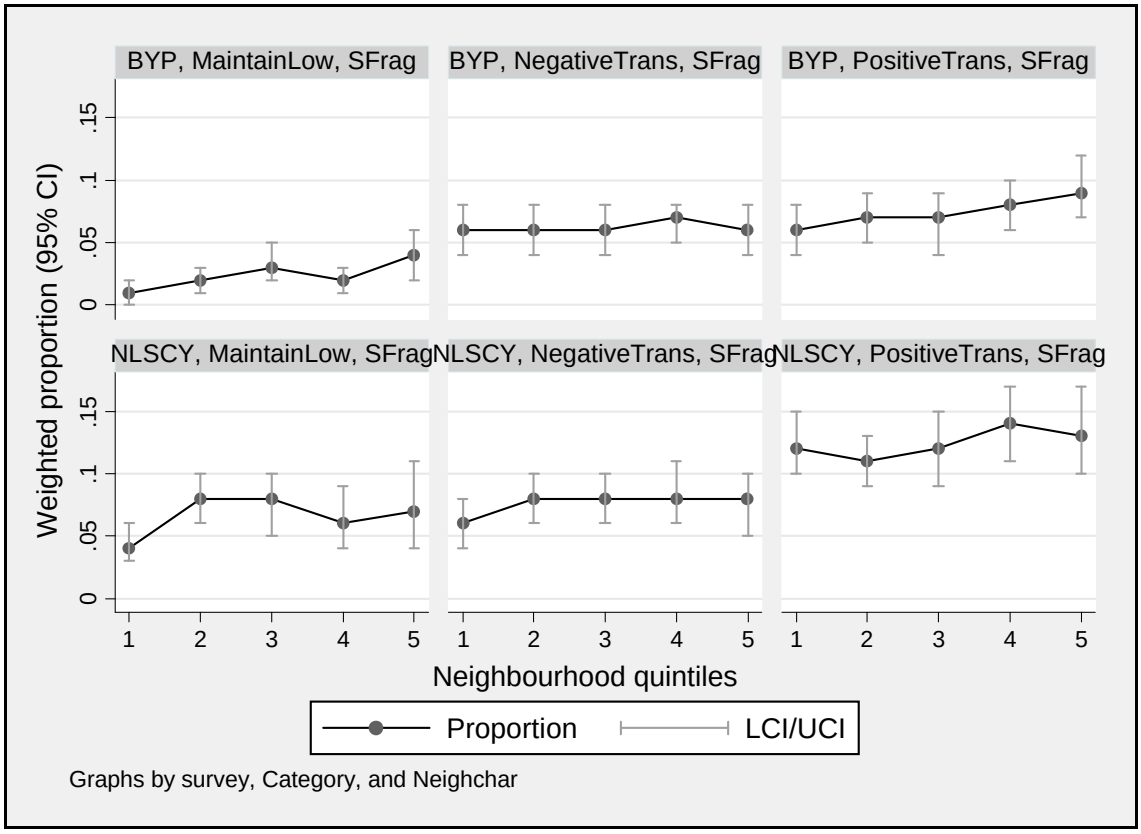
When change in self-esteem is graphed by levels of deprivation, the associations observed in the BYP are not strongly evident. Only one change outcome (positive transitions in self-esteem), shows any relationship with either neighbourhood deprivation (see Graph 4-3) or social fragmentation (see Graph 4-4).

Graph 4-3: Weighted proportions of change in self-esteem categories by quintiles of neighbourhood deprivation.



Where MaintainLow indicates self-esteem is maintained at low levels between t1 and t2, NegativeTrans indicates that self-esteem declines, PositiveTrans indicates an improvements in self-esteem (i.e. low at t1 but high at t2), and NDep indicates neighbourhood deprivation. LCI and UCI indicate Lower and Upper Confidence Intervals respectively.

Graph 4-4: Weighted proportions of change in self-esteem categories by quintiles of social fragmentation.



Where MaintainLow indicates self-esteem is maintained at low levels between t1 and t2, NegativeTrans indicates that self-esteem declines, PositiveTrans indicates an improvements in self-esteem (i.e. low at t1 but high at t2), and SFrag indicates social fragmentation. LCI and UCI indicate Lower and Upper Confidence Intervals respectively.

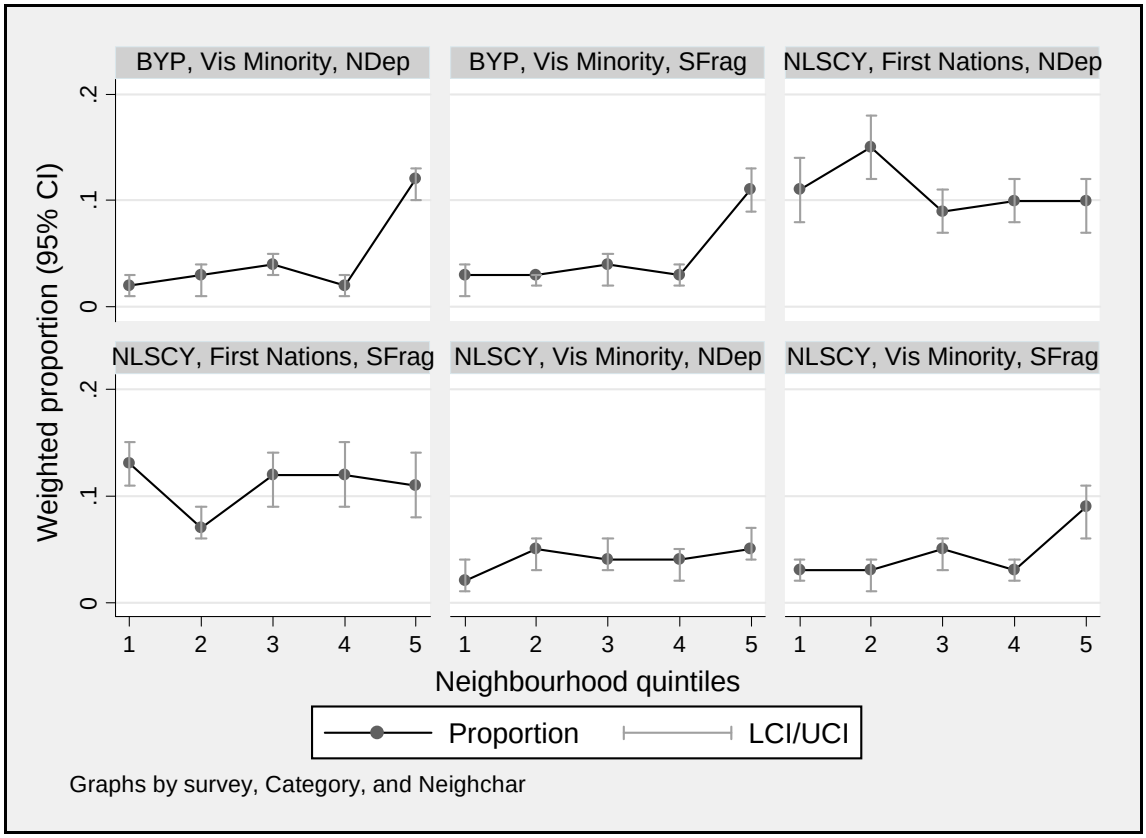
4.4.2 Individual characteristics as confounders of any neighbourhood deprivation or social fragmentation relationships

Examination of the distribution of age, sex and year of entry into the survey did not show descriptive relationship with neighbourhood deprivation.

Adolescents who belonged to visible minority groups were clustered in the most deprived and the most fragmented 20% of neighbourhoods in the UK, but no distinct pattern was observed for these groups in Canada (Graph 4-5). As membership of these groups is theoretically associated with mental health and self-esteem (see section 2.5.2), they could be potential

confounders of the neighbourhood deprivation and self-esteem relationships in the UK, but not Canada.

Graph 4-5: Distribution of adolescents from visible minority and First Nation race/ethnicity groups by neighbourhood characteristics in the UK and Canada.



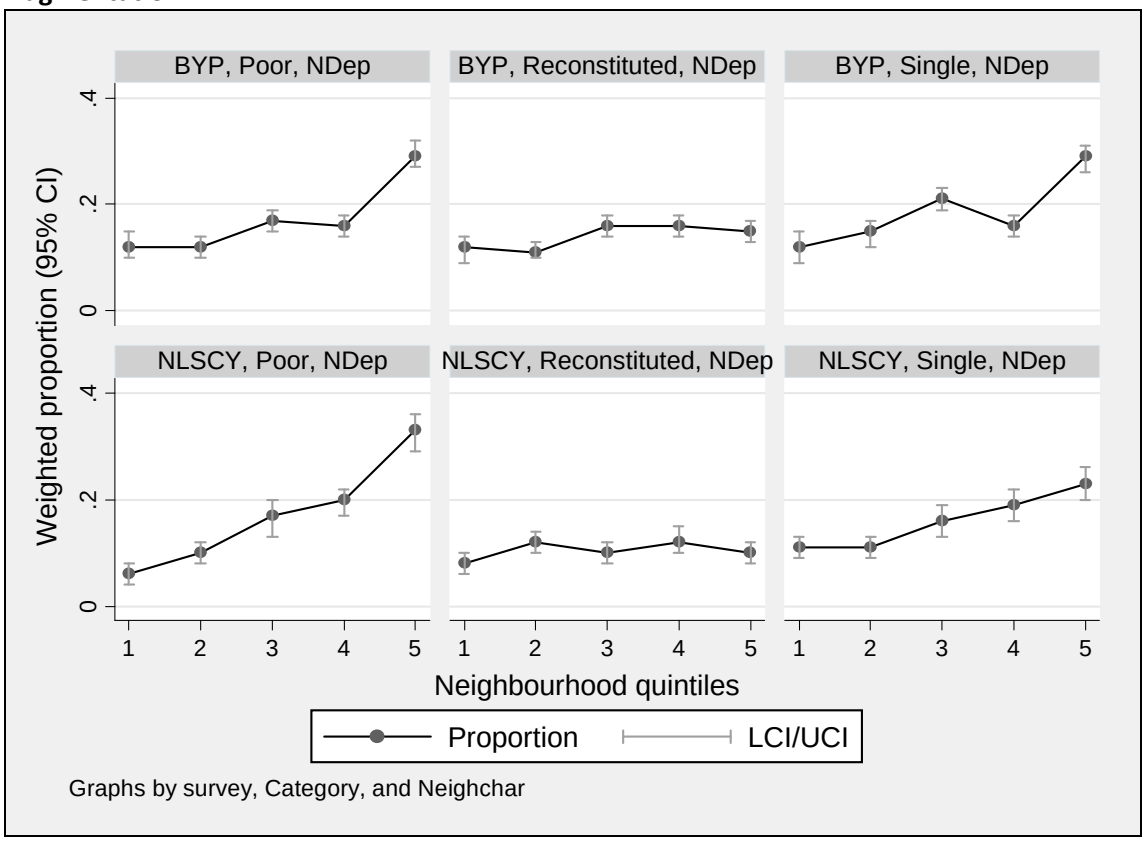
Where 'Vis Minority' refers to Visible Minority, SFrag refers to social fragmentation, NDep refers to neighbourhood deprivation and LCI and UCI refer to Lower and Upper Confidence Intervals respectively.

Investigation of adolescents' perceptions of their relationships with their parents did not vary by neighbourhood deprivation or social fragmentation, consistent with previous work in this field (Wickrama and Bryant, 2003).

Family structure, socio-economic status and maternal depression were all observed to vary by levels of neighbourhood deprivation and social fragmentation. Patterns were similar for neighbourhood deprivation and social fragmentation and so are shown for neighbourhood deprivation below in Graph 4-6. The proportions of low income families (and those with low

educational qualifications although this is not shown) is associated with neighbourhood deprivation, and therefore a potential confounder. However, while this pattern is also evident for intact (not shown) and single parent families, reconstituted families are not clustered by neighbourhood deprivation or social fragmentation. Therefore, while living in a reconstituted family may be important for explaining variations in self-esteem or change in self-esteem, it will not confound the relationship between self-esteem and neighbourhood characteristics.

Graph 4-6: Distribution of key family characteristics by neighbourhood deprivation and social fragmentation.

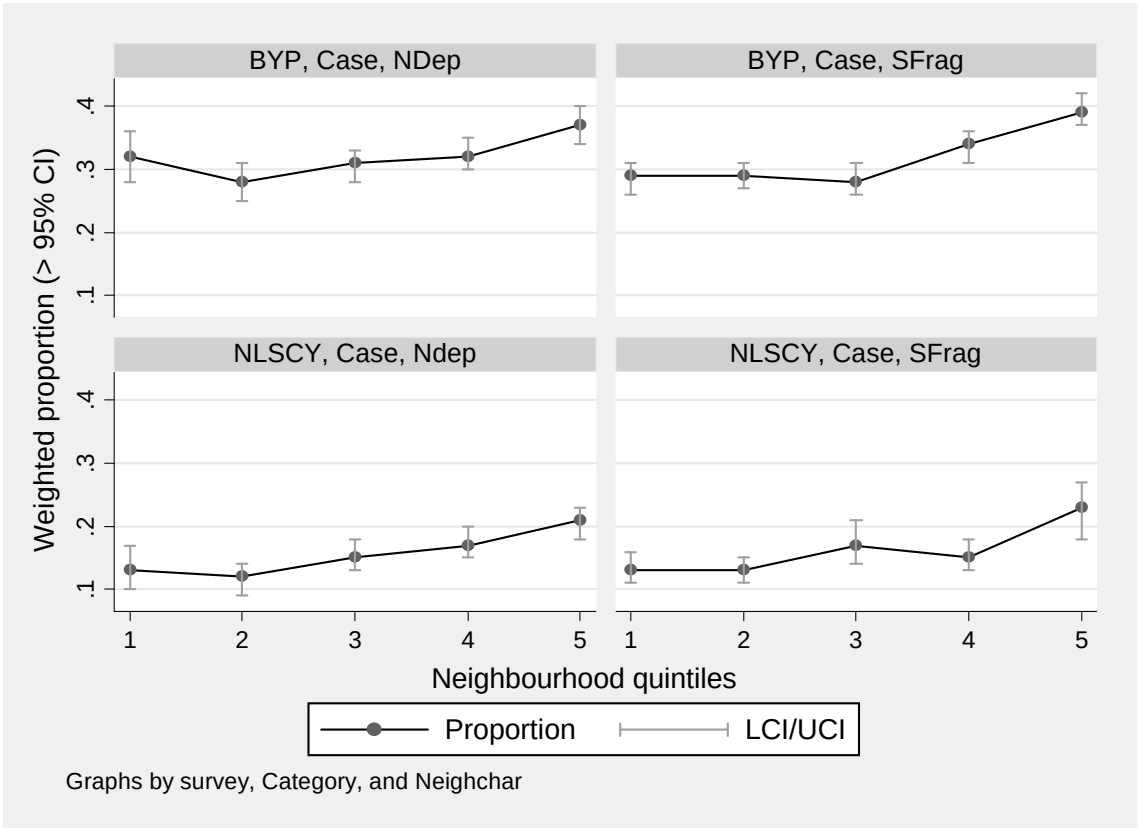


Where 'Poor' refers to poor households, NDep to neighbourhood deprivation, 'Single' to single parent households, LCI and UCI to Lower and Upper Confidence Intervals respectively.

Maternal depression is another potential compositional variable identified in the review of mental health in adulthood in, and is also an important covariate of adolescent self-esteem and mental health (see section 2.5.3). The distribution of maternal depression by neighbourhood deprivation and social fragmentation in the two surveys analysed here is presented below in Graph 4-7. These graphs all suggest that maternal depression may be

associated with both neighbourhood deprivation and social fragmentation in both surveys. This means that theoretically it may act as a confounder of the relationship between self-esteem and neighbourhood characteristics.

Graph 4-7: Distribution of maternal depression by neighbourhood deprivation and social fragmentation



Where 'Case' refers to case of maternal depression, NDep to neighbourhood deprivation, SFrag to social fragmentation and LCI and UCI refer to Lower and Upper Confidence Intervals respectively.

Overall, this analysis has highlighted that some aspects of the individual and family model should be expected to explain self-esteem, but not confound the relationship between self-esteem and neighbourhood characteristics. These include age, sex, year of measurement, perceptions of relationships with friends and parents, and living in a reconstituted family.

Other characteristics may explain part of the variation in self-esteem and also, due to their associations with neighbourhood characteristics described here, confound the relationships under investigation. These include household socio-economic status (maternal education and income) and single parent family status.

4.5 Variance components models

Chapter three described that clustering in the data may have important implications for the inference of statistical significance for any observed relationships in the data. The models described below assess the magnitude and statistical significance of clustering that is evident at a neighbourhood level (between individuals in neighbourhoods) and at an individual level (between repeated measures in individuals).

The models presented in Table 4-7 show that clustering due to the longitudinal nature of the data accounts for a considerable degree of the variation in low self-esteem. In a model which partitions the variation into between and within-individual variation only, the between-individual variation accounts for 43% of the variation in low self-esteem in the NLSCY (M1a), and 48% of the variation in the BYP (M2a). This is clearly a large and substantial proportion of the variation. The MOR gives an interpretation of this on an odds scale. The MOR for the NLSCY (M1a) between-individual variance is 4.46 while the BYP MOR is 5.21. These are relatively large effect sizes, and show that when individuals are compared across the dataset there is, on average, a five-fold difference in the odds of reporting low self-esteem. Finally, when the two-level model is compared to a single level logistic regression model fitted to the same data, the likelihood ratio test indicates that there are considerable differences between the models (chi squared value = 361 for NLSCY and 354 for BYP) and is significant at the 99.9% level ($p < 0.001$) in both cases. In summary, between-individual clustering in low self-esteem represents a large proportion of the variation overall and must be taken account of in any given modelling strategy to avoid over-estimating the standard errors in the model.

In stark contrast, the between-neighbourhood variation makes up considerably less of the variation in low self-esteem. In the NLSCY, only 2% of the variation in self-esteem is attributable to differences between neighbourhoods (M1b), consistent with other work on mental health reported by Matheson et al. (2006) for adults, while in the BYP, around 6% is attributable to this source of variation (consistent with estimates reported by Fagg et al. (2006) for UK adolescents (M2b). This variation is translated into relatively low MOR values of 1.43 in the NLSCY and 1.82 in the BYP (although these are reasonable). Most importantly however, is that the likelihood ratio test indicates that the there is no substantial or statistically significant difference in the fit to the data as a result of including the between the NLSCY model and the two-level model (M1a), suggesting that these between-neighbourhood variation may have arisen from chance alone. In fact, the increase in the AIC value (the difference in AIC values between M1b and M1a) suggests that the increase in complexity in the model is not justified by the reduction in fit. A similar finding is evident for the BYP. The likelihood ratio test indicates that only a small additional benefit to fit is achieved through inclusion of the random parameter (chi squared value equals 4, p=0.021). Therefore, there may be some small between-neighbourhood variation due to the inclusion of the random intercept term, over and above what might be expected from chance alone. However, this is of such a small magnitude that it is highly unlikely to alter the conclusions drawn from the research. While the log likelihood reduces by a small amount, the decrease in the AIC term between the two and three level models (difference in AIC between M2b and M2a) indicates that the increase in fit achieved is only very small, and that the fit of the model is not improved by the addition of the random intercept term.

Overall, these models show that between-individual variation in low self-esteem introduces considerable clustering to the models which must be taken account of. They also show that while there is limited evidence of between-neighbourhood variation in low self-esteem in the BYP, this is likely to have no impact on the statistical inference of models and does not need to

be adjusted for in order to establish reliable estimates of the associations between neighbourhood deprivation and low self-esteem in either survey. This is an example, of how multilevel models can, and should, be used to highlight cases where between-neighbourhood variation is *not* an important parameter (Duncan et al., 1998).

Table 4-7: Magnitude and significance of between-neighbourhood and between-individual clustering in the NLSCY (n=3421) and BYP (n=1922)

	NLSCY (n=3421)		BYP (n=1922)	
Parameters	**M1a: Ind.**	**M1b: Ind. + Neigh.**	**M2a: Ind.**	**M2b: Ind. + Neigh.**
Variance (standard error)				
Neighbourhood	…	0.087 (0.151)	…	0.39 (0.21)
Adolescent	2.821 (0.272)	2.73 (0.309)	2.30 (0.95)	2.56 (0.35)
Median Odds Ratio				
Neighbourhood	…	1.33	…	1.82
Adolescent	4.96	4.84	5.21	4.60
Intra-class correlation				
Neighbourhood	…	7%	…	6%
Adolescent	43%	37%	48%	41%
Fit				
Log likelihood	-3675	-3675	-2404	-2402
AIC	7434	7436	4812	4810
Lrtest against null	Chi = 361, p<0.001	Chi = 361, p < 0.001	Chi = 354, p <0.001	Chi = 358, p < 0.001
Lrtest against Ind. model	…	Chi = 0.65, p =0.421	…	Chi = 4, p=0.021
Neighbourhood N (min, mean, max)	…	1958 (1, 4, 200)	…	851 (2,9,62)
Adolescents N (min, mean, max)	2432 (2,3,3)	2432 (2,3,3)	1922 (2,4,5)	1922 (2,4,5)

Where 'lrtest' refers to the likelihood ratio test and tests statistical significance of differences between models. 'AIC' refers to Akaike's Information Criteria and tests improvements in fit over and above increases in complexity.

4.6 Discussion

This chapter has considered key aspects of the NLSCY and BYP samples which are highly relevant in the following chapters in terms of what modelling strategy should be employed and how results from those models should be interpreted.

The models have shown that overall the NLSCY is generalisable to adolescents who were 4-11 in 1994. The same is generally true for the BYP sample, which represents adolescents aged 11-

15 between 1994-2004. It is of note that this sample may slightly under-represent those reporting low self-esteem in the population. It is also of note that while neighbourhood deprivation is similar in the NLSCY sample and those who were excluded, social fragmentation was not. In the BYP, this was the case for both the neighbourhood deprivation and social fragmentation variables. This means that results from the analyses can be generalised with some robustness, but more caution should be used when generalising associations between self-esteem and social fragmentation, and neighbourhood characteristics in the UK.

The analysis of neighbourhood showed that some but not all individual and family covariates may confound the relationships between neighbourhood characteristics and self-esteem.

The variance components models showed that between-individual variation is likely to have important inferences for the statistical significance of relationships between neighbourhood (and individual and family) covariates of self-esteem, but that any effects of neighbourhood clustering are negligible. A two-level modelling taking account of between-individual variation strategy is therefore most appropriate. The next chapter uses this approach to model relationships between neighbourhood deprivation and current low self-esteem.

CHAPTER 5 – EQUALISATION IN LOW SELF-ESTEEM

5.1 Introduction

This chapter considers the concurrent associations between low self-esteem and neighbourhood deprivation in a similar way to a cross-sectional analysis. As such, the chapter explicitly addresses the first two research questions set out by the literature review.

1. *Is there support for socio-economic equalisation in early adolescent self-esteem in the UK and Canada across household socio-economic status and neighbourhood deprivation?*

2. *Is support for equalisation consistent across the socio-geographic levels of family, neighbourhood, region and nation?*

The analysis runs in four stages for both the NLSCY and the BYP. Firstly, an individual model is developed (section 5.2) which examines associations between low self-esteem and individual and family level characteristics. This is important for establishing whether there is evidence for equalisation at the household level, that is, are the indicators of household socio-economic status used here (income, maternal education, lone parent family) associated with low self-esteem. If not, then the findings may support equalisation, if so, they may be more indicative of a social inequalities perspective. In addition the associations, combined with results from chapter four which investigated the distribution of these individual and family characteristics by neighbourhood deprivation, will highlight where neighbourhood composition is an important process which might explain low self-esteem. If factors are simultaneously associated with both neighbourhood deprivation and with low self-esteem, then they can be considered to confound the relationship in a way indicative of a compositional explanation.

The next section addresses the second part of the first research question (5.3), examining whether neighbourhood deprivation is associated with low self-esteem on an unadjusted and / or an adjusted basis. These tests establish the relative support *over the whole sample* for the equalisation or deprivation amplification hypotheses.

The third section (5.4) tests the equalisation hypothesis in more detail, examining whether there is evidence for trends with age and differences by sex. It also examines whether relationships are different across different sub-groups of adolescents within the population defined by their sociological and socio-geographic characteristics.

Finally, having established differences by sex for several variables, the analysis stratifies the models by sex to consider the evidence from the independent perspectives of boys and girls (section 5.5). The findings from the chapter are then summarised and discussed in detail in a final section (5.6).

All logistic regression tables include the following abbreviations: 'OR' for odds ratio; '[95%CI]' for 95% confidence interval"; and 'p' for p-value. The AIC and log likelihood value give an indication of the statistical fit of the model to the data. The criteria are indicative of fit only, and are not used to select variables or models as this was done on a purely theoretical basis on the recommendation of Long and Freese (1999). In addition, it is important to remember that when using a two-level multilevel model for longitudinal data (that is, a repeated measures model with a between-individual intercept term), odds ratios are interpreted as the odds of the outcome (low self-esteem) being reported by a given a adolescent in a deprived neighbourhood (for example), compared to the *same* adolescent in an affluent neighbourhood (Carrière and Bouyer, 2002). This is distinct from a single level logistic regression which reports the *average* odds of all adolescents in deprived neighbourhoods compared to the *average* odds of all adolescents in affluent neighbourhoods. Variance inflation factor (VIF) statistics were calculated for the full models in both surveys to determine whether multicollinearity

between independent coefficients was of particular concern: all VIF were less than five indicating that multicollinearity was not a significant problem (see section 3.5.2.4).

5.2 Individual and family associations with low self-esteem

5.2.1 NLSCY

Table 5-1 presents the unadjusted associations (M1) between individual and family covariates and low self-esteem, with 95% confidence intervals and p values. The other models then progressively adjust for three sets of variables including demographic characteristics (M2); perceptions of parenting and friends (M3); and family environment (M4).

The odds of reporting low self-esteem are higher in older adolescents than the same adolescents when they are younger. There is a weak gradient to this relationship. In this context, a gradient relates to the observation that with increasing age, the estimated odds of low self-esteem also progressively increase (M1: Age 12/13 OR = 2.20 [1.87, 2.59]) than (M1: Age 14/15 OR = 2.67 [2.26, 3.15]) when compared to 10/11 year old age-group. The finding is robust to adjustment and is only attenuated marginally by the other demographic characteristics (M2) and perceptions of the adolescent (M3). The increase in the proportions of adolescents reporting low self-esteem with increasing age is consistent with growth curve studies which suggest that self-esteem declines over time (Baldwin and Hoffmann, 2002).

Girls report raised odds relative to boys. This is consistent with a large body of literature which reports lower self-esteem in girls (Robins et al., 2002; Kling et al., 1999). Adjustment for the other variables does not attenuate the statistical significance of the odds ratios, although the odds ratio for girls is increased substantially with adjustment for perceptions of parenting and friends (M3). This suggests that the effects of sex may strongly interact with perceptions of parenting and friends. Again, this assertion is consistent with studies focussed on the gendered importance of peer networks (Valentine, 2000).

Ethnicity, as measured using the adolescents' ancestry (reported by PMK), has no observable association with their odds of reporting low self-esteem, before or after adjustment. This is likely to be at least partially due to the conflation of very heterogeneous groups into the same category. For example, earlier work on adolescent mental health shows that adolescents self-identifying as 'Indian' heritage report lower psychological distress than those who identify with a 'White British' status (Fagg et al., 2006). In contrast, those who identify themselves as Black African or Black Caribbean report higher levels of psychological distress than 'White British' adolescents. As both these groups are conflated in this analysis, it is therefore not surprising that there are no differences overall.

Adolescents from a First Nations heritage do not report lower self-esteem than those 'Canadian' backgrounds. This group faces particular problems in Canada on a number of health outcomes (Richmond and Ross, 2009) and may be expected to evaluate their self-worth more critically when they are living in the wider (i.e. non-Reserve) community. However, evidence from the UK and the US suggests that ethnic minority individuals do not draw comparisons with individuals outside their own ethnic group, but make comparisons with those inside (Zagefka and Brown, 2005; Rosenberg, 1965). This difference in reference group is an important component of self-esteem and yet is rarely testable with general surveys. Exploring the role of reference groups would provide important insights into the development of self-esteem in this age group, and on the operation of important contextual effects which could not be explored here such as the ethnic density effect (Whitley et al., 2004).

The unadjusted associations between years of measurement are sizeable and strong, respondents in 1994 had lower odds of reporting low self-esteem than any other year (see M1). All statistically significant findings were highly significant, well above the 95% threshold of confidence. These associations are entirely attenuated after adjustment for age, sex and ethnicity (see M2). While the odds ratios become significant for 1998 and 2002, the general

inconsistencies in these findings combined with a lack of a plausible theoretical interpretation, leads to a conclusion that these associations are spurious.

Adolescents' perceptions of their relationships with parents and friends are strongly and significantly associated with their unadjusted odds of reporting low self-esteem (see M1). For each unit increase on the parental nurture scale, the odds of reporting low self-esteem are reduced by 21% (OR =0.79 [0.78, 0.81]). In contrast, for each unit increase on the parental rejection scale, the odds of reporting low self-esteem increase by 19%. Both associations are highly statistically significant, $p < 0.001$ in all cases, and the estimates precise. The findings for parents are consistent with a large body of work on self-esteem in this age group (Coopersmith, 1967; Rosenberg, 1965; Greene and Way, 2005; Glendinning, 1999).

The unadjusted association presented in M1 suggests that each increase on the friendship quality scale is associated with a 26% reduction in odds. The relationship is not substantially affected by adjustment for demographic characteristics (M2), perceptions of parents (M3), or independently-measured aspects of the family environment (M4). These findings for peers were also consistent with an emerging body of work examining self-esteem (Greene and Way, 2005; Glendinning, 1999).

Unadjusted associations are observed between low self-esteem and all independently-measured categories of the family environment (see M1). However, many of these associations are strongly attenuated by adjustment. Family functioning is found to be protective. For each unit increase on the McMaster family functioning scale, the odds of adolescents reporting low self-esteem reduces by 11%. This association is attenuated to non-significance after adjustment for all individual and family factors in M4. This is inconsistent with other work on the NLSCY which found that when members of the same sample were children, family functioning was associated with a composite vulnerability index (Racine and Boyle, 2002). However that study did not control for other aspects of the family environment

such as relationships with parents to the same degree. This may explain the attenuation of the association between low self-esteem and family functioning in this analysis.

Adolescents living in reconstituted families have 1.86 [1.46, 2.38] times the unadjusted odds of reporting low self-esteem than those in intact families and a slightly weaker association (OR = 1.69 [1.37,2.09]) is observed for single-parent families (see M1). However, both are strongly attenuated by adjustment (in M4), the single parent family association, to non-significance (Reconstituted OR = 1.50 95%CI: 1.15, 1.97; Single OR = 1.07, [0.83, 1.39]). These findings are replicated in several studies which do not conflate single parent and reconstituted family environments (McMunn et al., 2001; Rodgers and Pryor, 1998; Fagg et al., 2006).

M1 suggests that HH income is associated with the odds of adolescents reporting low self-esteem: those from low income families have 1.32 [1.09,1.59] times the odds of reporting low self-esteem than those living in average income families, while those in high income families have reduced odds (OR = 0.73 [0.61,0.88]). However, both these associations are attenuated to non-significance after adjustment (see M4).

The unadjusted associations between levels of maternal education and low self-esteem are presented in M1. Adolescents whose mothers report having a high school education have reduced odds (OR = 0.77 95%CI: 0.63, 0.94]), while those whose mothers have degrees or a diploma are half as likely to report low self-esteem (OR = 0.54, 95%CI: 0.40, 0.72]). While the unadjusted difference between high school and less than high school education is reduced to non-significance in M4, the unadjusted association between those with degrees and diplomas and low self-esteem is only slightly attenuated (OR = 0.66, [0.48,0.91]). These findings are consistent with work by Emerson et al. (2005) who find that emotional disorders in adolescents are associated with high levels of maternal education.

Maternal depression is associated with increased odds of reporting low self-esteem on an unadjusted basis in M1 (OR = 1.44, [1.19, 1.74]), but this is attenuated to non-significance by adjustment in M4. This is inconsistent with previous literature for adolescent mental health (Ford et al., 2004; Brown and Harris, 1978), but might be explained by the extensive adjustment in these models for relationships between adolescents and parents which might be the mechanism through which maternal depression might be expected to be associated with low self-esteem in this age group.

In terms of the between-individual clustering, there was substantial clustering observed in the null model in chapter four (section 4.5: Table 4-7: M1a) where the median odds ratio was equal to 4.46. Addition of the demographic characteristics increased this substantially to an MOR of 5.53 indicating that taking account of the age and sex of the individual increased the between-individual variability in low self-esteem. This is interesting because it suggests that the demographic parameters *increase* the amount of between-individual variation rather than explain it. When the perceptions variables are added to the model, the MOR is significantly attenuated to 3.73, but the independently measured family environment variables do not attenuate this at all.

The log likelihood value of the demographic model can be compared with that derived from the null model fitted in chapter four (Table 4-7). The log likelihood in that case was -4220. A likelihood ratio test establishes that the difference between the null model and the demographic model is statistically different at the 95% level. Similarly the perceptions models is statistically different from the demographic model and the family environment is different from the perceptions model, all at the 95% level. It is notable that the difference between the family environment and the perceptions model is quite marginal (p=0.034).

Examination of the AIC shows that improvements in fit are parsimonious over all three models. Compared to the two level null model with no parameters presented in chapter four (section

4.5: Table 4-7: M1a), the AIC is reduced from 8445 to 7155, a substantial drop indicating an improvement in fit as a result of the inclusion of the demographic characteristics. Fit is improved significantly again with the addition of the perceptions variables to 5915 but then only marginally to 5907 with the addition of the independently measured aspects of family environment.

Table 5-1: Associations between individual and family characteristics and low self-esteem in the NLSCY (N= 3421)

Covariates	M1: Unadjusted OR [95% CI] p	M2: Demographics OR [95% CI] p	M3: Perceptions OR [95% CI] p	M4: Family environment OR [95% CI] p
Age (ref. 10/11 yrs)				
12/13 yrs	2.20 [1.87,2.59] <0.000	2.23 [1.82,2.73] <0.000	2.30 [1.82,2.92] <0.000	2.34 [1.84,2.98] <0.000
14/15 yrs	2.67 [2.26,3.15] <0.000	2.57 [2.02,3.28] <0.000	2.33 [1.76,3.08] <0.000	2.33 [1.75,3.11] <0.000
Sex (ref. boys)				
Girls	1.59 [1.34,1.88] <0.000	1.62 [1.36,1.94] <0.000	2.95 [2.45,3.57] <0.000	2.92 [2.40,3.54] <0.000
Ethnicity (ref. Canadian)				
European	0.86 [0.70,1.07] 0.178	0.85 [0.68,1.07] 0.161	0.84 [0.67,1.05] 0.125	0.89 [0.71,1.12] 0.329
First Nations	1.02 [0.74,1.41] 0.911	1.01 [0.72,1.42] 0.937	0.88 [0.62,1.24] 0.456	0.93 [0.65,1.32] 0.674
Other Visible Minority	1.34 [0.87,2.07] 0.179	1.34 [0.86,2.11] 0.201	0.91 [0.58,1.42] 0.683	0.89 [0.56,1.41] 0.606
Year (ref. 1994)				
1996	1.51 [1.16,1.95] 0.002	0.87 [0.65,1.17] 0.371	1.08 [0.76,1.53] 0.685	1.11 [0.78,1.60] 0.558
1998	2.66 [2.07,3.42] <0.000	1.22 [0.89,1.66] 0.216	1.85 [1.29,2.67] 0.001	1.95 [1.34,2.84] <0.000
2000	1.83 [1.39,2.42] <0.000	0.74 [0.51,1.05] 0.091	1.11 [0.74,1.65] 0.624	1.16 [0.77,1.75] 0.472
2002	3.26 [2.41,4.42] <0.000	1.03 [0.68,1.54] 0.897	1.62 [1.04,2.54] 0.033	1.71 [1.08,2.70] 0.022
2004	3.62 [2.48,5.27] <0.000	1.03 [0.63,1.69] 0.896	1.51 [0.89,2.58] 0.128	1.24 [0.68,2.26] 0.483
Parental Nurture	0.79 [0.78,0.81] <0.000		0.81 [0.79,0.83] <0.000	0.81 [0.79,0.83] <0.000
Parental Rejection	1.19 [1.16,1.21] <0.000		1.13 [1.10,1.15] <0.000	1.12 [1.09,1.14] <0.000
Friendship Quality	0.74 [0.72,0.76] <0.000		0.72 [0.70,0.74] <0.000	0.72 [0.69,0.74] <0.000
Family Functioning	0.88 [0.83,0.93] <0.000			1.00 [0.94,1.07] 1.000
Family Structure (ref. Intact)				
Reconstituted	1.86 [1.46,2.38] <0.000			1.50 [1.15,1.97] 0.003
Single Parent	1.69 [1.37,2.09] <0.000			1.07 [0.83,1.39] 0.590
HH income (ref. Average)				
High	0.73 [0.61,0.88] 0.001			0.90 [0.72,1.12] 0.340
Low	1.32 [1.09,1.59] 0.005			1.11 [0.88,1.40] 0.389
Maternal Education (ref. < High School)				
High School	0.77 [0.63,0.94] 0.012			0.87 [0.69,1.09] 0.226
Diploma or Degree	0.54 [0.40,0.72] <0.000			0.66 [0.48,0.91] 0.011
Maternal Depression (ref. Not depressed)				
Depressed	1.44 [1.19,1.74] <0.000			1.17 [0.94,1.47] 0.160
Log likelihood		-3565	-2942	-2930
AIC	n/a	7155	5915	5907
MOR	n/a	5.53	3.73	3.71

5.2.2 BYP

The unadjusted and progressively adjusted associations between individual and family contexts in the BYP are reported in Table 5-2. In contrast to the NLSCY, there is little apparent association between age and low self-esteem. While 14 year olds report significantly and 15 year olds report marginally higher odds of low self-esteem, this pattern is not in the form of a gradient with increasing self-esteem. As with the NLSCY, the significance of the age variable is attenuated by the inclusion of the perceptions of relationships with parents and friends variables in M2 although in contrast to the NLSCY, the attenuation is to non-significance.

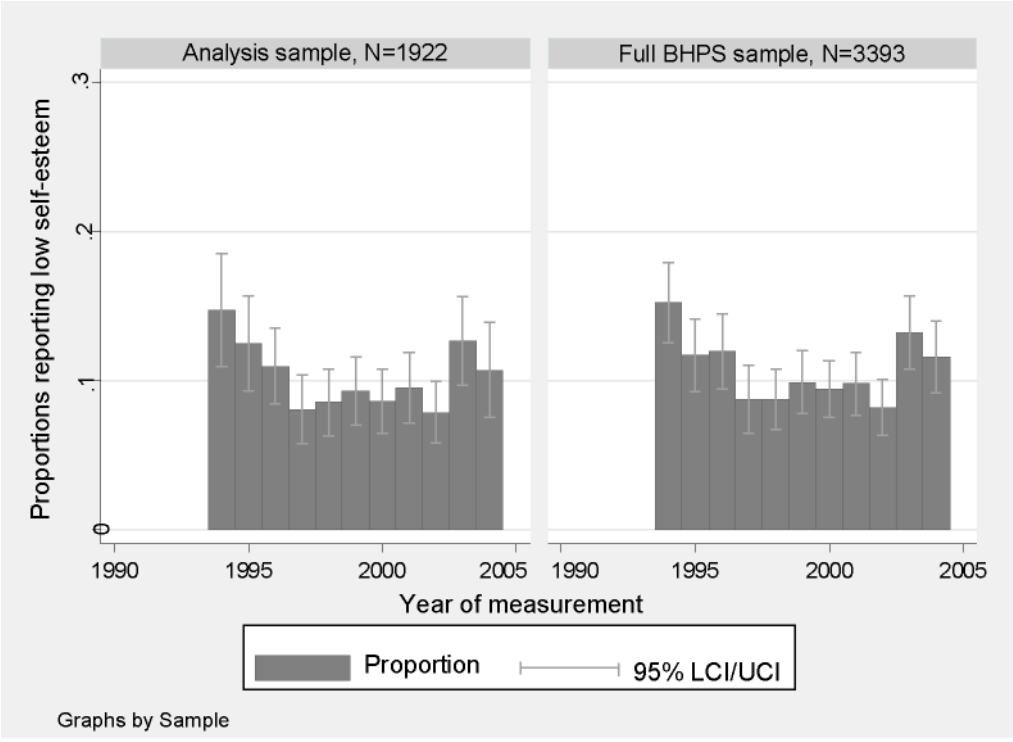
As with the NLSCY, being a girl is positively associated with increased odds of reporting low self-esteem (see M1). This finding is robust to adjustment for demographic (see M2), perceptions (M3) and family environment (M4). This is consistent with the finding from the NLSCY in direction and magnitude and also consistent with the literature mentioned above.

Belonging to a visible minority ethnic group in the UK is not associated with low self-esteem (see M1 to M4). Again, this is consistent with the findings from the NLSCY and is discussed above.

There are strong associations between year of entry and low self-esteem even after adjustment for all demographic, perceptions and family environment factors. While several associations are associated on an unadjusted basis and then attenuated to non-significance by adjustment (1996 and 2004), several are not explained by other factors in the model (1997-2002). The differences between the non-respondents and the respondents highlighted in chapter four (section 4.3.2) indicate that there is potential for this to be a design effect, caused by differential exclusion. However, this seems unlikely as comparison of the weighted proportions of low self-esteem for the full BYP sample and the analysis sample by year shows

that both have very similar proportions of low self-esteem by year indicating that the design effect did not influence this distribution (see Graph 5-1). Other mechanisms which might be possible would be a change in survey design from 1994 to later years. However, the only significant change was from a paper-based collection (PAPI) to a computer-based method, which came into effect in 1999. Otherwise, questions relating to self-esteem were the same at each year, contextually (i.e. no other questions were asked in 1994 which weren't asked in later years) and in terms of content. Given that the lowest odds of reporting low self-esteem are in the middle years, this could be due to bias introduced by repeatedly questioning individuals on the self-esteem. It may be that adolescents are more likely to evaluate these questions negatively when they are first asked, or become desensitised after having been asked once. Under this explanation, as the proportion who have been previously exposed will increase year on year, the proportions reporting low self-esteem could conceivably drop. However, this does not account for the increased proportions at the end of the survey.

Graph 5-1: Weighted proportions reporting low self-esteem by year in the BYP analysis sample and full samples.



Adolescent-perceived measures of relationships with parents indicated that adolescents who perceived that they talked with both parents very regularly reported lower odds of low self-esteem than those who talked with parents on a 'normal' basis. This suggests that this indicator was measuring a positive communication and not indicative of problems in the relationship. This inference is seemingly confirmed by comparisons of adolescents who reported 'hardly ever' talking with their parents. This category as associated with significantly raised odds of low self-esteem relative to normal levels of low self-esteem.

Negative aspects of the parent-adolescent relationships were measured by the frequency of arguments between adolescents and their parents. Adolescents who reported arguments on most days with parents were associated with raised odds of low self-esteem, infrequent arguments, with lower odds. The unadjusted associations for these two variables were not attenuated substantially after adjustment for other variables (see M2, M3, M4). This is similar way to the analogous variables in the NLSCY (parental nurturance and rejection variables).

The variable measuring whether adolescents were unhappy with their friends was also, as expected, associated with raised odds of low self-esteem. However, the odds associated with this variable were considerably stronger than the variables for parent-adolescent relationships. This was not similar to the NLSCY where peer relationships (measured by the friendship scale) were associated to a similar magnitude.

The youth-reported measure in the BYP which captured how happy the adolescents felt with their families was, like the analogous measure for peers, very strongly associated with the odds of reporting low self-esteem. The strength of these associations, while expected theoretically, might be explained by the nature of the questions. 'Happiness' with friends or family might require more personal reflection on the self, than recall of arguments or talking

about close things with parents – therefore there may be a closer conceptual overlap leading to an over-estimate of the relationship.

Family structure was associated with low self-esteem in a very similar way to that observed in the NLSCY data. Adolescents living in single and reconstituted families in the UK reported lower self-esteem on an unadjusted basis, but this was attenuated by taking account of perceptions of relationships with parents and other aspects of the family environment. The attenuation was to non-significance for single parent families but associations remained significant for reconstituted families. The magnitude and significance of the odds ratios were comparable to those observed in the NLSCY.

Household income was associated on an unadjusted basis with raised odds, and affluence with lowered odds of reporting low self-esteem relative to adolescents living in median income families (see M1). The relationship between deprivation and low self-esteem was attenuated to non-significance after adjustment (see M4), as in the NLSCY. However, the relationship between relative affluence at the household level and low self-esteem remains significantly protective after adjustment (see M4), where it did not in the NLSCY.

There was no unadjusted relationship between the intermediate levels of maternal education (GCSE and A-level) in the BYP (see M1), where high school education was significant on an unadjusted (but not after adjustment) in the NLSCY. The highest level of maternal education (degree or diploma) is associated with lower odds of low self-esteem in the BYP on an unadjusted (see M1) and adjusted basis (see M4). This is consistent with the NLSCY and with published reports of this relationship (Emerson et al., 2005).

While maternal depression was associated on an unadjusted basis with low self-esteem in the NLSCY, this was attenuated to non-significance after adjustment in that survey. In contrast,

maternal depression in the BYP is significantly associated with increased odds of low self-esteem in the BYP both before (see M1) and after adjustment (M4). This finding is consistent with previous research which suggests that maternal depression is an independent risk factor for adolescent psychological health in the UK (Ford et al., 2004; Brown and Harris, 1978). However, as mentioned above, it is possible that the finding was attenuated to non-significance in the NLSCY because the parenting and family functioning variables. As these were multi-item psychometric scales in the NSLCY, and single item questions in the BYP, it is possible that if they had been measured with less error in the NLSCY than the BYP then this association would have been completely attenuated by adjustment.

The between-individual MOR was, in contrast to the NLSCY findings, systematically reduced with the inclusion of the demographic characteristics (relative to the null model presented in chapter four, Table 4-7: M2a). The inclusion of the perceptions and then the independently measured family characteristics also attenuated this variance.

Compared to the null model (log likelihood of -2404 reported in Table 4-7) the demographic model was significantly different under the chi-squared distribution at 95% level of confidence ($p<0.001$). This was the same for the whole sequence, i.e. null > demographic > perceptions > family environment, all at $p<0.001$. When fit was adjusted for complexity by the AIC, a similar finding emerged, suggesting that the models were not only different, but also improved on a parsimonious basis by the inclusion of all parameters. This is in contrast to the NLSCY findings where the fit improvements were not necessarily parsimonious for the family environment parameters

Table 5-2: Associations between individual and family characteristics and low self-esteem in the BYP (N = 1922, obs = 7738)

Table 5-2 Covariates	M1: Unadjusted OR [95%CI] p	M2: Demographic OR [95%CI] p	M3: Perceptions OR [95%CI] p	M4: Family Environment OR [95%CI] p
Age (ref. 11)				
12	1.26 [0.95,1.68] 0.106	1.25 [0.93,1.67] 0.134	1.17 [0.88,1.57] 0.285	1.13 [0.84,1.52] 0.415
13	1.16 [0.88,1.53] 0.299	1.17 [0.87,1.56] 0.299	1.05 [0.78,1.41] 0.756	0.97 [0.72,1.32] 0.868
14	1.42 [1.06,1.89] 0.017	1.50 [1.10,2.05] 0.010	1.27 [0.93,1.74] 0.136	1.13 [0.82,1.55] 0.467
15	1.31 [0.97,1.77] 0.081	1.43 [1.02,2.00] 0.040	1.18 [0.84,1.66] 0.342	1.03 [0.73,1.45] 0.870
Sex (ref. Boys)				
Girls	2.20 [1.71,2.84] 0.000	2.22 [1.72,2.86] 0.000	2.13 [1.67,2.73] 0.000	2.11 [1.65,2.69] 0.000
Ethnicity (ref. Non-visible)				
Visible minority	0.97 [0.50,1.88] 0.937	1.10 [0.57,2.12] 0.773	0.98 [0.52,1.85] 0.948	0.93 [0.49,1.74] 0.812
Year (ref. 1994)				
1995	0.80 [0.50,1.29] 0.366	0.73 [0.45,1.19] 0.211	0.73 [0.45,1.19] 0.205	0.67 [0.41,1.10] 0.117
1996	0.67 [0.42,1.07] 0.095	0.60 [0.37,0.96] 0.032	0.61 [0.38,0.98] 0.042	0.57 [0.35,0.93] 0.023
1997	0.45 [0.27,0.75] 0.002	0.39 [0.23,0.65] 0.000	0.39 [0.23,0.66] 0.000	0.36 [0.22,0.61] 0.000
1998	0.48 [0.29,0.78] 0.003	0.42 [0.25,0.69] 0.001	0.41 [0.25,0.68] 0.001	0.38 [0.23,0.64] 0.000
1999	0.56 [0.35,0.92] 0.022	0.49 [0.29,0.80] 0.005	0.52 [0.31,0.86] 0.011	0.50 [0.30,0.83] 0.008
2000	0.52 [0.32,0.83] 0.007	0.44 [0.27,0.72] 0.001	0.46 [0.28,0.75] 0.002	0.44 [0.27,0.72] 0.001
2001	0.55 [0.34,0.88] 0.013	0.45 [0.28,0.74] 0.002	0.48 [0.29,0.78] 0.003	0.46 [0.28,0.75] 0.002
2002	0.48 [0.30,0.78] 0.003	0.38 [0.23,0.63] 0.000	0.41 [0.25,0.67] 0.000	0.39 [0.23,0.65] 0.000
2003	0.87 [0.54,1.41] 0.571	0.65 [0.39,1.10] 0.107	0.71 [0.42,1.18] 0.186	0.70 [0.41,1.17] 0.168
2004	0.73 [0.43,1.22] 0.230	0.53 [0.30,0.94] 0.030	0.56 [0.31,0.99] 0.045	0.53 [0.30,0.94] 0.030
Talks with parents (ref. 'Regular')				
Hardly ever	1.31 [1.04,1.66] 0.022		1.39 [1.09,1.77] 0.007	1.35 [1.06,1.72] 0.016
Most days	0.54 [0.40,0.75] 0.000		0.61 [0.44,0.85] 0.003	0.67 [0.48,0.93] 0.017
Argues with parents (ref. 'Regular')				
Hardly ever	0.45 [0.36,0.58] 0.000		0.50 [0.39,0.63] 0.000	0.56 [0.43,0.71] 0.000
Most days	2.02 [1.44,2.81] 0.000		1.79 [1.28,2.52] 0.001	1.58 [1.12,2.23] 0.010
Happiness with friends (ref. Happy)				
Unhappy with friends	6.57 [4.74,9.09] 0.000		6.37 [4.60,8.82] 0.000	5.27 [3.79,7.33] 0.000
Happiness with family (ref. Happy)				

Table 5-2 **Covariates**	**M1: Unadjusted** **OR [95%CI] p**	**M2: Demographic** **OR [95%CI] p**	**M3: Perceptions** **OR [95%CI] p**	**M4: Family Environment** **OR [95%CI] p**
Unhappy with family	6.30 [4.68,8.48] 0.000			4.25 [3.14,5.75] 0.000
Family Structure (ref. Intact)				
Reconstituted	2.04 [1.51,2.76] 0.000			1.74 [1.30,2.33] 0.000
Single Parent	1.61 [1.19,2.18] 0.002			1.10 [0.80,1.51] 0.550
HH income (ref. Average)				
High	0.63 [0.49,0.82] 0.001			0.65 [0.50,0.86] 0.002
Low	1.33 [1.04,1.70] 0.023			1.22 [0.95,1.58] 0.123
Maternal Education (ref. <GCSE)				
GCSE	0.77 [0.57,1.04] 0.088			0.87 [0.65,1.16] 0.331
A-level	0.70 [0.44,1.11] 0.130			0.85 [0.55,1.33] 0.479
Diploma or degree	0.62 [0.44,0.87] 0.005			0.70 [0.50,0.97] 0.034
Maternal Depression (ref. Not depressed)				
Depressed	1.51 [1.24,1.85] 0.000			1.42 [1.16,1.74] 0.001
Log likelihood	n/a	-2314	-2214	-2143
AIC	n/a	4665	4473	4349
Between-individual MOR	n/a	5.01	4.39	4.12

5.3 Neighbourhood associations with low self-esteem

5.3.1 NLSCY

The results reported below address the first research question. Associations between neighbourhood deprivation and social fragmentation are assessed first on an unadjusted basis, and then after adjusted for the full individual and family models previously developed for the NLSCY (M4 in Table 5-1) and the BYP (M4 in Table 5-2).

There are no statistically significant unadjusted associations between quintiles of neighbourhood deprivation and the odds of reporting low self-esteem (see M1). However, after adjustment, quintiles 3-5 (from average to most deprived relative to least deprived) are associated with *lower* odds of reporting low self-esteem (Average OR = 0.68, [0.49,0.93; Q4 OR = 0.63, [0.45, 0.87; Most deprived OR 0.72, [0.51, 1.01, p=0.055). This is to say, adolescents living in the most affluent 20% of neighbourhoods are more likely to report low self-esteem than the more deprived 80% of neighbourhoods.

Unadjusted associations between quintiles of neighbourhood social fragmentation are non-linearly associated with increased odds of reporting low self-esteem. Adolescents living in the second most fragmented areas have similar odds of reporting low self-esteem (OR = 1.04, [0.81, 1.34]). However, adolescents living in quintile 2 (OR = 1.37 95%CI: 1.08, 1.74]) and quintile 3 (OR = 1.34 95%CI: 1.06, 1.70]) have raised odds of reporting low self-esteem, and the odds of reporting low self-esteem are highest in the most socially deprived neighbourhoods (OR = 1.58 95%CI: 1.19, 2.11]).

Associations are adjusted for all the individual and family factors modelled in Table 5-1: M4. However, as the magnitude or the statistical significance of these individual and family odds

ratios was not substantially attenuated by the inclusion of the neighbourhood or other geographical variables, they are not presented at this point in the analysis. The unadjusted odds of low self-esteem are similar across all provinces (see M1). However, after adjustment for demographic, perceptions and family environment variables, and the other geographical variables, the odds of adolescents in Quebec reporting low self-esteem are raised and statistically significant (OR = 1.70 [1.29,2.25 in M2: OR = 1.64: [1.24,2.17 in M3). In the case of the provincial effect for Quebec, these findings are consistent with work by Georgiades et al. (2007) and Willms (2002). These report that French-Canadian children and those in Quebec, report lower internalising mental health outcomes than other Canadians.

The addition of the neighbourhood and other geographical factors to the model does attenuate the MOR slightly from 3.71 in the individual and family model (M4 in Table 5-1) to 3.62 and 3.61 in the neighbourhood deprivation and social fragmentation models. This reduction in the between-individual variation is small in magnitude, but larger than that observed when family environment factors were entered into the individual and family models.

The differences in log likelihood between full individual and neighbourhood deprivation and social fragmentation models (M2 and M3 in Table 5-3 respectively) are both significant under the likelihood ratio test at the 95% level ($p<0.001$). The AIC value for M2 and M3 reduces from the individual and family model, indicating that fit increases in a parsimonious way.

Table 5-3: Associations between wider geography, neighbourhood deprivation, social fragmentation and low self-esteem in the NLSCY (N=3421)

Covariates	M1: Unadjusted models OR [95% CI] p	M2: Adjusted neighbourhood deprivation OR [95% CI] p	M3: Adjusted social fragmentation OR [95% CI] p
Rurality (ref. Rural)			
Urban	1.00 [0.84,1.19] 0.992	1.11 [0.91,1.36] 0.295	1.19 [0.97,1.47] 0.095
Province (ref. Ontario)			
Maritimes*	1.06 [0.83,1.36] 0.622	1.11 [0.84,1.48] 0.467	1.06 [0.81,1.39] 0.679
Quebec	1.18 [0.92,1.51] 0.205	1.70 [1.29,2.25]<0.001	1.64 [1.24,2.17] <0.001
Manitoba	1.12 [0.78,1.60] 0.552	1.19 [0.81,1.75] 0.383	1.15 [0.78,1.69] 0.476
Saskatchewan	0.71 [0.49,1.02] 0.067	0.70 [0.47,1.04] 0.074	0.70 [0.47,1.04] 0.077
Alberta	0.77 [0.55,1.07] 0.125	0.73 [0.51,1.04] 0.080	0.74 [0.51,1.05] 0.093
British Columbia	0.83 [0.59,1.17] 0.294	0.90 [0.62,1.31] 0.594	0.87 [0.60,1.26] 0.461
Neighbourhood Deprivation (ref. Least deprived)			
Quintile 2	0.95 [0.71,1.28] 0.749	0.81 [0.59,1.13] 0.215	…
Average	0.94 [0.71,1.26] 0.694	0.68 [0.49,0.93] 0.017	…
Quintile 4	0.94 [0.70,1.25] 0.672	0.63 [0.45,0.87] 0.006	…
Most deprived	1.00 [0.76,1.33] 0.974	0.72 [0.51,1.01] 0.055	…
Social Fragmentation (ref. Least fragmented)			
Quintile 2	1.37 [1.08,1.74] 0.010	…	1.13 [0.87,1.47] 0.355
Average	1.34 [1.06,1.70] 0.015	…	1.12 [0.86,1.47] 0.395
Quintile 4	1.04 [0.81,1.34] 0.742	…	0.83 [0.62,1.11] 0.213
Most fragmented	1.58 [1.19,2.11] 0.002	…	1.08 [0.77,1.51] 0.668
Log likelihood	n/a**	-2911	-2909
AIC	n/a	5888	5891
Individual MOR	n/a	3.62	3.61

* models adjusted for full individual and family model described in M4 (Table 5-1). ** This column reports results of multiple models and therefore model fit summary statistics are not applicable here.

5.3.2 BYP

As with the NLSCY above, models are run which examine the unadjusted and fully adjusted (for all individual and family factors) associations between low self-esteem and neighbourhood characteristics, urban/rural and region of residence.

There is evidence of a significant *protective* association (OR = 0.47, 95%CI 0.30,0.73) for those adolescents living in Scotland such that low self-esteem is less likely to be reported by Scottish adolescents than Welsh or English adolescents. This is not attenuated by adjustment for all individual, family and neighbourhood characteristics. Other than this, region of residence and urban/rural status are not statistically significantly associated with the odds of reporting low self-esteem.

The finding of a significantly protective effect of Scottish residence was not expected and is generally inconsistent with the health inequalities literature which suggests that there is a negative Scottish 'effect' associated with health (McCormick and Leicester, 1998). However, previous psychological morbidity literature in the UK (Duncan et al., 1995) has found that this is not necessarily found for psychological outcomes in adults, but suggested that this may be due to urban/rural distinctions in the regions of Scotland that they examined. The sample size was not sufficient to explore this effect in this study and it was not the main focus, although it would be interesting to note further studies which also highlight this effect.

On a comparative basis, it is interesting to observe that regional associations are only apparent for adolescents from Scotland and Quebec. While the directions of the odds ratios are opposite it is of note that both regions share similar cultural differences relative to the reference regions/provinces of the South of England and Ontario respectively. For example, both are substantially autonomous in terms of key social systems such as health and education

from the reference region/province. Additionally, both have a culturally distinct identity with strong nationalist interests on a political basis.

Neighbourhood deprivation is not associated with teenage self-esteem, as observed in the NLSCY. However, while adolescents in most affluent neighbourhoods in the NLSCY were more likely to report low self-esteem than adolescents from other neighbourhood types, this was not replicated in the BYP.

The highest levels of social fragmentation were associated with raised odds of low self-esteem in the BYP as in the NLSCY. Similarly, for both surveys, these relationships were attenuated to non-significance by the inclusion of the individual and family level coefficients.

The MOR was attenuated slightly, from 4.12 in the family environment model (Table 5-2:M4) to 4.04 in the neighbourhood deprivation model (Table 5-4: M2) and 4.01 in the social fragmentation model (Table 5-4: M3).

In terms of model fit, differences between the individual and family and the neighbourhood models are statistically significant at the 95% level (neighbourhood deprivation chi = 16, p=0.007) and (social fragmentation chi = 15, p=0.005). However, the addition of these parameters does not constitute a parsimonious increase in fit statistically, AIC increases in both cases from the individual and family model value of 4349 to 4356 and 4354 for neighbourhood deprivation and social fragmentation respectively.

Table 5-4. Unadjusted and adjusted associations between geographical factors and low self-esteem in the BYP (N=1922, obs=7738)

Covariates	M1: Unadjusted models OR [95%CI] p	M2: Adjusted Neighbourhood Deprivation OR [95%CI] p	M3: Adjusted Social Fragmentation OR [95%CI] p
Urban/Rural (ref. Rural)			
Urban	1.30 [0.97,1.74] 0.082	1.24 [0.90,1.70] 0.188	1.27 [0.94,1.70] 0.119
Region (ref. South of England)			
Midlands/East of England	0.96 [0.56,1.64] 0.875	0.82 [0.57,1.18] 0.293	0.86 [0.60,1.23] 0.403
London	0.78 [0.54,1.14] 0.197	0.79 [0.46,1.35] 0.383	0.77 [0.46,1.32] 0.345
North West of England	0.71 [0.43,1.15] 0.160	0.73 [0.45,1.17] 0.192	0.76 [0.48,1.21] 0.253
North of England	0.79 [0.52,1.19] 0.259	0.83 [0.55,1.25] 0.372	0.86 [0.57,1.28] 0.456
Scotland	0.47 [0.30,0.73] 0.001	0.47 [0.29,0.74] 0.001	0.47 [0.30,0.73] 0.001
Wales	0.92 [0.61,1.39] 0.701	0.88 [0.58,1.33] 0.535	0.92 [0.62,1.37] 0.679
Neighbourhood deprivation (ref. Least deprived)			
Quintile 2	1.20 [0.71,2.02] 0.492	1.10 [0.66,1.82] 0.727	…
Average	1.55 [0.95,2.52] 0.078	1.19 [0.73,1.94] 0.490	…
Quintile 4	1.45 [0.90,2.34] 0.129	1.18 [0.71,1.96] 0.534	…
Most Deprived	1.49 [0.92,2.42] 0.104	1.25 [0.74,2.13] 0.406	…
Social Fragmentation (ref. Least fragmented)			
Quintile 2	1.22 [0.80,1.84] 0.353	…	1.05 [0.70,1.56] 0.816
Average	1.24 [0.81,1.90] 0.320	…	1.26 [0.84,1.91] 0.265
Quintile 4	1.21 [0.80,1.84] 0.371	…	1.12 [0.75,1.68] 0.587
Most fragmented	1.54 [1.02,2.34] 0.041	…	1.29 [0.84,1.97] 0.239
Log likelihood	n/a**	-2135	-2134
AIC	n/a	4356	4354
MOR	n/a	4.04	4.01

* M2 and M3 adjusted for full individual and family model described in M4 (Table 5-2). ** This column reports results of multiple models and therefore model fit summary statistics are not applicable here.

5.3.3 Summary

The NLSCY and BYP findings presented so far suggest that the individual and family factors are generally associated with low self-esteem in a manner which is consistent with previous theoretical and empirical work.

In terms of the equalisation hypothesis there is weak and nonlinear evidence for deprivation amplification for social fragmentation gradients in early adolescence for both surveys, but not for neighbourhood deprivation. After adjustment for individual and family factors, there is clear support for an equalisation theory.

This said, household socio-economic status is weakly associated with low self-esteem, and weakly supports a socio-economic inequalities perspective. The interpretation of whether there is equalisation in youth self-esteem by neighbourhood deprivation is therefore complex and is discussed at the end of this chapter.

The next section considers the degree to which the findings can be generalised over key sub-groups in the population. This examines cross-level interactions between neighbourhood characteristics and characteristics of the individual and family.

5.4 Interactions

As justified in section 2.5 interactions were tested between age and sex and all the analytic variables to investigate the possibility that effects would be mediated by age or sex. Secondly, interactions were tested between neighbourhood deprivation and social fragmentation to examine the interactive pathways described in section 2.5.

The first stage of the analysis of interactions identified those which were potentially significant by testing each interaction independently after adjustment for the full neighbourhood deprivation and social fragmentation models developed above (M2 and M3 in Table 5-3 and Table 5-4 respectively). Obviously, this produced a large number of interaction terms, many of which were not significant. Therefore, the results from this stage are summarised below. Those interaction terms which were significant are labelled as Sig. in the table, and those which were non-significant are labelled as Ns.

5.4.1 NLSCY

The results reported in Table 5-5 show that associations observed between the individual and family characteristics and low self-esteem did not vary with levels of neighbourhood deprivation (see Table 5-5).

There were no observable interactions between neighbourhood deprivation and social fragmentation when the two were entered into the same model (Table 5-5). Nor were there interactions with urban/rural residence or province for either neighbourhood deprivation or social fragmentation.

However, age interacted significantly with sex, parental nurturance and with family functioning in both the social fragmentation and neighbourhood deprivation models. All other age and sex interaction terms were non-significant. The age and sex interaction was consistent with many studies which find that girls' self-esteem declines more rapidly towards mid-adolescence than boys (Robins and Trzesniewski, 2005; Baldwin and Hoffmann, 2002) a pattern also observed in comparisons of Canada and the UK for depression in this age group (Wade et al., 2002). The interactions with parenting and family relationships are also consistent with observations in the literature (Emler, 2001) and are examined in more detail below. Age and sex interactions with province of residence were not tested because no socially plausible mechanism was obvious, and no literature could be found which supported such an interaction.

Table 5-5. Multiplicative interactions with age, sex and neighbourhood deprivation after adjustment for individual, family and neighbourhood deprivation, urban/rural and province of residence (NLSCY, N=3421).

	Interactions between age, sex, and neighbourhood deprivation		
Covariates	**Age***	**Sex***	**Neighbourhood deprivation***
Age	…	Sig.	Ns.
Sex	Sig.	…	Ns.
Ethnicity	Ns.	Ns.	Ns.
Parental Nurture	Sig.	Ns.	Ns.
Parental Rejection	Ns.	Ns.	Ns.
Friendship Quality	Ns.	Ns.	Ns.
Family Functioning	Ns.	Sig.	Ns.
Family Structure	Ns.	Ns.	Ns.
HH income	Ns.	Ns.	Ns.
Maternal Education	Ns.	Ns.	Ns.
Maternal Depression	Ns.	Ns.	Ns.
Province	n/t	n/t	Ns.
Rurality	Ns.	Ns.	Ns.
Social fragmentation**			N.s

* All models in column adjusted for the full individual, family, neighbourhood and geographical model developed in M2, Table 5-3 above. ** This model also included a coefficient for social fragmentation as the direct effect must also be included in an interaction model. n/t - Not tested. "…" indicates that interaction would not be sensible , i.e. sex*sex

Interactions at the individual level were consistent with those described above in the neighbourhood deprivation models in Table 5-5. Like neighbourhood deprivation, social fragmentation was not associated differentially with self-esteem by any of the variables tested (see Table 5-6).

Table 5-6. Multiplicative interactions with age, sex and social fragmentation after adjustment for individual, family and social fragmentation, urban/rural and province of residence (NLSCY, N=3421).

	Interactions between age, sex, social fragmentation and covariates		
Covariates	**Age***	**Sex***	**Social Fragmentation***
Age	…	Sig.	Ns.
Sex	Sig.	…	Ns.
Ethnicity	Ns.	Ns.	Ns.
Parental Nurture	Sig.	Ns.	Ns.
Parental Rejection	Ns.	Ns.	Ns.
Friendship Quality	Ns.	Ns.	Ns.
Family Functioning	Ns.	Sig.	Ns.
Family Structure	Ns.	Ns.	Ns.
HH income	Ns.	Ns.	Ns.
Maternal Education	Ns.	Ns.	Ns.
Maternal Depression	Ns.	Ns.	Ns.
Province	n/t	n/t	Ns.
Rurality	Ns.	Ns.	Ns.

* All models in column adjusted for the full individual, family, neighbourhood and geographical model developed in M3, Table 5-3 above.n/t - Not tested. "…" indicates no interaction i.e. sex*sex

The results reported in Table 5-7 show that all interactions which were significant in section 5.4.1remained significant when they were mutually adjusted for each others' influence in the model. However, as described in section 3.5.4.2, interactions are interpreted as a system, with reference to all three parts of the system, i.e covariate x_i, x_2 and x_i*x_2. In this model, there are three interactions with sex which makes the interpretation of each problematic. Therefore, it is best to consider the interpretation of these within the sex-stratified model. M1 and M2 in the table show the almost exact equivalence of the models with neighbourhood deprivation (M1) or social fragmentation (M2).

The inclusion of the interactions increases the estimate of the between-individual variation. However, the increase is marginal (3.62 in M2:Table 5-3) to 3.69 in the neighbourhood deprivation interactions model (M1 in the table below).

The likelihood ratio test of the deviance between models without the interactions (M2 and M3 in Table 5-3) and the full interactions models (M1 and M2 below) suggests that the two are statistically significantly different. The AIC also reduces from 5888 to 5858 in the models which suggests that despite increasing the complexity of the model by adding 5 additional parameters, the improvement in fit remains parsimonious.

Table 5-7: Interaction models-neighbourhood and low self-esteem (NLSCY: N=3421).

Table 5-7 Covariates	M1: Neighbourhood OR[95% CI] p	M2: Social Fragmentation OR[95% CI] p CI] p
Age 12/13 (ref. 10/11 yrs)	1.62 [0.70,3.75] 0.261	1.59 [0.69,3.69] 0.276
14/15 yrs	0.42 [0.18,0.98] 0.045	0.41 [0.17,0.96] 0.041
Girls (ref. boys)	0.52 [0.19,1.42] 0.199	0.53 [0.19,1.44] 0.214
Sex*Age		
Sex*12/13 yrs	1.69 [1.13,2.51] 0.010	1.68 [1.13,2.51] 0.011
Sex*14/15 yrs	2.22 [1.45,3.38] <0.000	2.22 [1.46,3.39] <0.000
Ethnicity (ref. Canadian)		
European	0.88 [0.70,1.11] 0.292	0.88 [0.70,1.11] 0.279
First Nations	1.05 [0.73,1.51] 0.796	1.05 [0.73,1.51] 0.787
Other Visible	0.95 [0.59,1.52] 0.833	0.93 [0.58,1.49] 0.775
Year (ref. 1994)		
1996	1.28 [0.85,1.93] 0.241	1.29 [0.85,1.94] 0.230
1998	2.27 [1.49,3.47] <0.000	2.27 [1.49,3.47] <0.000
2000	1.33 [0.84,2.10] 0.225	1.33 [0.84,2.10] 0.225
2002	1.91 [1.16,3.15] 0.011	1.89 [1.15,3.12] 0.012
2004	1.32 [0.70,2.48] 0.385	1.33 [0.71,2.49] 0.378
Parental Nurture	0.78 [0.75,0.82] <0.000	0.78 [0.75,0.82] <0.000
Parental Nurture*Age		
Nurture*12/13 yrs	1.00 [0.95,1.06] 0.873	1.01 [0.95,1.06] 0.839
Nurture*14/15 yrs	1.09 [1.03,1.16] 0.002	1.10 [1.03,1.16] 0.002
Parental Rejection	1.13 [1.11,1.16] <0.000	1.13 [1.10,1.16] <0.000
Friendship Quality	0.72 [0.69,0.74] <0.000	0.72 [0.69,0.74] <0.000
Family Functioning	0.91 [0.82,1.00] 0.044	0.91 [0.82,1.00] 0.047
Family Functioning*Sex	1.18 [1.04,1.34] 0.011	1.17 [1.03,1.33] 0.013
Family Structure (ref.		
Reconstituted	1.47 [1.12,1.93] 0.006	1.46 [1.11,1.93] 0.006
Single Parent	1.05 [0.81,1.37] 0.710	1.04 [0.80,1.36] 0.745
HH income (ref. Average)		
High	0.86 [0.69,1.08] 0.197	0.89 [0.71,1.11] 0.282
Low	1.10 [0.87,1.40] 0.416	1.10 [0.87,1.40] 0.439
Maternal Education (ref. < High School)		
High School	0.91 [0.73,1.15] 0.452	0.93 [0.74,1.18] 0.563
Diploma or Degree	0.64 [0.46,0.90] 0.009	0.68 [0.49,0.95] 0.022
Maternal Depression (ref. Not depressed)		
Depressed	1.18 [0.94,1.49] 0.149	1.17 [0.93,1.47] 0.168
Rurality (ref. Rural)		
Urban	1.11 [0.91,1.36] 0.313	1.19 [0.97,1.47] 0.096
Province (ref. Ontario)		
Maritimes	1.12 [0.84,1.50] 0.425	1.07 [0.81,1.41] 0.620
Quebec	1.70 [1.28,2.26] <0.000	1.65 [1.24,2.18] 0.001
Manitoba	1.18 [0.80,1.75] 0.402	1.15 [0.78,1.69] 0.490
Saskatchewan	0.70 [0.47,1.04] 0.078	0.70 [0.47,1.05] 0.083
Alberta	0.73 [0.51,1.05] 0.089	0.74 [0.51,1.06] 0.101
British Columbia	0.90 [0.62,1.31] 0.587	0.87 [0.60,1.26] 0.458
Neighbourhood deprivation (ref. Least Deprived)		
Quintile 2	0.83 [0.60,1.15] 0.253	…
Average	0.67 [0.48,0.93] 0.015	…
Quintile 4	0.63 [0.46,0.88] 0.007	…
Most Deprived	0.72 [0.51,1.01] 0.061	…
Social fragmentation (ref. Least Deprived)		
Quintile 2	…	1.15 [0.88,1.50] 0.304
Average	…	1.13 [0.86,1.48] 0.378
Quintile 4	…	0.83 [0.62,1.12] 0.220
Most Deprived	…	1.07 [0.76,1.50] 0.717
Log likelihood	-2889	-2890
MOR	3.69	3.67

5.4.2 BYP

Neighbourhood deprivation did not interact with the individual and family variables in the model. There was evidence of an interaction with arguments with parents which was statistically significant at the required 95% level of confidence. However, at this stage it was not considered sensible to consider this interaction as robust owing to the *multiple comparisons* problem described in chapter three (section 3.5.2.3), whereby when enough interactions are tested, probability theory states that some would be expected to emerge as statistically significant by chance alone. The interaction suggests the association adjustment of the weak relationship between neighbourhood deprivation and adolescent low self-esteem may have been due to differential associations of neighbourhood deprivation for adolescents with differing quality of relationships with parents.

As with the NLSCY, age and sex were also tested for interactions with other covariates in the BYP. In the context of the neighbourhood deprivation model these showed, consistently with the NLSCY and the literature, that there was a strong interaction between age and sex. Interestingly, talking frequently with parents was found to interact with age. This is similar, in terms of the constructs involved, to the interaction observed above in the NLSCY between age and nurture. However, sex, other than the age interaction, did not interact with similar variables in both studies. In the UK, sex interacted with talking and arguing with parents and with levels of maternal education. In the NLSCY, there was no interaction between sex and parental nurturance and rejection.

Region was not tested for interactions in the BYP (unlike the NLSCY, where the province / neighbourhood characteristics interactions were tested). This was because there were not sufficient numbers from each UK region to calculate interactions robustly.

Table 5-8. Interactions with age, sex and neighbourhood deprivation in BYP (N=1922). All models are fully adjusted for individual and family effects.

Covariates	Interactions between age, sex, neighbourhood deprivation and covariates		
	Age*	**Sex***	**Neighbourhood deprivation**
Age	…	Sig.	Ns.
Sex	Sig.	…	Ns.
Ethnicity	Ns.	Ns.	Ns.
Talking with parents	Sig.	Sig.	Ns
Arguments with parents	Ns.	Sig.	Sig.
Happiness with friends	Ns.	Ns.	Ns.
Happy with family	Ns.	Ns.	Ns.
Family Structure	Ns.	Ns.	Ns.
HH income	Ns.	Ns.	Ns.
Maternal Education	Ns.	Sig.	Ns.
Maternal Depression	Ns.	Ns.	Ns.
Rurality	Ns	Ns.	Ns.
Social fragmentation			Ns.

* Model adjusted for the full individual, family, neighbourhood and geographical model developed in M2, Table 5-3 above .n/t - Not tested. "…" indicates that interaction would not be sensible , i.e. sex*sex

The results reported in Table 5-9 show that social fragmentation does not interact with parental arguments, but with household deprivation. This suggests that an association between social fragmentation and self-esteem may emerge for adolescents from some families and not others, based on household socio-economic status.

The table also shows that age and sex interactions are similar regardless of whether neighbourhood deprivation or social fragmentation is included in models.

Table 5-9. Interactions with age, sex, and social fragmentation in BYP (N=1922). All models are fully adjusted for individual and family effects.

	B12: Two-way interactions with Independent variables(I.V.)		
Covariates	**Age***	**Sex***	**Social fragmentation**
Age	…	Sig.	Ns.
Sex	Sig.	…	Ns.
Ethnicity	Ns.	Ns.	Ns.
Talking with parents	Sig.	Sig.	Ns.
Arguments with parents	Ns.	Sig.	Ns.
Happiness with friends	Ns.	Ns.	Ns.
Family Environment			
Happy with family	Ns.	Ns.	Ns.
Family Structure	Ns.	Ns.	Ns.
HH income	Ns.	Ns.	Sig.
Maternal Education	Ns.	Sig.	Ns.
Maternal Depression	Ns.	Ns.	Ns.
Rurality	Ns	Ns.	N.s

Mutual adjustment for all the interaction terms attenuated the interaction between frequent arguments and neighbourhood deprivation to non-significance (see M1 in Table 5-10). This interaction could therefore have been due to a chance finding, or could reasonably be explained by the sex and arguments interaction which remained significant. However, M2 in the same table shows that there is limited evidence of an interaction between social fragmentation and relative household income. The product term of the interaction suggest that there are no significant associations between social fragmentation and self-esteem for those adolescents living in high income families. However, for adolescents living in deprived families, social fragmentation appears to be associated with a *reduced* risk of reporting low self-esteem. As discussed in section 3.5.4.2, interactions must be interpreted as a system. Thus, the social fragmentation term in the model is interpreted at the reference category of the household income variable. This produces the interesting finding that for adolescents living in median income families, social fragmentation associated with an increased risk of reporting low self-esteem might be theorised given the review in chapter two. It is also interesting that when household income is interpreted at the reference level of social fragmentation (least fragmented), the risk associated with this variable for low self-esteem is much higher than in

the neighbourhood deprivation model presented in M2 where no cross-level interaction is present.

Unlike the NLSCY, after mutual adjustment for each others' influence, many of the lone interactions were attenuated to non-significance by adjustment for each others' inclusion. Specifically, while the age by sex interaction remained significant, the interaction between age and talking with parents was attenuated to non-significance. This is interesting as the analogous interaction (age*parental nurture) in the NLSCY models (M1 and M2 in Table 5-7) remained significant. In terms of the sex interactions, the interaction between sex and talking frequently with parents was attenuated to non-significance after adjustment for other interactions, while those between sex and arguing frequently with parents, and sex and maternal education remained statistically significant. The magnitude and statistical significance of individual and family interactions are similar in the neighbourhood deprivation (M1) and social fragmentation models (M2). However, as with the NLSCY, multiple sex interactions in the models suggest that relationships between social context and low self-esteem suggests that the sample should be examined on a sex-stratified basis. This is especially important when interpreting the influence of those variables which interact with sex, including: age, arguing with parents, and maternal education. Sex-stratified models are presented and discussed below in section 5.5.2.

Table 5-10 Fully adjusted interaction model (BYP, N=1922, obs=7738). Includes all significant two-way interactions (int.) identified in Table 5-5 .

Table 5-10	**M1: NeighDep + int.)**	**M2: SocFrag +int.)**
Covariates	OR [95% CI] p	OR [95% CI] p
Age (ref. 11)		
12	1.09 [0.65,1.82] 0.746	1.11 [0.66,1.86] 0.688
13	0.70 [0.41,1.18] 0.182	0.71 [0.42,1.19] 0.193
14	0.93 [0.55,1.56] 0.776	0.93 [0.55,1.58] 0.801
15	0.68 [0.38,1.24] 0.208	0.68 [0.38,1.25] 0.216
Sex (ref. Boys)		
Girls	1.23 [0.67,2.26] 0.506	1.29 [0.70,2.38] 0.411
Sex*age		
Girls*12	1.57 [0.86,2.84] 0.140	1.51 [0.83,2.74] 0.179
Girls*13	2.00 [1.11,3.62] 0.022	1.97 [1.09,3.58] 0.025
Girls*14	1.80 [0.99,3.27] 0.056	1.74 [0.95,3.18] 0.071
Girls*15	2.96 [1.52,5.74] 0.001	2.87 [1.47,5.59] 0.002
Ethnicity (ref. White)		
Visible minority	0.88 [0.47,1.67] 0.705	0.91 [0.48,1.74] 0.774
Year (ref. 1994)		
1995	0.67 [0.41,1.10] 0.117	0.66 [0.40,1.09] 0.106
1996	0.56 [0.35,0.92] 0.021	0.56 [0.34,0.91] 0.019
1997	0.36 [0.21,0.61] 0.000	0.35 [0.21,0.60] 0.000
1998	0.38 [0.23,0.63] 0.000	0.37 [0.22,0.62] 0.000
1999	0.49 [0.29,0.81] 0.006	0.49 [0.30,0.82] 0.007
2000	0.44 [0.26,0.72] 0.001	0.45 [0.27,0.74] 0.002
2001	0.47 [0.28,0.77] 0.003	0.48 [0.29,0.80] 0.004
2002	0.40 [0.24,0.67] 0.000	0.41 [0.25,0.69] 0.001
2003	0.73 [0.43,1.23] 0.236	0.75 [0.44,1.27] 0.285
2004	0.54 [0.30,0.98] 0.042	0.58 [0.32,1.04] 0.070
Talks to parents (ref. 'Regular')		
Most days	1.72 [0.91,3.25] 0.094	1.73 [0.91,3.27] 0.093
Hardly ever	1.08 [0.54,2.18] 0.828	1.08 [0.53,2.18] 0.834
Talks frequently*Age		
Most days *12	0.65 [0.31,1.38] 0.262	0.63 [0.30,1.34] 0.228
Hardly ever *12	0.39 [0.15,1.00] 0.051	0.38 [0.15,0.98] 0.046
Most days *13	0.83 [0.40,1.73] 0.620	0.79 [0.38,1.65] 0.532
Hardly ever *13	0.88 [0.37,2.13] 0.783	0.90 [0.37,2.17] 0.810
Most days *14	0.66 [0.31,1.39] 0.275	0.64 [0.30,1.36] 0.242
Hardly ever *14	0.79 [0.31,2.02] 0.627	0.78 [0.31,2.00] 0.609
Most days *15	0.55 [0.25,1.22] 0.140	0.53 [0.24,1.18] 0.120
Hardly ever *15	0.40 [0.13,1.22] 0.107	0.38 [0.12,1.16] 0.090
Talks frequently*Sex		
Most days *Girls	1.28 [0.79,2.09] 0.318	1.29 [0.79,2.11] 0.308
Hardly ever *Girls	0.82 [0.42,1.62] 0.576	0.85 [0.43,1.67] 0.631
Argues with parents (ref. 'Regular')		
Hardly ever	0.54 [0.20,1.42] 0.212	0.53 [0.36,0.78] 0.001
Most days	2.17 [0.69,6.86] 0.185	1.64 [0.94,2.86] 0.084
Argues frequently*Sex		
Hardly ever *Girls	1.07 [0.65,1.77] 0.790	1.08 [0.66,1.79] 0.758
Most days *Girls	0.89 [0.44,1.81] 0.755	0.91 [0.45,1.85] 0.792
Happiness with friends (ref. Happy)		
Unhappy with friends	5.13 [3.68,7.15] 0.000	5.13 [3.68,7.16] 0.000
Happiness with family (ref. Happy)	4.10 [3.01,5.56] 0.000	4.20 [3.09,5.72] 0.000
Unhappy		
Family Structure (ref. Intact)		
Reconstituted	1.71 [1.27,2.29] 0.000	1.70 [1.27,2.28] 0.000

Table 5-10	**M1: NeighDep + int.)**	**M2: SocFrag +int.)**
Covariates	OR [95% CI] p	OR [95% CI] p
Single Parent	1.10 [0.80,1.52] 0.541	1.08 [0.78,1.48] 0.651
HH income (ref. Average)		
High	0.65 [0.49,0.86] 0.002	0.87 [0.45,1.68] 0.673
Low	1.23 [0.95,1.59] 0.120	2.86 [1.40,5.81] 0.004
Maternal Education (ref. <GCSE)		
GCSE	1.10 [0.71,1.70] 0.662	1.12 [0.72,1.74] 0.607
A-level	1.48 [0.80,2.75] 0.214	1.48 [0.79,2.77] 0.216
Diploma or degree	0.54 [0.31,0.95] 0.031	0.54 [0.31,0.94] 0.030
Maternal Education*Sex		
Girls*GCSE	0.72 [0.41,1.29] 0.271	0.69 [0.38,1.23] 0.205
Girls*A-level	0.40 [0.17,0.97] 0.042	0.38 [0.16,0.92] 0.031
Girls*Diploma/degree	1.73 [0.88,3.39] 0.109	1.62 [0.82,3.19] 0.162
Maternal Depression (ref. Not Depressed)		
Depressed	1.41 [1.15,1.74] 0.001	1.44 [1.17,1.77] 0.001
Rurality (ref. Rural)		
Urban	1.21 [0.88,1.66] 0.239	1.21 [0.89,1.63] 0.223
Region (ref. South of England)		
Midlands/East of England	0.82 [0.57,1.18] 0.296	0.88 [0.61,1.26] 0.475
London	0.72 [0.42,1.23] 0.230	0.74 [0.43,1.27] 0.270
North West of England	0.69 [0.43,1.11] 0.129	0.75 [0.47,1.21] 0.238
North of England	0.81 [0.53,1.22] 0.314	0.85 [0.57,1.28] 0.432
Scotland	0.46 [0.29,0.73] 0.001	0.48 [0.31,0.75] 0.001
Wales	0.89 [0.59,1.35] 0.586	0.91 [0.61,1.37] 0.667
Neighbourhood deprivation (ref. Least deprived)		
Q2	1.12 [0.62,2.04] 0.705	…
Average	1.06 [0.60,1.88] 0.829	…
Q4	1.32 [0.73,2.36] 0.356	…
Most Deprived	1.47 [0.81,2.69] 0.209	…
Q2* Hardly ever	0.94 [0.32,2.80] 0.913	…
Q2*Most days	1.13 [0.29,4.45] 0.862	…
Average* Hardly ever	1.96 [0.71,5.42] 0.194	…
Average* Most days	0.76 [0.21,2.82] 0.683	…
Q4* Hardly ever	0.69 [0.25,1.94] 0.484	…
Q4* Most days	0.90 [0.26,3.09] 0.871	…
Most Deprived* Hardly ever	0.76 [0.27,2.13] 0.608	…
Most Deprived* Most days	0.47 [0.13,1.67] 0.246	…
Social fragmentation (ref. Least fragmented)		
Q2	…	1.60 [0.94,2.72] 0.084
Average	…	1.60 [0.92,2.78] 0.097
Q4	…	1.39 [0.81,2.40] 0.233
Most fragmented	…	1.87 [1.08,3.24] 0.026
Social fragmentation*HH income		
Q2* High Income	…	0.47 [0.19,1.12] 0.087
Q2* Low Income	…	0.33 [0.13,0.80] 0.014
Average* High Inc	…	0.66 [0.26,1.66] 0.375
Average* Low Inc	…	0.56 [0.23,1.36] 0.204
Q4* High Income	…	0.83 [0.34,1.98] 0.669
Q4* Low Income	…	0.54 [0.23,1.29] 0.167
Most Fragmented* High Income	…	1.00 [0.43,2.31] 0.997
Most Fragmented*Low Income	…	0.21 [0.09,0.52] 0.001
Log likelihood	-2127	-2123
AIC	4362	4354

5.5 Sex-stratified models

In this final section, the full models presented above are stratified by sex to allow clear interpretation of the sex interaction terms. The sex-stratified models retain only those interactions which were significant in that section.

5.5.1 NLSCY

Compared with the least deprived neighbourhoods, boys in all four of the other quintiles have significantly reduced odds of reporting low self-esteem (see M1a in Table 5-11). This finding for boys seems relatively robust, the statistical significance of the associations indicate that the all quintiles are statistically significantly *protective* relative to the most affluent (least deprived) quintile at the 95% level. For boys therefore, this finding is consistent with the results over the whole sample reported in M1 of Table 5-7. There is no observable association between neighbourhood deprivation and low self-esteem for girls (see M1B in Table 5-11). However, this apparent sex by neighbourhood deprivation should be treated cautiously as it was not found in the formal investigation of interactions (see section 5.4.1). Stratification of samples is not the ideal way to test for interaction as the independent samples (of boys and girls in this case) share variation due to their shared family and neighbourhood circumstances. This is artificially separated out by stratification and can lead to erroneous conclusions if not considered in conjunction with formal tests for interaction across the whole sample.

Models M2a and M2b do not show any particular deviation from the models conducted over the full sample in terms of the neighbourhood characteristics and are presented for completeness, individual, family, neighbourhood, regional and interaction terms are consistent with those reported in M1a and M1b.

Models 1a and 1b will be used for interpretation of the sex-interaction terms presented earlier. It is clear from examination of these stratified models that family functioning, if it presents a risk to low self-esteem, does so for girls more than for boys although neither term in either model is statistically significant at the 95% level.

The interactions between sex, age and parental nurturance are difficult to interpret as age and sex both interact with each other and with parental nurturance. However, the sex-stratified model makes this clearer. When parental nurturance is at the lowest it can be, the model predicts that 12 and 13 year old girls will have much greater odds (OR = 4.31, 95%CI 1.26, 14.77), while 14 and 15 year old girls will not be any different to the youngest age group (see M1a, Table 5-11). The wide confidence intervals suggest that uncertainty is very high, although the p value is not marginal, In stark contrast, at this level of parental nurturance, boys will not report any difference by age (see M1b).

The parental nurturance term suggests parental nurturance is protective at age 10/11. The product of that term and age suggests that the variable remains protective towards mid-adolescence, but that the association weakens significantly by age 14 and 15 for both boys and girls. Specifically, the association is attenuated by 9% for boys and girls at this age compared to ages 10/11 (Girls Parental nurturance*14/15 OR = 1.09, 95%CI 1.01, 1.18 for girls, Boys parental nurturance*14/15 OR = 1.09, 95%CI 1.00, .18 for boys) to 0.85 (i.e. 0.78 * 1.09). This may reflect growing independence from parents and an increasing reliance on relationships with friends in the formation and evaluation of the self in adolescence.

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Table 5-11. Sex-stratified adjusted models of low self-esteem, neighbourhood deprivation and social fragmentation (NLSCY:N=3421).

Table 5-11	Full neighbourhood deprivation model by sex		Full social fragmentation model by sex	
	M1a: Girls (n=1773)	M1b: Boys (n=1648)	M2a: Girls (n=1773)	M2b: Boys (n=1648)
Covariates	OR [95% CI] p	OR [95% CI] p	OR [95% CI] p	OR [95% CI] p
Age (ref. 10/11 yrs)				
12/13 yrs	4.31 [1.26,14.77] 0.020	1.13 [0.35,3.59] 0.839	4.27 [1.25,14.59] 0.021	1.07 [0.34,3.40] 0.909
14/15 yrs	1.10 [0.32,3.72] 0.880	0.36 [0.11,1.23] 0.103	1.07 [0.32,3.62] 0.912	0.34 [0.10,1.16] 0.086
Ethnicity (ref. Canadian)				
European	0.81 [0.59,1.09] 0.166	1.01 [0.71,1.44] 0.959	0.81 [0.59,1.09] 0.166	1.00 [0.70,1.43] 0.983
First Nations	1.00 [0.61,1.63] 0.996	1.15 [0.66,1.99] 0.618	1.00 [0.61,1.63] 0.988	1.17 [0.68,2.03] 0.569
Visible minority	1.06 [0.57,1.96] 0.849	0.88 [0.42,1.81] 0.720	1.05 [0.57,1.93] 0.884	0.89 [0.43,1.84] 0.755
Year (ref. 1994)				
1996	1.39 [0.79,2.45] 0.247	1.15 [0.63,2.12] 0.643	1.39 [0.79,2.45] 0.248	1.14 [0.62,2.09] 0.667
1998	1.96 [1.10,3.49] 0.022	2.76 [1.47,5.18] 0.002	1.96 [1.10,3.48] 0.022	2.72 [1.45,5.08] 0.002
2000	0.96 [0.52,1.80] 0.904	2.05 [1.04,4.03] 0.039	0.96 [0.51,1.78] 0.889	2.02 [1.03,3.96] 0.042
2002	1.43 [0.73,2.80] 0.300	2.88 [1.36,6.09] 0.006	1.42 [0.72,2.78] 0.311	2.84 [1.35,5.99] 0.006
2004	1.05 [0.47,2.39] 0.899	1.64 [0.60,4.54] 0.338	1.06 [0.47,2.41] 0.885	1.64 [0.60,4.53] 0.336
Parental Nurture	0.78 [0.73,0.84] 0.000	0.78 [0.73,0.84] 0.000	0.78 [0.73,0.84] 0.000	0.78 [0.73,0.84] 0.000
Parental Nurture*Age				
Nurture*12/13 yrs	0.98 [0.90,1.06] 0.585	1.02 [0.95,1.11] 0.554	0.98 [0.90,1.06] 0.599	1.03 [0.95,1.11] 0.496
Nurture*14/15 yrs	1.09 [1.01,1.18] 0.024	1.09 [1.00,1.18] 0.051	1.10 [1.01,1.19] 0.021	1.09 [1.00,1.19] 0.042
Parental Rejection	1.12 [1.09,1.16] 0.000	1.14 [1.10,1.18] 0.000	1.12 [1.09,1.16] 0.000	1.14 [1.10,1.18] 0.000
Friendship Quality	0.72 [0.69,0.76] 0.000	0.71 [0.68,0.74] 0.000	0.72 [0.69,0.76] 0.000	0.71 [0.68,0.74] 0.000
Family Functioning	1.06 [0.98,1.16] 0.146	0.91 [0.83,1.01] 0.066	1.06 [0.97,1.15] 0.176	0.91 [0.83,1.01] 0.064
Family structure (ref. Intact)				
Reconstituted	1.34 [0.92,1.93] 0.123	1.67 [1.11,2.51] 0.013	1.34 [0.92,1.93] 0.124	1.68 [1.12,2.52] 0.013
Single Parent	0.93 [0.66,1.32] 0.702	1.21 [0.81,1.81] 0.354	0.92 [0.65,1.30] 0.633	1.24 [0.83,1.86] 0.298
Household income (ref. Average)				
High	0.80 [0.59,1.08] 0.141	0.92 [0.66,1.29] 0.623	0.81 [0.60,1.09] 0.159	0.97 [0.69,1.36] 0.863
Low	0.98 [0.72,1.35] 0.917	1.29 [0.89,1.86] 0.178	0.96 [0.70,1.32] 0.813	1.31 [0.91,1.88] 0.154
High School	0.94 [0.69,1.28] 0.699	0.88 [0.62,1.26] 0.483	0.94 [0.69,1.28] 0.706	0.92 [0.65,1.31] 0.646
Diploma or Degree	0.77 [0.49,1.20] 0.246	0.54 [0.33,0.90] 0.017	0.79 [0.51,1.22] 0.284	0.60 [0.36,0.97] 0.039
Maternal depression (ref. Not Depressed)				

Table 5-11	**Full neighbourhood deprivation model by sex**		**Full social fragmentation model by sex**	
	M1a: Girls (n=1773)	**M1b: Boys (n=1648)**	**M2a: Girls (n=1773)**	**M2b: Boys (n=1648)**
Covariates	**OR [95% CI] p**	**OR [95% CI] p**	**OR [95% CI] p**	**OR [95% CI] p**
Depressed	1.34 [0.99,1.81] 0.058	1.00 [0.70,1.42] 0.994	1.34 [0.99,1.81] 0.059	0.99 [0.70,1.41] 0.965
Urban / rural (ref. Rural)				
Urban	1.11 [0.84,1.45] 0.461	1.14 [0.84,1.56] 0.395	1.12 [0.84,1.48] 0.442	1.33 [0.97,1.82] 0.072
Province (ref. Ontario)				
Maritimes*	1.28 [0.87,1.88] 0.209	0.95 [0.62,1.47] 0.816	1.30 [0.90,1.88] 0.156	0.83 [0.54,1.25] 0.371
Quebec	2.33 [1.61,3.37] 0.000	1.08 [0.69,1.68] 0.733	2.33 [1.61,3.38] 0.000	1.00 [0.65,1.56] 0.984
Manitoba	1.32 [0.76,2.32] 0.327	1.01 [0.59,1.75] 0.959	1.32 [0.75,2.31] 0.339	0.92 [0.53,1.57] 0.747
Saskatchewan	0.79 [0.46,1.37] 0.397	0.60 [0.34,1.08] 0.088	0.82 [0.48,1.42] 0.486	0.57 [0.32,1.02] 0.058
Alberta	0.95 [0.59,1.53] 0.821	0.51 [0.29,0.89] 0.017	0.97 [0.60,1.56] 0.891	0.53 [0.31,0.93] 0.025
British Columbia	1.15 [0.70,1.90] 0.573	0.67 [0.38,1.17] 0.159	1.15 [0.70,1.90] 0.574	0.60 [0.34,1.05] 0.074
Neighbourhood deprivation (ref. least deprived)				
Above Average	1.03 [0.67,1.59] 0.892	0.60 [0.36,0.98] 0.043	…	…
Average	0.79 [0.51,1.21] 0.276	0.53 [0.32,0.88] 0.014	…	…
Below Average	0.82 [0.53,1.26] 0.359	0.45 [0.27,0.76] 0.003	…	…
Most Deprived	0.94 [0.60,1.48] 0.791	0.50 [0.30,0.86] 0.011	…	…
Social fragmentation (ref. least fragmented)				
Above Average	…	…	1.28 [0.89,1.84] 0.185	1.00 [0.67,1.48] 0.989
Average	…	…	1.18 [0.82,1.70] 0.380	1.10 [0.74,1.63] 0.644
Below Average	…	…	0.88 [0.59,1.32] 0.545	0.76 [0.49,1.18] 0.222
Most Deprived	…	…	1.43 [0.91,2.24] 0.116	0.67 [0.39,1.16] 0.151
Log likelihood	-1636	-1223	-1636	-1233
AIC	2539	3344	2539	3344
MOR	1.8027381	1.8308543	1.8027381	1.8308543

5.5.2 BYP

The sex-stratified models provide interesting insights into the interaction terms in the full model of social fragmentation in the BYP presented in M2, Table 5-10. In terms of the interaction with social fragmentation, this does not differ by sex. However, it is interesting because the estimates for the most fragmented quintile versus the least fragmented quintile for those in low income families is relatively large and inversely associated with low self-esteem (Girls Q5*Low = 0.21, 95% CI 0.07, 0.68). These estimates are consistent over both boys and girls indicating that they are quite unlikely to be due to chance. However, it is also important to note that the interaction does not follow a clear pattern.

The sex-stratified models confirm the age and sex interaction, such that girls decline in self-esteem while boys remain similar with age. They also suggest that the interaction between talking with parents and sex may have been statistically significant but has few substantial implications when sex-stratified in that the estimates are of a similar magnitude and significance for both boys and girls. However, there are interesting interactions between maternal education and sex. While protective for both sexes, this is only apparent for mothers with A-levels for girls and degree level educational status for boys.

Table 5-12: Sex--stratified models of low self-esteem, social fragmentation and neighbourhood deprivation (BYP, N=1922).

Table 5-12	Full neighbourhood deprivation model by sex		Full social fragmentation model by sex	
	M1a: Girls (n=976,obs=3939)	M1b: Boys (n=946,obs=3799)	M2a: Girls (n=976,obs=3939)	M2b: Boys (n=946,obs=3799)
Covariates	OR [95% CI] p	OR [95% CI] p	OR [95% CI] p	OR [95% CI] p
Age (ref. 11)				
12	1.35 [0.90,2.00] 0.145	0.89 [0.57,1.40] 0.625	1.33 [0.89,1.99] 0.160	0.88 [0.56,1.38] 0.587
13	1.30 [0.87,1.94] 0.194	0.66 [0.42,1.06] 0.084	1.29 [0.87,1.93] 0.207	0.66 [0.41,1.05] 0.082
14	1.43 [0.94,2.19] 0.097	0.83 [0.51,1.34] 0.439	1.42 [0.93,2.17] 0.108	0.83 [0.51,1.35] 0.442
15	1.58 [1.00,2.48] 0.048	0.53 [0.30,0.92] 0.026	1.57 [0.99,2.47] 0.053	0.53 [0.30,0.93] 0.027
Ethnicity (ref. White majority)				
Visible minority	0.70 [0.28,1.76] 0.452	1.02 [0.42,2.50] 0.965	0.71 [0.28,1.79] 0.470	1.07 [0.44,2.63] 0.883
Year (ref. 1994)				
1995	0.87 [0.46,1.64] 0.664	0.40 [0.18,0.89] 0.024	0.85 [0.45,1.61] 0.614	0.40 [0.18,0.89] 0.026
1996	0.65 [0.35,1.23] 0.189	0.40 [0.19,0.87] 0.020	0.63 [0.33,1.20] 0.163	0.41 [0.19,0.88] 0.022
1997	0.37 [0.18,0.72] 0.004	0.31 [0.14,0.71] 0.005	0.34 [0.17,0.68] 0.002	0.32 [0.14,0.73] 0.007
1998	0.38 [0.19,0.74] 0.005	0.34 [0.15,0.75] 0.008	0.36 [0.18,0.72] 0.004	0.34 [0.15,0.76] 0.008
1999	0.44 [0.22,0.87] 0.017	0.53 [0.25,1.14] 0.106	0.43 [0.22,0.84] 0.014	0.53 [0.25,1.15] 0.107
2000	0.37 [0.19,0.72] 0.004	0.52 [0.24,1.09] 0.085	0.36 [0.19,0.71] 0.003	0.53 [0.25,1.12] 0.095
2001	0.39 [0.20,0.75] 0.005	0.58 [0.27,1.22] 0.149	0.38 [0.20,0.75] 0.005	0.57 [0.27,1.22] 0.147
2002	0.32 [0.16,0.64] 0.001	0.53 [0.24,1.14] 0.104	0.32 [0.16,0.64] 0.001	0.53 [0.24,1.15] 0.108
2003	0.79 [0.40,1.57] 0.496	0.56 [0.25,1.29] 0.176	0.80 [0.40,1.60] 0.527	0.56 [0.24,1.30] 0.180
2004	0.57 [0.27,1.21] 0.142	0.46 [0.18,1.19] 0.111	0.58 [0.27,1.24] 0.162	0.46 [0.18,1.19] 0.107
Talks to parents (ref. 'Regular')				
Hardly ever	1.54 [1.11,2.14] 0.010	1.26 [0.87,1.82] 0.222	1.51 [1.09,2.10] 0.014	1.28 [0.88,1.86] 0.191
Most days	0.58 [0.38,0.89] 0.013	0.75 [0.45,1.25] 0.270	0.57 [0.37,0.89] 0.012	0.77 [0.46,1.29] 0.314
Argues with parents (ref. 'Regular)				
Hardly ever	0.58 [0.42,0.80] 0.001	0.55 [0.37,0.82] 0.003	0.57 [0.41,0.79] 0.001	0.57 [0.38,0.84] 0.005
Most days	1.49 [0.95,2.33] 0.082	1.72 [0.98,3.00] 0.058	1.43 [0.91,2.24] 0.121	1.67 [0.95,2.93] 0.076
Happiness with friends (ref. Happy)				
Unhappy with friends	4.24 [2.77,6.50] 0.000	6.60 [3.92,11.11] 0.000	4.33 [2.82,6.66] 0.000	6.56 [3.88,11.10] 0.000

Table 5-12	Full neighbourhood deprivation model by sex		Full social fragmentation model by sex	
	M1a: Girls (n=976,obs=3939)	M1b: Boys (n=946,obs=3799)	M2a: Girls (n=976,obs=3939)	M2b: Boys (n=946,obs=3799)
Covariates	**OR [95% CI] p**	**OR [95% CI] p**	**OR [95% CI] p**	**OR [95% CI] p**
Happiness with family (ref. Happy)				
Unhappy	3.93 [2.67,5.79] 0.000	4.67 [2.83,7.69] 0.000	3.95 [2.68,5.82] 0.000	4.69 [2.83,7.75] 0.000
Family Structure (ref. Intact)				
Reconstituted	1.63 [1.11,2.40] 0.013	1.88 [1.20,2.95] 0.006	1.64 [1.11,2.42] 0.013	1.94 [1.23,3.05] 0.004
Single Parent	0.87 [0.58,1.31] 0.513	1.55 [0.94,2.56] 0.086	0.86 [0.57,1.30] 0.481	1.51 [0.91,2.51] 0.107
HH income (ref. Average)				
High	0.53 [0.37,0.76] 0.001	0.89 [0.58,1.38] 0.608	0.69 [0.30,1.59] 0.387	1.34 [0.46,3.91] 0.590
Low	1.29 [0.93,1.79] 0.122	1.17 [0.77,1.77] 0.474	3.02 [1.21,7.54] 0.018	2.87 [0.93,8.81] 0.066
Maternal Education (ref. <GCSE)				
GCSE	0.78 [0.53,1.14] 0.195	1.07 [0.69,1.67] 0.752	0.78 [0.53,1.14] 0.191	1.10 [0.70,1.72] 0.673
A-level	0.58 [0.31,1.09] 0.089	1.44 [0.76,2.72] 0.258	0.56 [0.30,1.05] 0.073	1.47 [0.78,2.78] 0.232
Diploma or degree	0.96 [0.63,1.46] 0.847	0.51 [0.29,0.91] 0.023	0.93 [0.61,1.41] 0.733	0.49 [0.27,0.86] 0.013
Maternal Depression (ref. Not depressed)				
Depressed	1.56 [1.20,2.03] 0.001	1.26 [0.90,1.75] 0.183	1.57 [1.21,2.05] 0.001	1.27 [0.90,1.77] 0.170
Rurality (ref. Rural)				
Urban	1.15 [0.77,1.71] 0.499	1.35 [0.80,2.27] 0.266	1.13 [0.78,1.64] 0.529	1.39 [0.85,2.30] 0.193
Region (ref. South of England)				
Midlands/East of England	0.89 [0.56,1.42] 0.632	0.71 [0.40,1.25] 0.236	0.96 [0.60,1.54] 0.877	0.77 [0.43,1.35] 0.360
London	1.15 [0.77,1.71] 0.499	1.35 [0.80,2.27] 0.266	0.79 [0.39,1.57] 0.497	0.68 [0.29,1.60] 0.379
North West of England	0.79 [0.42,1.48] 0.462	0.55 [0.27,1.15] 0.115	0.87 [0.47,1.61] 0.658	0.62 [0.30,1.27] 0.188
North of England	0.97 [0.55,1.70] 0.911	0.62 [0.33,1.15] 0.130	1.03 [0.60,1.76] 0.926	0.64 [0.35,1.19] 0.158
Scotland	0.49 [0.27,0.89] 0.019	0.39 [0.19,0.81] 0.012	0.51 [0.29,0.90] 0.019	0.41 [0.21,0.84] 0.014
Wales	1.12 [0.67,1.87] 0.666	0.55 [0.27,1.10] 0.092	1.11 [0.68,1.83] 0.677	0.60 [0.30,1.20] 0.149
Neighbourhood deprivation (ref. Least deprived)				
Q2	0.95 [0.50,1.79] 0.876	1.47 [0.62,3.50] 0.383	…	…
Average	1.22 [0.67,2.23] 0.511	1.26 [0.53,2.98] 0.596	…	…
Q4	1.05 [0.56,1.99] 0.871	1.47 [0.62,3.49] 0.381	…	…
Most Deprived	1.08 [0.56,2.10] 0.818	1.65 [0.67,4.09] 0.280	…	…

Table 5-12	Full neighbourhood deprivation model by sex		Full social fragmentation model by sex	
	M1a: Girls (n=976,obs=3939)	M1b: Boys (n=946,obs=3799)	M2a: Girls (n=976,obs=3939)	M2b: Boys (n=946,obs=3799)
Covariates	**OR [95% CI] p**	**OR [95% CI] p**	**OR [95% CI] p**	**OR [95% CI] p**
Social fragmentation (ref. Least deprived)				
Q2	…	…	2.09 [1.07,4.11] 0.032	1.72 [0.73,4.06] 0.219
Average	…	…	1.51 [0.73,3.12] 0.264	1.28 [0.54,3.02] 0.580
Q4	…	…	1.49 [0.74,3.00] 0.264	2.23 [0.94,5.27] 0.068
Most Deprived	…	…	1.60 [0.78,3.27] 0.200	1.34 [0.46,3.91] 0.590
Social fragmentation*HH income				
Q2* High Income	…	…	0.30 [0.10,0.92] 0.036	0.97 [0.24,3.95] 0.967
Q2* Low Income	…	…	0.30 [0.10,0.93] 0.037	0.37 [0.08,1.62] 0.185
Average* High Inc	…	…	1.01 [0.30,3.37] 0.989	0.34 [0.08,1.49] 0.155
Average* Low Inc	…	…	0.63 [0.20,1.96] 0.425	0.49 [0.12,1.99] 0.322
Q4* High Income	…	…	0.75 [0.24,2.39] 0.629	0.77 [0.20,3.00] 0.712
Q4* Low Income	…	…	0.52 [0.17,1.60] 0.256	0.51 [0.13,2.01] 0.334
Most Fragmented* High Income	…	…	1.40 [0.48,4.03] 0.538	0.55 [0.14,2.11] 0.381
Most Fragmented*Low Income	…	…	0.21 [0.07,0.68] 0.009	0.22 [0.05,0.87] 0.031
Log likelihood				
AIC	2607	1775	2602	1781
MOR	3.86	4.03	3.84	4.042

5.6 Discussion

The analysis in this chapter addressed the first two research questions identified in chapter two. Firstly, it tested support for the hypothesis of equalisation in early adolescent self-esteem by examining whether the odds of reporting low self-esteem were associated with levels of neighbourhood deprivation. Secondly, it examined interactions with age, sex, and socio-geographic bearing to examine whether a) the specific age and sex components of the hypothesis are observed and b) whether the hypothesis is consistently observed over all sub-groups of adolescents. In the course of this analysis, the chapter also examined support for the deprivation amplification hypothesis, again across the whole sample and by sub-group. Findings are discussed below.

5.6.1 Support for the deprivation amplification hypothesis

Section 2.4.4 suggested that, as with adults, health in youth might be explained with reference to the deprivation amplification hypothesis. This would imply, in this context that self-esteem would be inversely associated with neighbourhood deprivation *over and above* individual and family characteristics.

Support for the hypothesis was not consistent with the findings reported in this chapter as neither social fragmentation nor neighbourhood were associated with self-esteem on an unadjusted basis in either the UK or Canada.

The findings are consistent with the UK literature (Fagg et al., 2006; Collishaw, 2009; West et al., 2004) which has examined these relationships on a cross-sectional basis for adolescents. They are not consistent with work with investigated these relationships on an unadjusted basis for children and adolescents (Ford et al., 2004) and which found inverse relationships.

Findings from Canada are limited to those relating to young children. On comparable measures, these found an inverse relationship between neighbourhood deprivation and parent reported mental health outcomes for 4-11 year olds (Boyle and Lipman, 2002). This is interesting because the adolescents examined in this study are a subset of those 4-11 year olds and it appears that there is no strong support for deprivation amplification in the same children even at a young age.

In contrast to these findings and the findings from this thesis, U.S. studies of adolescents and children *do* consistently support deprivation amplification (Wickrama and Bryant, 2003; Wickrama et al., 2005b; Turley, 2002b; Xue, 2005). Thus, we can speculate that deprivation amplification as a process may be more consistently supported in the United States.

Social fragmentation was examined in depth in this analysis to provide a second angle on deprivation amplification. The social environment was consistently highlighted in the literature testing relationships between neighbourhood deprivation and mental health for both adolescents (Fagg et al., 2006) and adults (Matheson et al., 2006; Curtis et al., 2009; Ivory, 2009). However, no associations were found in this thesis for this relationship. This provides a more robust test of earlier work which suggested that social fragmentation may be associated with psychological health in adults but that this indicator was not associated with adolescent psychological distress (Fagg et al., 2006).

5.6.2 Support for socio-economic equalisation hypothesis

Moving on from the discussion of the deprivation amplification hypothesis, the principal finding from the chapter was that adolescents were not more likely to report low self-esteem by levels of either neighbourhood deprivation or social fragmentation. This finding was consistent across the NLSCY and the BYP and is in clear support of the socio-economic

equalisation hypothesis of self-esteem in adolescence for neighbourhood deprivation (West et and Sweeting., 2004). It is again important to point out that this support is *not due* to the effects of composition attenuating relationships between neighbourhood deprivation and self-esteem to non-significance, as both unadjusted and adjusted relationships supported the hypothesis. An equalised, unadjusted association is highly consistent with the hypothesis, as it shows that health does not vary across socio-economic contexts as is expected from other studies at older and younger ages (see, for example, West and Sweeting, 2004 and the review in section 2.3).

Drawing on the other literature from the UK which has tested this question on a multivariate basis, the support for the equalisation position is consistent with samples constrained to particular regions in the UK (Fagg et al., 2006). No relationship was found between levels of neighbourhood deprivation and the mean levels of psychological distress in this population. However, Fagg et al. (2006) discussed the possibility that the non-significance of the relationship could be due to the lack of variability in this sample as most of the neighbourhoods in question were deprived relative to the national average. The findings reported in this study add to that debate, because the range of neighbourhood deprivation included is considerably larger, which increases the robustness of the conclusions reported here about equalisation.

Canadian boys were less likely to report low self-esteem in quintiles two to five, implying that those in the least deprived neighbourhoods were, if anything *more likely* to report low self-esteem than elsewhere in the country. Again, this is in support of the equalisation theory put forward by West and Sweeting (2004) which stipulates that for mental health and malaise symptoms specifically, socio-economic equalisation, and even reverse gradients with socio-economic status are to be expected. It is also interesting in the context of the Boyle et al.

(2002) finding which reported a reverse gradient (i.e. broadly consistent with the finding here) for the NLSCY adolescents as young children (aged 4-11). This is significant because it might imply that equalisation does not emerge as hypothesised by West (1997) from a position of deprivation amplification in this longitudinal cohort, but that this association with neighbourhood deprivation may have been consistent since early childhood.

In a recent study, Collishaw et al. (2009) reported univariate associations for a range of psychological outcomes (but not self-esteem) in this age group. This analysis was particularly relevant to the findings here, as it was conducted for a representative sample of 11-15 year olds across England, Scotland and Wales. Collishaw et al. (2009) estimate the association between neighbourhood deprivation and psychological distress reported by three types of informant, parents, teachers and adolescents themselves (using the same list of symptoms from the Strengths and Difficulties Questionnaire). Interestingly, an inverse gradient with neighbourhood deprivation was reported for parent and teacher reported psychological distress, but not for self-reported mental health. This is important for the findings from this thesis, as although the findings are consistent with equalisation theory for *self-reported* psychological outcomes (and therefore consistent with the findings in this thesis), they support the deprivation amplification hypothesis for parent and teacher reported psychological distress. Importantly, this study remains the only study to have tested this question in a multivariate model for this age group, and therefore able to draw conclusions about the equalisation hypothesis from that perspective.

The longitudinal design used in this thesis allowed it to make a contribution to several areas of the equalisation debate. The trends reported above were consistent with the literature, showing the strength of the relationships between sex and self-esteem emerged over early adolescence. This is consistent with a large body of work which also finds this gendered

trajectory for both self-esteem (Baldwin and Hoffman, 2002) and depression (Wade et al., 2002). In addition to these trends, the equalisation hypothesis would be strongly supported if evidence could be found that the relationship between neighbourhood deprivation were to weaken over the course of early adolescence (West and Sweeting, 2004). This was not found, because neighbourhood deprivation was not associated with self-esteem *at any point* in early adolescence in either the BYP or the NLSCY. While inconsistent with West and Sweeting (2004) hypothesis, the finding *is* consistent with their observations in the same paper. They suggest that this might be because while they theorised the end of childhood to be at approximately age 10 or 11, the chronological threshold may be lower in contemporary youth, as 'adolescence' extends into the domains of childhood (West et al., 2004).

The equalisation hypothesis centres not just on the observation that socio-economic effects will weaken when children enter early adolescence, but also that the role of peers will become more closely associated with health. As peer, and other external social influences such as youth culture are theorised to cut across class, this would be marked by a reduction in the importance of the family and an increase in importance of peers. This was examined in this chapter and while parental nurturance weakened with age in the NLSCY and the BYP, this only remained significant in the NLSCY after adjustment. No trends were observed in either survey for peers. Thus, the relative importance of parents may decline somewhat, but the general conclusion is that these *social influences* remain very important for youth in addition to peer influences. This is supported by work presented by Greene et al., (2005), who find that over the same period, the family and peer contexts are both important, although they suggest that the family is even more important. It is perhaps relevant that their sample is particularly ethnically diverse as it is conceivable that the relative importance of peer and family influences may vary by ethnicity.

This study developed an unadjusted and adjusted family socio-economic status model prior to the neighbourhood models to test the equalisation and deprivation amplification hypothesis at that level of analysis. This recognises the assertion made by several authors that the household may be a more important level of analysis than neighbourhood when considering mental health outcomes (Weich et al., 2005; Chandola et al., 2003).

The findings from this thesis consistently support the equalisation theory as it is currently specified for *neighbourhood deprivation*. However, when patterns of *household* socio-economic status are considered for the three non-occupational outcomes used in this study (household income, maternal education and lone parent family), there is only mixed support. West et al. (2004) describe trends in their data by age and sex, in a way which broadly corresponds with the unadjusted analyses reported here across the whole sample. The unadjusted findings here are *not* consistent with equalisation at the household level but more closely support work on socio-economic *inequalities* in health (Black et al., 1980). The emergence of gradients may be observed because of the increased range of socio-economic variation in the NLSCY and BYP samples and highlights the importance of utilising nationally representative and socio-economically diverse population samples.

The *adjusted* household level findings broadly support the idea of varying processes at different scales: both a social group equalisation *and* a family socio-economic inequalities perspective. Findings from chapter five and chapter six suggest that unadjusted socio-economic gradients are attenuated dramatically by control for family social environments, often to non-significance. This suggests that socio-economic gradients *at the household level* may have independent effects supportive of inequalities, but that these are mediated through household social relationships. Overall, this is consistent with the *family process model* of economic hardship which was formulated specifically with reference to early adolescents

(Conger et al., 1992; Conger et al., 1993) and which is also demonstrated in studies of adolescents from the National Child Development Study (Sacker et al., 2002). Thus, while not the focus of the thesis, which focuses on the neighbourhood context, the findings support a social inequalities perspective at the household level and not an equalisation hypothesis.

5.6.3 Consistency of support for equalisation in youth

The second research question posed by this thesis questioned whether equalisation would be observed consistently for all sub-groups of adolescents. This suggests that neighbourhood deprivation and social fragmentation might not impact in the same way for all individuals, groups or in different contexts.

In one sense, this thesis, in testing associations at a particular point in the life span, for one very specific relationship, between neighbourhood deprivation and self-esteem for contemporary adolescents, already implicitly recognises these interactions. Specifically, it is predicated on the assertion that the importance of neighbourhoods may vary at critical periods in the life-span (with its focus on early adolescence), life-course (contemporary focus), outcomes (self-esteem), and neighbourhood characteristics (specific indices of neighbourhood characteristics).

The findings from this thesis test a large number of interactions between neighbourhoods and individual and family environments explicitly. It has taken seriously the problem of *multiple comparisons* discussed in the methodology (Oxman and Guyatt, 1992). To reduce this issue, the thesis outlined interactions *a priori* with reference to the literature in chapter two (section 2.5). Then, owing to the large sample size of the BYP and NLSCY samples, which might make the detection of interactions in the sample which were not present in the population even more likely, only interactions which were evident over the whole sample at two stages of

analysis were accepted as robust (section 3.5.4). None of the neighbourhood interactions in either survey met those pre-specified criteria apart from an interaction between neighbourhood social fragmentation and family socio-economic status.

The finding that no interactions were significant in one sense completely addresses the second research question under test in this thesis. It implies that the equalisation hypothesis is supported for all sub-groups within the population; the observed equalisation by neighbourhood deprivation impacts in apparently equal ways on all early adolescents regardless of whether they are girls or boys, relatively young or old (within the range 11-15), or belong to a visible ethnic minority group.

Socio-economic status at the household level may interact with neighbourhood deprivation under the relative deprivation or competition hypotheses (Jencks and Mayer, 1990). However, this was not found *in a robust way* in this analysis. While interactions were observed for social fragmentation with household income, this had no clear interpretation in the context of the model which included sex interactions. This is in contrast to earlier work presented by Drukker et al. (2006) where Drukker et al. (2006) who found clear evidence of non-significant *trends* in the interaction between maternal education and neighbourhood deprivation. The results reported by Drukker et al., (2006) indicate that neighbourhood deprivation was associated with an *increase* in self-esteem for adolescents whose mothers were well educated and a *decrease* for those who were less well educated. The finding is also inconsistent with work from the United States that there are apparent significant *reductions* in risk of depression associated with relative deprivation (Wickrama and Bryant, 2003; Turley, 2002a). However, all the findings run counter to the relative deprivation and competition hypotheses specified by Jencks and Mayer (1990). These both predict that adolescents would report worse outcomes when comparing themselves to, or competing with more affluent peers. Thus, the combination

of findings emphasises that socio-economic status and neighbourhood deprivation appear to operate quite differently in adolescence than adulthood even when (as in Wickrama and Bryant, 2003; Turley, 2002a) deprivation amplification is supported over the whole sample.

The family social environment may also be associated differentially under conditions of neighbourhood deprivation (Leventhal and Brooks-Gunn, 2000). No interactions were observed in these analyses to support such a framework. This is in line with other work which investigates these interactions (Wickrama and Bryant, 2003) and which found that adolescent-reported relationships with parents did not interact with neighbourhood deprivation. However, in the same study parental reported relationships with depressive symptoms weakened with increasing levels of neighbourhood deprivation. This firstly suggests that social factors at the household level may vary, and be observed qualitatively between different neighbourhoods (Furstenberg, 1993). It also aligns with the work by Collishaw (2009), Currie (2000) and Curtis (2004) which suggests that the source of measurement of mental health, household socio-economic status, and neighbourhood environment is likely to be critical in determining whether relationships emerge.

Equalisation was not observed to vary with levels of social fragmentation and rurality in either Canada or the UK. This is in contrast to the findings of Caughy (2003) and Drukker et al. (2005) and shows that even when social fragmentation was high, self-esteem remained equalised by levels of neighbourhood deprivation. These differences in responses may again be attributable to differences in life stage because the samples in the Caughy (2003) and Drukker et al. (2005) studies related to young children and adults respectively.

5.6.4 Summary and implications

The chapter has addressed the two primary research questions set out in this thesis. The findings from this chapter support the hypothesis that self-esteem is equalised for early adolescents in the UK and Canada across levels of neighbourhood deprivation. This finding is *not* the result of adjustment for composition, but is found on an unadjusted and adjusted basis. Moreover, it is found across all sub-groups which could be tested. As such the hypothesis appears to be consistently observed across all early adolescents in the general household population for both countries.

CHAPTER 6 – ASSOCATIONS BETWEEN CHANGE IN SELF-ESTEEM AND NEIGHBOURHOOD DEPRIVATION

6.1 Introduction

Chapter two established that few studies have explored the prospective associations between neighbourhood characteristics and adolescent mental health outcomes. As argued in that review, the advantage of prospective associations is that they strengthen causal inferences by establishing whether a hypothesised causal covariate precedes an outcome. Related to this, longitudinal analyses also allow investigation of which factors differentiate whether individuals maintain good and bad health, or whether they experience a change in health status. These facets of the relationship between adolescent self-esteem and neighbourhood characteristics have not yet been examined on a multivariate basis. Overall, the analyses in this chapter address the third research question primarily, namely:

Is there evidence for prospective associations between adolescent self-esteem and socio-geographic processes of neighbourhood context, composition, health selective migration and socio-geographic mobility in the UK and Canada?

6.2 Differences between chapter five and chapter six samples

The NLSCY and BYP samples from chapter five differed from those used in chapter six. Both contain exactly the same individuals. However, some responses which were included in the chapter five models could not be included in the chapter six models. This is because chapter six uses data at the first time point 1 (t1) in each transition on the independent variables to

construct the self-esteem change variable, and to describe how it is associated with the independent variables at t1. This means that the sub-samples could potentially differ on those time-varying variables in the model. This is investigated in this section on a bivariate basis, using proportions and 95% confidence intervals. Descriptive statistics are compared for those observations which were used in both chapters and those which were used in the analyses presented in chapter five, but not in chapter six. As discussed in section 3.5.1, the confidence intervals used in these descriptives are both weighted, and adjusted for the non-independence of observations within individuals.

6.2.1 NLSCY

The results reported in Table 6-1 show that the only differences between the two groups of observations were in terms of perceptions of parenting. The chapter five only observations, which were drawn from the respondents when they were older on average, were significantly lower on the parental rejection than those used in both chapters. Friendship quality was higher in the observations drawn from both chapters. However, perceptions of parental nurturance were similar across both sets of observations. Other than the differences on the friendship quality and parental rejection scales, there were no observable differences in the proportions of the subsamples reporting low self-esteem, on independently measured family (family structure, household income, maternal education and depression), or geographical (neighbourhoods, rurality, province) environments.

Table 6-1: Sub-samples differences for chapter five and chapter six for NLSCY

Variables	Chapter five only (obs=1927)	Chapter five *and* chapter six (obs=6621)
Age group		
10/11	0	0.31 [0.29,0.33]
12/13	0.44 (0.42, 0.44)	0.39 [0.37,0.41]
14/15	0.56 (0.53, 0.58)	0.30 [0.28,0.31]
Self-esteem		
Low	0.17 [0.15, 0.18]	0.19 [0.18, 0.21]
Parental nurturance	15.12 (14.99, 15.26)	15.23 (15.06, 15.39)
Parental rejection	7.85 (7.71, 8.00)	8.63 (8.45, 8.81)
Friendship quality	13.08 (12.99, 13.17)	13.29 (13.19, 13.4)
Family functioning	7.63 (7.58, 7.68)	7.57 (7.51, 7.63)
Family structure		
Intact	0.74 (0.73, 0.76)	0.72 (0.71, 0.74)
Reconstituted	0.11 (0.10, 0.12)	0.11 (0.10, 0.12)
Single	0.15 (0.14, 0.17)	0.17 (0.15, 0.18)
Household income		
Average	0.52 (0.50, 0.54)	0.54 (0.52, 0.56)
High	0.31 (0.30, 0.33)	0.29 (0.27, 0.3)
Low	0.16 (0.15, 0.18)	0.17 (0.16, 0.19)
Uncorrected chi2(2)		
Maternal depression		
Case	0.16 (0.14, 0.17)	0.15 (0.14, 0.17)
Maternal education		
Less than high school	0.19 (0.18, 0.21)	0.18 (0.17, 0.20)
High school	0.62 (0.61, 0.64)	0.63 (0.61, 0.65)
Degree or diploma	0.18 (0.17, 0.20)	0.19 (0.17, 0.21)
Province		
Ontario	0.38 (0.36, 0.39)	0.38 (0.36, 0.40)
Maritimes	0.08 (0.07, 0.08)	0.07 (0.07, 0.08)
Quebec	0.26 (0.24, 0.27)	0.26 (0.24, 0.28)
Manitoba	0.04 (0.03, 0.04)	0.04 (0.03, 0.04)
Saskatchewan	0.04 (0.03, 0.04)	0.04 (0.03, 0.04)
Alberta	0.11 (0.10, 0.11)	0.11 (0.10, 0.12)
British Columbia	0.11 (0.10, 0.12)	0.11 (0.10, 0.12)
Urban/rural		
Rural	0.25 (0.24, 0.26)	0.25 (0.23, 0.26)
Neighbourhood deprivation		
Least deprived (Q1)	0.20 (0.18, 0.22)	0.19 (0.18, 0.21)
Q2	0.21 (0.19, 0.22)	0.2 (0.19, 0.22)
Average	0.22 (0.20, 0.23)	0.22 (0.20, 0.23)
Q4	0.20 (0.19, 0.22)	0.21 (0.19, 0.22)
Most deprived (Q5)	0.18 (0.16, 0.19)	0.18 (0.17, 0.19)
Social fragmentation		
Least fragmented (Q1)	0.26 (0.24, 0.27)	0.26 (0.24, 0.28)
Q2	0.22 (0.20, 0.23)	0.22 (0.20, 0.24)
Average	0.22 (0.21, 0.23)	0.22 (0.21, 0.24)
Q4	0.18 (0.17, 0.19)	0.17 (0.16, 0.19)
Most fragmented (Q5)	0.12 (0.11, 0.14)	0.12 (0.11, 0.14)

Proportions in first column were included in the chapter five sample only and were not analysed in chapter six., Those in the second column were analysed in both chapters.

6.2.2 BYP

Differences between the chapter five and chapter six samples were assessed on a bivariate basis using the descriptive statistics summarised below. As expected, few differences were observed as a result of the omission of the predictor variables at ages 14 and 15, and the outcome variable at age 11 and 12. It is axiomatic that there were no observations for 11 and 12 year olds in the chapter five only sample as these observations were omitted as outcomes in chapter six to use as lagged independent variables for the analysis.,

The only statistically significant changes were observed between talking with parents. In the subsample which was analysed in sample five only but excluded from analysis in chapter six, the proportion of adolescents who talked to their parents most days was higher (proportion = 18, 95%CI 0.17, 0.20) than the subsample analysed in both chapters (proportion = 0.14, 95% CI 0.12,0.16). A similar effect was observed with happiness with family, where fewer adolescents were unhappy with their family in the chapter 5 only sample, compared to the chapter five and six sample. Overall, this reflects the trend observed in chapter four, that perception of family life and relationships with parents are subject to change with age in this period and thus, that observations from subsamples of different ages will differ in this regard.

Table 6-2: Differences between the samples used in chapter five and those used in chapter six for BYP

Table 6-2 Variables	**Chapter five only (n=1922, obs.=3,972)**	**Chapter five *and* chapter six (n=1922, obs.= 4,068)**
Age		
11	0	0.36 [0.35,0.37]
12	0	0.43 [0.42,0.44]
13	0.33 [0.32,0.34]	0.11 [0.10,0.12]
14	0.33 [0.32,0.34]	0.07 [0.06,0.08]
15	0.34 [0.33,0.35]	0.02 [0.02,0.03]
Self-esteem		
Low	0.10 [0.09,0.11]	0.10 [0.08,0.11]
Talks to parent(s)		
Hardly ever	0.18 [0.16,0.20]	0.22 [0.20,0.24]

Table 6-2 Variables	**Chapter five only (n=1922, obs.=3,972)**	**Chapter five *and* chapter six (n=1922, obs.= 4,068)**
Regularly	0.64 [0.62,0.66]	0.64 [0.62,0.66]
Most days	0.18 [0.17,0.20]	0.14 [0.12,0.16]
Argues with parent(s)		
Hardly ever	0.35 [0.33,0.37]	0.32 [0.30,0.34]
Regularly	0.59 [0.57,0.61]	0.61 [0.59,0.63]
Most days	0.06 [0.05,0.07]	0.07 [0.06,0.08]
Happy with peers		
Unhappy	0.05 [0.04,0.06]	0.05 [0.04,0.06]
Happy with family		
Unhappy	0.05 [0.04,0.06]	0.08 [0.07,0.10]
Family structure		
Intact	0.67 [0.64,0.69]	0.66 [0.63,0.68]
Reconstituted	0.14 [0.12,0.16]	0.15 [0.13,0.17]
Single	0.19 [0.17,0.21]	0.19 [0.17,0.22]
Household income		
Average	0.50 [0.47,0.52]	0.53 [0.51,0.55]
High	0.31 [0.28,0.33]	0.30 [0.28,0.32]
Low	0.20 [0.18,0.21]	0.17 [0.15,0.19]
Maternal depression		
Case	0.32 [0.30,0.34]	0.32 [0.30,0.34]
Maternal education		
No qualifications	0.37 [0.34,0.39]	0.36 [0.33,0.38]
GCSE	0.31 [0.28,0.33]	0.32 [0.29,0.34]
A-level	0.09 [0.08,0.11]	0.09 [0.08,0.11]
Degree or diploma	0.23 [0.21,0.25]	0.23 [0.21,0.26]
Region		
South of England	0.29 [0.26,0.31]	0.30 [0.27,0.33]
East of England and Midlands	0.21 [0.19,0.23]	0.23 [0.20,0.25]
London	0.10 [0.08,0.12]	0.09 [0.07,0.10]
North West	0.12 [0.10,0.14]	0.12 [0.10,0.14]
Rest of North	0.15 [0.13,0.17]	0.17 [0.14,0.19]
Scotland	0.08 [0.07,0.09]	0.06 [0.05,0.07]
Wales	0.05 [0.04,0.06]	0.04 [0.03,0.05]
Urban/rural		
Rural	0.21 [0.19,0.23]	0.21 [0.19,0.23]
Neighbourhood deprivation		
Least deprived (Q1)	0.10 [0.09,0.12]	0.11 [0.09,0.12]
Q2	0.16 [0.14,0.18]	0.17 [0.15,0.20]
Average	0.23 [0.21,0.25]	0.24 [0.21,0.26]
Q4	0.26 [0.24,0.28]	0.25 [0.23,0.28]
Most deprived (Q5)	0.24 [0.22,0.26]	0.23 [0.21,0.25]
Social fragmentation		
Least fragmented (Q1)	0.15 [0.13,0.17]	0.17 [0.15,0.19]
Q2	0.22 [0.20,0.24]	0.22 [0.20,0.24]
Average	0.17 [0.16,0.19]	0.18 [0.16,0.20]
Q4	0.21 [0.19,0.23]	0.20 [0.18,0.22]
Most fragmented (Q5)	0.24 [0.22,0.26]	0.23 [0.21,0.26]

Proportions in first column were included in the chapter five sample only and were not analysed in chapter six. Those in the second column were analysed in both chapters.

6.3 Unadjusted associations between independent variables and change in self-esteem

The models for this section are described in depth in the methodology (see chapter three). Multinomial models are used to model all the possible transitions between high and low self-esteem at t1 and high and low self-esteem at follow-up. Thus, four outcomes are modelled, adolescents who maintain-high self-esteem at both time-points ('Maintain High'; t1 = high, t2 = high), adolescents who report an improvement in self-esteem ('Improvement ; t1=low, t2 = high), adolescents who report a decline in low self-esteem (Decline ; t1 = high, t2 = low), and adolescents who report that they maintain-low self-esteem ('Maintain-low; t1 = low, t2 = low).

As discussed in the methodology, the results of these models can be interpreted in a similar way to three logistic regression models with the following outcomes: 'Maintain High (ref.) vs. Improvement'; 'Maintain High' (ref.) vs. 'Decline ; and 'Maintain High' (ref.) vs. 'Maintain Low'. These models calculate relative risk ratios (abbreviated to RRR in tables), 95% confidence intervals ([95%CI]) and p values (p). Relative risk ratios have, as discussed in the methodology, a similar interpretation to odds ratios where, as is the case here, the outcomes are rare.

6.3.1 NLSCY

Neighbourhood deprivation at t1 is non-significantly associated with all self-esteem change outcomes (Table 6-3). However, there are unadjusted associations between social fragmentation and improvement in self-esteem (Improvement: Social Fragmentation Q5 RRR = 1.48 [1.14, 1.87] p=0.003), and maintenance of low self-esteem (Maintain-Low: Social Fragmentation Q5 RRR = 1.59 [1.05,2.39] p = 0.001).

Adolescents living in high income households were at a statistically significantly lower risk of reporting either a decline in self-esteem or of maintaining low self-esteem than adolescents from average backgrounds. They were no more likely to maintain high self-esteem or improve from one time point to another relative to those from more average income families. Household income deprivation was also associated with change in self-esteem but only for declines, not maintenance or improvements. Another indicator of socio-economic status, high levels of maternal education (degree or diploma) versus less than high school level, was associated with all transition types on an unadjusted basis. This association was consistently protective for all self-esteem transitions.

Otherwise, as might be expected, variables which were significantly associated with low self-esteem on a concurrent basis in chapter five (see findings in section 5.2.1) were also prospectively associated on an unadjusted basis with the types of self-esteem transitions that adolescents report. It is important to note that covariates tend to be associated with all the transition types in a similar direction. The exceptions to this are age and sex which vary in their associations with the transition types. The full range of associations will be commented on in more detail below after adjustment for all the variables in the model.

Table 6-3: Unadjusted associations and self-esteem change in the NLSCY (N=3421, 6621 transitions). Maintain-High (4876 transitions) is reference category for each of the three outcomes

	N1: Unadjusted associations with self-esteem change		
Table 6-3	**Improvement (n=821) vs. Maintain High**	**Decline (n=497) vs. Maintain High**	**Maintain Low (n=427) vs. Maintain High**
Covariates at t1	**RRR [95% CI] p**	**RRR [95% CI] p**	**RRR [95% CI] p**
Age (ref. 10/11-12/13)			
12/13-14/15	1.65 [1.37,1.98] 0.000	0.95 [0.82,1.10] 0.512	1.86 [1.60,2.16] 0.000
Sex (ref. boys)			
Girls	1.01 [0.84,1.22] 0.935	1.68 [1.44,1.95] 0.000	1.60 [1.25,2.04] 0.000
Ethnicity (ref. Canadian)			
European	1.00 [0.78,1.27] 0.986	0.81 [0.68,0.98] 0.028	0.94 [0.70,1.27] 0.695
First Nations	0.95 [0.65,1.40] 0.809	0.88 [0.66,1.19] 0.410	0.89 [0.55,1.43] 0.625
Other Visible Minority	2.04 [1.31,3.17] 0.001	1.36 [0.93,1.98] 0.112	1.38 [0.77,2.47] 0.283
Baseline year(ref. 1994-96)			
1996-98	0.94 [0.70,1.26] 0.690	1.25 [1.00,1.55] 0.046	1.85 [1.42,2.41] 0.000
1998-00	1.64 [1.24,2.18] 0.001	0.90 [0.71,1.15] 0.415	1.47 [1.04,2.08] 0.028
2000-02	1.05 [0.76,1.45] 0.761	1.16 [0.91,1.48] 0.236	1.50 [1.05,2.15] 0.027
2002-04	1.42 [0.97,2.08] 0.074	1.12 [0.82,1.55] 0.469	1.62 [1.04,2.53] 0.034
Parental Nurture	0.81 [0.79,0.83] 0.000	0.94 [0.92,0.96] 0.000	0.81 [0.78,0.83] 0.000
Parental Rejection	1.14 [1.11,1.16] 0.000	1.05 [1.03,1.07] 0.000	1.16 [1.13,1.19] 0.000
Friendship Quality	0.75 [0.72,0.77] 0.000	0.90 [0.88,0.93] 0.000	0.73 [0.70,0.76] 0.000
Family Functioning	0.88 [0.82,0.95] 0.000	0.86 [0.82,0.91] 0.000	0.88 [0.81,0.96] 0.005
Family Structure (ref. Intact)			
Reconstituted	1.69 [1.28,2.23] 0.000	1.39 [1.10,1.76] 0.006	2.09 [1.51,2.91] 0.000
Single Parent	1.49 [1.15,1.91] 0.002	1.31 [1.07,1.61] 0.010	1.63 [1.20,2.21] 0.002
Relative Income (ref. Average)			
High	0.88 [0.70,1.09] 0.236	0.75 [0.63,0.90] 0.002	0.67 [0.51,0.89] 0.006
Low	1.25 [0.98,1.59] 0.072	1.23 [1.02,1.49] 0.033	1.24 [0.94,1.63] 0.129
Maternal Education (ref. < High School)			

Table 6-3	N1: Unadjusted associations with self-esteem change Improvement (n=821) vs. Maintain High	Decline (n=497) vs. Maintain High	Maintain Low (n=427) vs. Maintain High
Covariates at t1	**RRR [95% CI] p**	**RRR [95% CI] p**	**RRR [95% CI] p**
High School	0.88 [0.70,1.11] 0.289	0.76 [0.64,0.91] 0.003	0.85 [0.64,1.12] 0.248
Diploma or Degree	0.59 [0.43,0.83] 0.002	0.52 [0.40,0.67] 0.000	0.60 [0.40,0.89] 0.012
Maternal Depression (ref. Depressed)			
Not depressed	1.46 [1.14,1.87] 0.003	1.50 [1.23,1.83] 0.000	1.61 [1.22,2.11] 0.001
Rurality (ref. Rural)			
Urban	1.07 [0.88,1.31] 0.491	0.98 [0.84,1.15] 0.845	1.13 [0.88,1.44] 0.349
Province (ref. Ontario)			
Maritimes	0.93 [0.71,1.22] 0.590	1.05 [0.85,1.30] 0.669	0.98 [0.69,1.40] 0.932
Quebec	0.83 [0.62,1.10] 0.188	1.06 [0.85,1.32] 0.584	1.28 [0.91,1.79] 0.161
Manitoba	1.30 [0.91,1.87] 0.147	0.96 [0.69,1.32] 0.786	0.89 [0.52,1.53] 0.675
Saskatchewan	0.73 [0.49,1.09] 0.125	0.61 [0.43,0.86] 0.005	0.85 [0.49,1.45] 0.545
Alberta	0.70 [0.48,1.02] 0.062	0.74 [0.55,1.00] 0.051	0.77 [0.48,1.23] 0.277
British Columbia	0.62 [0.41,0.93] 0.022	0.73 [0.53,1.00] 0.049	0.95 [0.58,1.55] 0.823
Neighbourhood deprivation (ref. Least Deprived)			
Q2	0.96 [0.68,1.36] 0.835	1.01 [0.76,1.33] 0.961	1.12 [0.72,1.75] 0.616
Average	0.88 [0.63,1.23] 0.457	0.95 [0.72,1.24] 0.701	1.21 [0.80,1.85] 0.372
Q4	0.84 [0.60,1.17] 0.292	0.94 [0.72,1.23] 0.642	1.20 [0.79,1.82] 0.397
Most deprived	1.07 [0.78,1.48] 0.663	1.16 [0.90,1.50] 0.263	1.12 [0.74,1.70] 0.594
Social Fragmentation (ref. Least Fragmented)			
Q2	1.21 [0.91,1.61] 0.188	1.12 [0.90,1.40] 0.296	1.65 [1.16,2.34] 0.005
Average	1.26 [0.95,1.67] 0.104	1.11 [0.89,1.38] 0.365	1.37 [0.96,1.96] 0.082
Q4	1.12 [0.83,1.51] 0.447	0.98 [0.78,1.23] 0.852	1.16 [0.80,1.70] 0.433
Most Fragmented	1.48 [1.07,2.06] 0.019	1.18 [0.91,1.54] 0.216	1.59 [1.05,2.39] 0.027

6.3.2 BYP

The BYP has a smaller number of transitions in self-esteem owing partially to the smaller overall sample size and partially to the lower proportions of adolescents reporting low self-esteem at any point (see chapter three). This has significant implications for analyses of these data.

There are non-systematic unadjusted associations between neighbourhood deprivation and improvement in self-esteem. Decline and maintenance of low self-esteem are not associated with neighbourhood deprivation. There are no unadjusted associations between neighbourhood social fragmentation and changes in self-esteem, although there is a marginal but large unadjusted relative risk associated with the highest quintile of social fragmentation and maintenance of low self-esteem.

Family socio-economic status is less consistently associated with self-esteem changes than in the NLSCY on an unadjusted basis. In contrast to the NLSCY, high household income is not associated with any change transition in self-esteem and low household income is associated with an increased risk of self-esteem improving from one time point to another, but not with any other change category. Maternal education is protective for all change outcomes, such that adolescents are more likely to maintain high self-esteem if their mothers have any education. However, those associations are only significant for one change category (decline), at the very highest levels of maternal education. Adolescents whose mothers have gained intermediate levels of education (GCSE or A-level) are not statistically differentiated between change categories at all relative to adolescents of mothers with no qualifications, and therefore inference cannot be made as to whether the protective associations with maternal education are not due to sampling error.

The unadjusted results for the other variables in the model are provided for reference in Table 6-4. They show that the majority of individual and family level variables, other than ethnicity and urban/rural status, are associated with transitions in self-esteem independently of the other variables in the model. However, these patterns are complex and as they are not central to the thesis, are interpreted after adjustment only.

Table 6-4: Unadjusted associations and self-esteem change in the BYP (N=1922, 3980 transitions). Maintain-High (3316 transitions) is reference category for each of the three outcomes

Table 6-4	B1: : Unadjusted associations with self-esteem change		
	Improvement (n=300) vs. Maintain-High	Decline (n=260)vs. Maintain-High	Maintain-Low (n= 104) vs. Maintain-High
Covariates at t1	**RRR [95% CI] P**	**RRR 95% CI] P**	**RRR 95% CI] P**
Age (ref. 11)			
12	1.18 [0.87,1.59] 0.298	1.09 [0.79,1.49] 0.608	1.69 [1.00,2.87] 0.050
13	1.02 [0.73,1.42] 0.927	0.84 [0.59,1.21] 0.351	1.84 [1.09,3.10] 0.022
Sex (ref. Boys)			
Girls	2.04 [1.50,2.76] 0.000	1.32 [0.98,1.80] 0.071	2.65 [1.46,4.80] 0.001
Ethnicity*ta (ref. Non-visible)			
Visible minority	1.01 [0.50,2.01] 0.984	1.37 [0.75,2.53] 0.307	0.33 [0.06,2.00] 0.230
Year (ref. 1994)			
1995	0.66 [0.36,1.20] 0.171	0.75 [0.46,1.22] 0.247	0.64 [0.30,1.37] 0.251
1996	0.59 [0.32,1.09] 0.090	0.53 [0.30,0.95] 0.033	0.36 [0.16,0.81] 0.013
1997	0.60 [0.32,1.13] 0.113	0.41 [0.22,0.78] 0.007	0.21 [0.07,0.63] 0.005
1998	0.61 [0.34,1.10] 0.098	0.56 [0.32,0.97] 0.039	0.30 [0.13,0.71] 0.006
1999	0.75 [0.42,1.34] 0.328	0.62 [0.36,1.07] 0.085	0.92 [0.46,1.85] 0.809
2000	0.93 [0.54,1.60] 0.796	0.56 [0.33,0.94] 0.028	0.28 [0.10,0.75] 0.012
2001	1.17 [0.69,1.98] 0.564	0.44 [0.24,0.80] 0.007	0.46 [0.21,1.01] 0.054
2002	1.35 [0.81,2.26] 0.254	0.45 [0.25,0.80] 0.006	0.17 [0.06,0.53] 0.002
Talks with parents ('Regular')			
Hardly ever	1.10 [0.75,1.60] 0.640	1.46 [1.02,2.07] 0.036	1.09 [0.63,1.88] 0.752
Most days	1.15 [0.79,1.67] 0.470	0.61 [0.38,0.96] 0.033	0.35 [0.17,0.72] 0.004
Argues with parents (ref. 'Regular')			
Hardly ever	0.59 [0.43,0.80] 0.001	0.56 [0.40,0.79] 0.001	0.23 [0.12,0.43] 0.000
Most days	1.29 [0.73,2.27] 0.374	1.29 [0.77,2.14] 0.334	2.39 [1.23,4.65] 0.010
Happiness with friends (ref. Happy)			
Unhappy with friends	1.68 [0.88,3.23] 0.116	5.62 [3.74,8.44] 0.000	2.75 [1.32,5.74] 0.007
Happiness with family (ref. Happy)			
Unhappy	1.63 [0.95,2.80] 0.079	5.24 [3.39,8.12] 0.000	6.78 [3.89,11.81] 0.000
Family Structure (ref. Intact)			

Table 6-4	B1: : Unadjusted associations with self-esteem change		
	Improvement (n=300) vs. Maintain-High	Decline (n=260)vs. Maintain-High	Maintain-Low (n= 104) vs. Maintain-High
Covariates at t1	**RRR [95% CI] P**	**RRR 95% CI] P**	**RRR 95% CI] P**
Reconstituted	1.74 [1.20,2.53] 0.004	1.66 [1.14,2.42] 0.009	2.45 [1.35,4.44] 0.003
Single Parent	1.20 [0.83,1.74] 0.340	1.20 [0.82,1.76] 0.351	2.17 [1.17,4.02] 0.014
HH income (ref. Average)			
High	0.88 [0.63,1.24] 0.467	0.74 [0.52,1.05] 0.095	0.59 [0.30,1.18] 0.136
Low	1.78 [1.30,2.45] 0.000	1.23 [0.85,1.78] 0.279	1.27 [0.73,2.22] 0.394
Maternal Education (ref. <GCSE)			
GCSE	0.92 [0.65,1.29] 0.618	0.76 [0.52,1.10] 0.147	0.89 [0.49,1.61] 0.695
A-level	0.68 [0.38,1.22] 0.192	0.86 [0.49,1.49] 0.586	0.64 [0.23,1.79] 0.392
Diploma or degree	0.79 [0.53,1.19] 0.264	0.63 [0.41,0.95] 0.026	0.79 [0.39,1.61] 0.518
Maternal Depression (ref. Depressed)			
Not depressed	1.77 [1.33,2.35] 0.000	1.99 [1.47,2.67] 0.000	1.87 [1.15,3.04] 0.012
Urban/Rural (ref. Rural)			
Urban	1.37 [0.95,1.98] 0.096	1.11 [0.78,1.59] 0.568	1.41 [0.70,2.85] 0.338
Region (ref. South of England)			
Midlands/East of England	0.83 [0.55,1.26] 0.380	0.98 [0.65,1.48] 0.927	0.61 [0.30,1.24] 0.173
London	0.73 [0.39,1.35] 0.318	0.71 [0.37,1.38] 0.316	1.22 [0.44,3.36] 0.707
North West of England	0.62 [0.34,1.12] 0.113	0.68 [0.39,1.18] 0.170	0.94 [0.42,2.12] 0.890
North of England	0.90 [0.58,1.39] 0.637	0.65 [0.40,1.06] 0.084	0.64 [0.30,1.37] 0.251
Scotland	0.82 [0.48,1.40] 0.469	0.57 [0.33,0.98] 0.042	0.25 [0.06,1.06] 0.061
Wales	0.79 [0.49,1.28] 0.341	0.92 [0.51,1.63] 0.763	0.90 [0.37,2.17] 0.810
Neighbourhood deprivation (ref. Least deprived)			
Q2	1.87 [1.01,3.44] 0.046	0.96 [0.53,1.76] 0.901	1.63 [0.53,5.03] 0.399
Average	2.08 [1.16,3.73] 0.014	0.99 [0.56,1.75] 0.963	1.37 [0.48,3.92] 0.556
Q4	1.75 [0.98,3.10] 0.057	1.27 [0.71,2.27] 0.419	1.74 [0.63,4.77] 0.284
Most Deprived	2.02 [1.13,3.62] 0.018	0.94 [0.53,1.66] 0.823	2.01 [0.70,5.81] 0.195
Social Fragmentation (ref. Least fragmented)			
Q2	1.04 [0.63,1.71] 0.876	0.96 [0.57,1.62] 0.889	1.64 [0.58,4.64] 0.347
Average	1.18 [0.70,2.01] 0.534	1.07 [0.62,1.83] 0.817	2.47 [0.88,6.97] 0.087
Q4	1.29 [0.78,2.12] 0.319	1.27 [0.78,2.09] 0.341	1.28 [0.44,3.74] 0.652
Most fragmented	1.51 [0.91,2.51] 0.112	1.26 [0.74,2.13] 0.393	2.83 [0.98,8.13] 0.054

6.4 Adjusted associations between neighbourhood deprivation and changes in self-esteem

6.4.1 NLSCY

The fully adjusted model reported in Table 6-5 show that the prospective adjusted associations between neighbourhood deprivation and change in self-esteem are statistically nonsignificant. In addition to these findings, the statistically significant unadjusted associations between neighbourhood social fragmentation and changes in self-esteem (Table 6-3) are attenuated to non-significance by adjustment for individual and family factors (see Table 6-5).

Relative household deprivation is not associated with any of the three outcomes after adjustment. High household income is marginally statistically significantly protective for maintaining low self-esteem (RRR = 0.71 [0.50, 0.99] p = 0.046), but is otherwise not associated with improvement or decline. High levels of maternal education are associated with reduced risks of reporting either an improvement or decline in self-esteem. However, education is not associated with maintenance of low self-esteem.

The adjusted results (Table 6-5) show that adolescents aged 12/13 are more likely to report improvements over the follow-up period of two years between cycles of the NLSCY. Those who are older are also more likely to report that they maintain low self-esteem than those aged 10/11, but less likely to decline. This patterning of response is difficult to interpret given the findings from chapter five, that age and sex interact in their association with low self-esteem. The results also indicate that girls are more likely to report all three change outcomes than boys. Put more simply, this suggests that boys are more likely to maintain high self-esteem between any two time points than girls. This contributes to the extensive literature on this subject, supporting research which highlights differential individual level growth curves for

boys and girls in self-esteem (Baldwin and Hoffmann, 2002). While there was evidence of unadjusted associations between some ethnic categories and transitions in Table 6-3, these are attenuated to non-significance after adjustment. As the concurrent non-significant associations reported in chapter five, this is unsurprising. However, it is consistent with the literature which suggests that ethnic categories are not helpful for explaining variations in self-esteem at the individual level (Emler, 2001; Rosenberg, 1965). Year of measurement is associated with increased risk of improvement, decline and maintenance of low self-esteem.

Teenage perceptions of parenting and friendships are associated with all three transitions outcomes in the same way (see Table 6-3). As expected, parental nurturance and friendships protect from decline, and maintenance of low self-esteem and parental rejection is associated with an increased risk of these outcomes. As with the associations observed for sex, this may be more helpfully interpreted that adolescents are more likely to maintain high self-esteem between cycles where perceptions of relationships with friends and parents at t1 were high. This finding is consistent with a large body of self-esteem work which emphasises the importance of social relationships to self-esteem (Coopersmith, 1967; Emler, 2001).

Family functioning is associated protectively with decline in low self-esteem after adjustment as might be expected theoretically (see N2). No statistically significant finding is observed for the improvement or maintenance of low self-esteem. Adolescents in reconstituted families have a higher probability of experiencing an improvement, a decline or to maintain low self-esteem. Maternal depression is associated with a marginally higher risk of reporting a decline in low self-esteem, but not with improvement or maintenance. The relative risk ratio is significant at 95% for this but the association is of marginal significance (1.26 [1.01,1.59] p=0.042).

Finally, the wider geography of change in self-esteem was examined on an adjusted basis. This confirmed that there are no associations between the degree of rurality and changes in self-esteem. However, province of residence is associated with the relative risk of reporting a decline in low self-esteem, adolescents living in the Western provinces at t1 are at a reduced risk of reporting low self-esteem two years later (Decline vs. Maintain High: Saskatchewan RRR = 0.50 [0.34,0.75] 0.001, Alberta RRR = 0.72 [0.52,0.99] 0.045, British Columbia RRR = 0.73 [0.51,1.02] 0.066). This apparent western protective association is contrasted with a higher relative risk for adolescents in Quebec maintaining low self-esteem (Maintain Low vs. Maintain High: Quebec RRR = 1.89 [1.28, 2.81] 0.001). The Quebec finding adds longitudinal detail to the concurrent finding in chapter five that, after adjustment low self-esteem is associated with residence in Quebec. Specifically, the concurrent association reflects a greater risk of adolescents in Quebec maintaining low self-esteem, rather than having particularly unstable self-esteem as might have been indicated by higher risks associated with either improvement or decline

Table 6-5: Neighbourhood deprivation and self-esteem change (fully adjusted for other covariates) in the NLSCY (N=3421, 6621 transitions). Maintain-High (4876 transitions) is reference category for each of the three outcomes

	Improvement vs. Maintain-High (n=821)	Decline vs. Maintain-High (n=497)	Maintain-Low vs. Maintain-High (n=427)
Covariates at t1	**RRR [95% CI] P**	**RRR 95% CI] P**	**RRR 95% CI] P**
Age (ref. 10/11-12.13)			
12/13-14/15	1.87 [1.42,2.45] 0.000	0.82 [0.68,0.99] 0.035	1.95 [1.51,2.54] 0.000
Sex (ref. boys)			
Girls	1.84 [1.47,2.31] 0.000	2.03 [1.72,2.40] 0.000	3.52 [2.65,4.66] 0.000
Ethnicity (ref. Canadian)			
European	1.01 [0.76,1.34] 0.963	0.84 [0.68,1.02] 0.078	0.89 [0.64,1.25] 0.508
First Nations	1.02 [0.65,1.60] 0.925	1.07 [0.77,1.48] 0.682	0.97 [0.57,1.66] 0.908
Other Visible Minority	1.53 [0.91,2.58] 0.112	0.99 [0.65,1.51] 0.956	0.77 [0.38,1.56] 0.470
Year (ref. 1994-96)			
1996-98	0.98 [0.63,1.51] 0.927	1.64 [1.22,2.21] 0.001	1.72 [1.15,2.58] 0.008
1998-00	2.11 [1.39,3.21] 0.000	1.27 [0.92,1.76] 0.151	1.60 [0.98,2.61] 0.063
2000-02	1.34 [0.84,2.11] 0.215	1.62 [1.17,2.25] 0.004	1.50 [0.89,2.55] 0.131
2002-04	1.62 [0.93,2.83] 0.090	1.88 [1.23,2.86] 0.003	1.41 [0.75,2.65] 0.288
Parental Nurture	0.82 [0.80,0.84] 0.000	0.94 [0.91,0.96] 0.000	0.81 [0.78,0.83] 0.000
Parental Rejection	1.10 [1.07,1.13] 0.000	1.04 [1.02,1.06] 0.000	1.14 [1.11,1.18] 0.000
Friendship Quality	0.75 [0.72,0.78] 0.000	0.90 [0.87,0.93] 0.000	0.71 [0.68,0.74] 0.000
Family Functioning	1.00 [0.91,1.08] 0.914	0.90 [0.85,0.96] 0.001	1.00 [0.90,1.11] 0.987
Family Structure (ref. Intact)			
Reconstituted	1.38 [1.00,1.92] 0.052	1.29 [1.00,1.67] 0.050	1.66 [1.14,2.40] 0.008
Single Parent	1.25 [0.90,1.72] 0.179	1.09 [0.85,1.40] 0.502	1.07 [0.73,1.56] 0.734
Relative Income (ref. Average)			
High	1.01 [0.77,1.33] 0.941	0.92 [0.75,1.13] 0.439	0.71 [0.51,1.00] 0.049
Low	1.06 [0.77,1.45] 0.732	1.09 [0.86,1.38] 0.467	1.08 [0.77,1.52] 0.658
Maternal Education (ref. < High School)			
High School	0.97 [0.73,1.28] 0.822	0.89 [0.72,1.10] 0.271	1.07 [0.77,1.51] 0.676
Diploma or Degree	0.67 [0.45,1.00] 0.049	0.66 [0.48,0.89] 0.007	0.84 [0.50,1.41] 0.507
Maternal Depression (ref. Not depressed)			
Depressed	1.15 [0.86,1.55] 0.352	1.26 [1.01,1.59] 0.042	1.14 [0.83,1.56] 0.427
Rurality (ref. Rural)			
Urban	1.15 [0.91,1.47] 0.246	0.98 [0.82,1.18] 0.858	1.12 [0.84,1.50] 0.434
Province (ref. Ontario)			
Maritimes*	0.99 [0.70,1.39] 0.948	1.07 [0.83,1.37] 0.596	1.05 [0.69,1.59] 0.828
Quebec	1.16 [0.83,1.62] 0.382	1.13 [0.88,1.45] 0.327	1.89 [1.28,2.81] 0.001
Manitoba	1.17 [0.76,1.81] 0.472	0.95 [0.67,1.36] 0.777	0.99 [0.54,1.81] 0.974
Saskatchewan	0.64 [0.41,1.02] 0.063	0.50 [0.34,0.75] 0.001	0.73 [0.40,1.32] 0.296
Alberta	0.69 [0.45,1.05] 0.083	0.72 [0.52,0.99] 0.045	0.74 [0.44,1.25] 0.259
British Columbia	0.67 [0.42,1.07] 0.091	0.73 [0.51,1.02] 0.066	0.96 [0.56,1.64] 0.882
Neighbourhood deprivation (ref. Least Deprived)			
Q2	0.91 [0.61,1.35] 0.631	0.97 [0.72,1.31] 0.859	0.99 [0.61,1.63] 0.979
Average	0.68 [0.46,1.00] 0.050	0.80 [0.60,1.09] 0.154	0.84 [0.53,1.34] 0.471
Q4	0.64 [0.43,0.96] 0.031	0.79 [0.58,1.07] 0.122	0.83 [0.52,1.33] 0.442
Q5	0.90 [0.60,1.35] 0.601	0.88 [0.65,1.21] 0.436	0.85 [0.51,1.41] 0.526
Log likelihood		-4274	
AIC		8740	

Table 6-6: Associations between social fragmentation (fully adjusted) and self-esteem change in the NLSCY (N=3421, 6621 transitions). Maintain-High (4876 transitions) is reference category for each of the three outcomes

	N3: Social fragmentation and transitions (fully adjusted*)		
	Improvement (n=821) vs. Maintain-High	Decline vs. Maintain-High (n=497)	Maintain-Low vs. Maintain-High (n=427)
Covariates at t1	**RRR [95% CI] P**	**RRR 95% CI] P**	**RRR 95% CI] P**
Social fragmentation*			
Q2	1.21 [0.88,1.68] 0.247	1.05 [0.83,1.33] 0.679	1.31 [0.89,1.92] 0.168
Average	1.18 [0.85,1.62] 0.327	0.96 [0.76,1.23] 0.762	0.99 [0.66,1.49] 0.951
Q4	1.01 [0.71,1.43] 0.974	0.81 [0.62,1.06] 0.121	0.75 [0.49,1.15] 0.188
Most Fragmented	1.14 [0.76,1.72] 0.531	0.87 [0.64,1.19] 0.399	0.82 [0.50,1.35] 0.444
Log likelihood		-4353	
AIC		8899	

* Social fragmentation is fully adjusted for all individual, family, urban/rural and region variables. The coefficients for the other covariates were very similar in magnitude and significance to those reported in Table 6-5 and so are not replicated here. These results are available in the appendix for this chapter (see Appendix Table 4).

6.4.2 BYP

The results reported in Table 6-4 show that apparent unadjusted associations between improvement and neighbourhood deprivation are attenuated to non-significance after adjustment. Similarly, social fragmentation is non-significantly associated with change in self-esteem.

Low household income remained associated with higher relative risks of improvements in self-esteem following adjustment, but not with any other transitions. High household income remained non-significantly associated with any of the change outcomes, and the statistically significant associations between high levels of maternal education were attenuated to non-significance when adjusted for individual and family factors.

There are few differences by age. However, sex is associated with larger relative risks of reporting all three comparison transitions, replicating findings of the same magnitude, direction and statistical significance in the NLSCY in Table 6-5, and suggesting that boys are more likely to maintain high self-esteem than girls. Ethnicity is not associated with any of the comparison transitions types as in the NLSCY. While year of measurement is associated with lower relative risks of decline and maintenance, it is not associated with improvement.

The adjusted model establishes that perceptions of parenting are prospectively associated with changes in self-esteem. These associations vary for positive and negative aspects of relationship. Talking with parents is associated with changes in self-esteem over the subsequent two years but not with maintaining low self-esteem. However, arguing with parents is associated with all three change categories. This highlights the complexity and centrality of this relationship. In addition, unhappiness with friends and family are, as expected associated with higher risks of most transitions. These associations were interesting as they

were not significantly associated with improvements in self-esteem (RRR = 1.33, 95%CI 0.73,2.42) while they were strongly associated with declines (RRR = 3.84 [2.32,6.33] and maintenance of low self-esteem 4.66 [2.45,8.86]. The unusual nature of these associations led to a short investigation of whether these associations might be bi-directional, This indicated that low self-esteem at t1 predicted perceptions of relationships with parents and happiness with family and friends and may explain why the associations between self-reports of relationships between adolescents and parents and low self-esteem are of such large magnitudes. The full results of that analysis are reported in the appendices in Appendix Table 2.

Aspects of family structure are consistently associated with changes in self-esteem. As expected from the findings in chapter five, reconstituted family structure is associated with all transitions. However, adolescents living in single parent families were not differentiated from those living in intact families in the transitions of self-esteem that they reported. Maternal depression was associated with all transition types.

There were no associations between urban/rural status and any transitions. Region of residence is generally not associated with transition type, although adolescents in Scotland are less likely to report maintain-low transitions. This is consistent with the findings in chapter five that adolescents in Scotland were less likely to report low self-esteem on a concurrent basis.

Table 6-7: Neighbourhood deprivation and change in self-esteem (fully adjusted for other covariates) in the BYP (N=1922, 3980 transitions). Maintain-High (n=3316 transitions) is reference category for the outcomes of Improvement, Decline and Maintain-Low.

Covariates at t1	Improvement (n=300) vs. Maintain-High RRR [95% CI] P	Decline (n=260)vs. Maintain-High RRR 95% CI] P	Maintain-Low (n= 104) vs. Maintain-High RRR 95% CI] P
Age (ref. 11)			
12	1.18 [0.86,1.63] 0.301	1.10 [0.79,1.54] 0.575	1.91 [1.12,3.27] 0.018
13	0.94 [0.67,1.32] 0.710	0.73 [0.50,1.06] 0.096	1.60 [0.91,2.83] 0.102
Girls (ref. Boys)	2.04 [1.49,2.80] 0.000	1.42 [1.04,1.95] 0.029	2.71 [1.42,5.17] 0.003
Ethnicity (ref. Non-visible)			
Visible minority	0.96 [0.44,2.06] 0.910	1.37 [0.70,2.66] 0.357	0.24 [0.04,1.64] 0.147
Year (ref. 1994)			
1995	0.62 [0.33,1.14] 0.125	0.61 [0.36,1.06] 0.079	0.55 [0.24,1.30] 0.175
1996	0.57 [0.31,1.07] 0.078	0.51 [0.28,0.93] 0.028	0.42 [0.16,1.07] 0.069
1997	0.60 [0.31,1.16] 0.130	0.38 [0.20,0.75] 0.005	0.22 [0.07,0.69] 0.009
1998	0.59 [0.32,1.07] 0.083	0.48 [0.26,0.88] 0.018	0.31 [0.12,0.82] 0.018
1999	0.76 [0.41,1.39] 0.370	0.64 [0.36,1.15] 0.139	1.14 [0.52,2.49] 0.741
2000	0.95 [0.54,1.67] 0.853	0.57 [0.32,0.99] 0.045	0.36 [0.13,1.05] 0.062
2001	1.19 [0.69,2.03] 0.532	0.47 [0.25,0.88] 0.019	0.49 [0.21,1.16] 0.105
2002	1.26 [0.74,2.15] 0.387	0.39 [0.21,0.71] 0.002	0.15 [0.05,0.48] 0.001
Talks with parents			
Hardly ever	1.31 [0.89,1.92] 0.174	1.59 [1.09,2.32] 0.015	1.37 [0.74,2.53] 0.314
Most days	1.47 [1.00,2.18] 0.052	0.77 [0.47,1.26] 0.301	0.60 [0.27,1.36] 0.223
Argues with parents (ref. 'Regular')			
Hardly ever	0.56 [0.40,0.79] 0.001	0.62 [0.42,0.91] 0.014	0.33 [0.17,0.63] 0.001
Most days	1.06 [0.58,1.93] 0.842	0.83 [0.47,1.47] 0.527	2.47 [1.12,5.44] 0.025
Happiness with friends (ref. Happy)			
Unhappy with	1.81 [0.95,3.46] 0.071	5.07 [3.26,7.88] 0.000	2.17 [0.96,4.95] 0.064
Happiness with family (ref. Happy)			
Unhappy	1.33 [0.73,2.42] 0.357	3.84 [2.32,6.33] 0.000	4.66 [2.45,8.86] 0.000
Family Structure (ref. Intact)			
Reconstituted	1.54 [1.06,2.23] 0.025	1.45 [0.99,2.12] 0.054	1.94 [1.01,3.74] 0.047
Single Parent	0.84 [0.56,1.26] 0.402	0.92 [0.60,1.42] 0.713	1.53 [0.80,2.92] 0.198
HH income (ref. Average)			
High	0.89 [0.62,1.29] 0.547	0.72 [0.48,1.07] 0.102	0.53 [0.26,1.05] 0.068
Low	1.78 [1.25,2.54] 0.001	1.18 [0.78,1.78] 0.441	1.02 [0.57,1.80] 0.952
Maternal Education (ref. <GCSE)			
GCSE	0.99 [0.69,1.44] 0.975	0.86 [0.59,1.26] 0.446	1.19 [0.65,2.19] 0.569
A-level	0.86 [0.47,1.57] 0.621	1.23 [0.69,2.21] 0.484	1.20 [0.42,3.47] 0.733
Diploma or degree	0.93 [0.61,1.43] 0.756	0.70 [0.46,1.09] 0.112	1.21 [0.58,2.53] 0.605
Maternal Depression (ref. Not depressed)			
Depressed	1.71 [1.28,2.28] 0.000	1.90 [1.40,2.58] 0.000	1.67 [1.02,2.72] 0.040
Urban/Rural (ref.			
Urban	1.33 [0.90,1.95] 0.151	1.23 [0.80,1.89] 0.343	1.29 [0.54,3.05] 0.565
Region (ref. South of England)			
Midlands/East of	0.80 [0.53,1.21] 0.293	1.01 [0.65,1.57] 0.960	0.72 [0.35,1.51] 0.389
London	0.63 [0.33,1.23] 0.178	0.66 [0.32,1.37] 0.263	1.03 [0.37,2.87] 0.953
North West of	0.56 [0.31,1.01] 0.056	0.60 [0.34,1.06] 0.078	0.71 [0.31,1.65] 0.427
North of England	0.79 [0.50,1.26] 0.328	0.65 [0.38,1.09] 0.103	0.54 [0.25,1.20] 0.132
Scotland	0.76 [0.42,1.37] 0.355	0.57 [0.31,1.05] 0.071	0.17 [0.03,0.87] 0.033
Wales	0.65 [0.40,1.06] 0.086	0.74 [0.40,1.37] 0.339	0.61 [0.27,1.40] 0.244
Neighbourhood deprivation (ref. Least deprived)			
Q2	1.89 [1.00,3.59] 0.051	0.84 [0.45,1.57] 0.587	1.27 [0.39,4.10] 0.694
Average	1.96 [1.07,3.58] 0.028	0.87 [0.46,1.62] 0.656	1.02 [0.29,3.53] 0.977
Q4	1.75 [0.93,3.29] 0.081	1.13 [0.60,2.13] 0.712	1.28 [0.39,4.15] 0.686
Most Deprived	1.80 [0.92,3.51] 0.086	0.78 [0.39,1.55] 0.478	2.01 [0.57,7.14] 0.280
Log likelihood		-4274	
AIC		8740	

Table 6-8: Associations between social fragmentation (fully adjusted) and change in self-esteem in the NLSCY (N=3421, 6621 transitions). Maintain-High (4876 transitions) is reference category for each of the three outcomes

	N3: Social fragmentation and change in self-esteem (fully adjusted)		
	Improvement (n=821) vs. Maintain-High	**Decline vs. Maintain-High (n=497)**	**Maintain-Low vs. Maintain-High (n=427)**
	RRR [95% CI] P	**RRR 95% CI] P**	**RRR 95% CI] P**
Social fragmentation (ref. Least fragmented) *			
Q2	1.02 [0.62,1.67] 0.941	0.79 [0.46,1.35] 0.390	1.54 [0.53,4.45] 0.425
Average	1.16 [0.68,1.98] 0.585	0.96 [0.55,1.68] 0.898	2.48 [0.81,7.57] 0.110
Q4	1.22 [0.74,2.04] 0.434	1.02 [0.59,1.75] 0.951	1.10 [0.39,3.09] 0.858
Most Fragmented	1.34 [0.79,2.27] 0.286	1.03 [0.58,1.84] 0.922	2.52 [0.88,7.26] 0.087
Log likelihood		-4353	
AIC		8898	

* Social fragmentation is fully adjusted for all individual, family, urban/rural and region variables. The coefficients for the other covariates were identical in magnitude and significance to those reported in Table 6-5 and so are not replicated here.

6.5 Interactions

Interactions were examined in two stages to test whether the relationship between change in self-esteem and neighbourhood characteristic could be generalised over all the individuals and groups equally. The interactions were first tested in models which adjusted for all the covariates at t1. Those which were found to be significant were then tested in the context of the other significant interactions.

6.5.1 NLSCY

There was evidence for interactions in the relationships between neighbourhood characteristics and change in self-esteem. Neighbourhood deprivation interacted with sex and family structure (Table 6-9) while social fragmentation interacted with sex, family structure and friendship quality (Table 6-10). These interactions were not evident in the analysis of low self-esteem in chapter five. They should therefore be treated with caution as the multinomial models below tests three times as many interaction possibilities as the comparable models in chapter five, with more opportunity for multiple comparison issues.

A second general point from these tables is that the findings support the role of sex is an important mediator of relationships between the family and neighbourhood social context and changes in self-esteem. In addition to the interactions with neighbourhood, sex mediates the relationship between many covariates.

Table 6-9: Interactions in neighbourhood deprivation model. Each cell represents an interaction between age, sex, or neighbourhood deprivation which each covariate in the rows.

	Improvement (n=821) vs. Maintain-High			Decline (n=497) vs. Maintain-High			Maintain-Low (n=427) vs. Maintain-High		
Covariates at t1	**Age**	**Sex**	**Neighbourhood Deprivation**	**Age**	**Sex**	**Neighbourhood Deprivation***	**Age**	**Sex**	**Neighbourhood Deprivation**
Age	…	Ns.	Ns.	…	Ns.	Ns.	…	Sig.	Ns
Sex.	Ns.	…	Sig.	Ns.	…	Ns.	Sig.	…	Ns.
Ethnicity.	Sig.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.
Parental Nurture.	Ns.	Sig.	Ns.	Sig.	Ns.	Ns.	Sig.	Ns.	Ns.
Parental Rejection.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.
Friendship Quality.	Ns.	Ns	Ns.	Ns.	Sig.	Ns.	Ns.	Ns.	Ns.
Family Functioning.	Ns.	Sig.	Ns.	Ns.	Ns.	Ns.	Ns.	Sig.	Ns.
Family Structure.	Ns.	Sig.	Ns.	Ns.	Ns.	Sig.	Ns.	Ns.	Ns.
Relative Income.	Ns.	Ns.	Ns.	Ns.	Sig.	Ns.	Ns.	Ns.	Ns.
Maternal Education.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.
Maternal Depression.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.
Rurality.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.

Interactions adjusted for all covariates. **Sig**. means that interaction was significant at the 95% level of confidence, **Ns**. means that the interaction was not significant at this level. '…' means that this was not a true interaction i.e. sex*sex.

Table 6-10: Two-way interactions in social fragmentation models in the NLSCY (N=3421, transitions = 6621)

	N5: Two way interaction models for social fragmentation, age and sex								
	Improvement (n=821) vs. Maintain-High			Decline (n=497) vs. Maintain-High			Maintain-Low (n=427) vs. Maintain-High		
Covariates at t1	**Age**	**Sex**	**SocFrag ***	**Age**	**Sex**	**SocFrag ***	**Age**	**Sex**	**SocFrag***
Age	…	Ns.	Ns.	…	Ns.	Ns.	…	Sig.	Ns
Sex.	Ns.	…	Sig.	Ns.	…	Ns.	Sig.	…	Ns.
Ethnicity.	Sig.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.
Parental Nurture.	Ns.	Sig.	Ns.	Sig.	Ns.	Ns.	Sig.	Ns.	Ns.
Parental Rejection.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.
Friendship Quality.	Ns.	Ns	Ns.	Ns.	Sig.	Ns.	Ns.	Ns.	Ns.
Family Functioning.	Ns.	Sig.	Ns.	Ns.	Ns.	Ns.	Ns.	Sig.	Ns.
Family Structure.	Ns.	Sig.	Ns.	Ns.	Ns.	Sig.	Ns.	Ns.	Ns.
Relative Income.	Ns.	Ns.	Ns.	Ns.	Sig.	Ns.	Ns.	Ns.	Ns.
Maternal Education.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.
Maternal Depression.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.
Rurality.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.

Interactions adjusted for all covariates. **Sig**. means that interaction was significant at the 95% level of confidence, **Ns**. means that the interaction was not significant at this level. '…' means that this was not a true interaction i.e. sex*sex.

As with chapter five, the significant interactions were then tested in two overall models, one for the neighbourhood deprivation and a second for social fragmentation. The results reported in Table 6-11 show that interactions between neighbourhood deprivation remained significant, as did those by sex. Interactions with age were attenuated to non-significance. This model is clearly not parsimonious and the large number of interactions in the model renders interpretation of the parameters too complex. Therefore, as with chapter four, this model establishes that stratification by sex is necessary in order to interpret the complex relationships between change in self-esteem and social context.

Table 6-11: All two-way interactions and self-esteem transitions in the NLSCY for neighbourhood deprivation model (N=3421, 6621 transitions). Maintain-High (4876 transitions) is reference category for each of the three outcomes

	N6: Two way interaction model for neighbourhood deprivation including all significant two-way interactions		
	Improvement (n=821) vs. Maintain-High	Decline (n=497) vs. Maintain-High	Maintain-Low (n=427) vs. Maintain-High
	RRR [95% CI] p	RRR [95% CI] p	RRR [95% CI] p
Age (ref. 10/11-12.13)			
12/13-14/15	1.48 [0.53,4.07] 0.453	0.36 [0.15,0.88] 0.024	0.89 [0.33,2.40] 0.822
Sex (ref. boys)	0.51 [0.09,3.03] 0.463	0.38 [0.09,1.63] 0.191	0.18 [0.02,1.36] 0.097
Sex*Age 12/13-14/15	1.52 [0.96,2.39] 0.074	1.34 [0.96,1.87] 0.086	1.70 [1.10,2.64] 0.017
Ethnicity (ref. Canadian)			
European	1.09 [0.67,1.77] 0.740	0.90 [0.67,1.20] 0.464	1.16 [0.68,1.98] 0.595
First Nations	1.66 [0.85,3.24] 0.136	1.14 [0.71,1.82] 0.593	1.21 [0.55,2.66] 0.630
Other Visible Minority	1.21 [0.47,3.09] 0.690	1.21 [0.70,2.10] 0.498	1.10 [0.37,3.24] 0.864
Ethnicity*Age			
European*Age 12/13	0.86 [0.48,1.55] 0.620	0.87 [0.58,1.30] 0.503	0.70 [0.40,1.23] 0.215
First Nations*Age 12/13	0.40 [0.17,0.99] 0.047	0.96 [0.51,1.81] 0.897	0.66 [0.28,1.55] 0.342
Other Visible Minority*Age 12/13	1.41 [0.46,4.35] 0.551	0.62 [0.27,1.42] 0.258	0.58 [0.17,1.98] 0.385
Year (ref. 1994-96)			
1996-98	1.09 [0.68,1.73] 0.720	1.94 [1.40,2.68] 0.000	2.08 [1.35,3.19] 0.001
1998-00	2.34 [1.48,3.69] 0.000	1.49 [1.05,2.10] 0.025	1.89 [1.13,3.16] 0.016
2000-02	1.48 [0.91,2.43] 0.116	1.93 [1.35,2.75] 0.000	1.83 [1.06,3.18] 0.031
2002-04	1.64 [0.92,2.94] 0.095	2.18 [1.41,3.37] 0.000	1.64 [0.85,3.14] 0.138
Parental Nurture	0.84 [0.79,0.88] 0.000	0.94 [0.90,0.98] 0.008	0.78 [0.73,0.83] 0.000
Parental Nurture*Age 12/13	1.01 [0.95,1.07] 0.739	1.05 [1.00,1.10] 0.072	1.06 [0.99,1.12] 0.084
Parental Nurture*Sex	0.93 [0.88,0.98] 0.007	0.94 [0.90,0.99] 0.017	0.99 [0.93,1.05] 0.686
Parental Rejection	1.10 [1.07,1.13] 0.000	1.04 [1.02,1.06] 0.000	1.14 [1.10,1.18] 0.000
Friendship Quality	0.75 [0.72,0.79] 0.000	0.85 [0.81,0.89] 0.000	0.70 [0.66,0.74] 0.000
Friendship Quality*Sex	0.99 [0.92,1.07] 0.773	1.12 [1.05,1.19] 0.001	1.03 [0.95,1.12] 0.414
Family Functioning	0.87 [0.77,0.98] 0.020	0.83 [0.75,0.92] 0.000	0.88 [0.76,1.03] 0.104
Family Functioning*Sex	1.32 [1.12,1.56] 0.001	1.15 [1.02,1.31] 0.026	1.26 [1.03,1.54] 0.024
Family Structure (ref. Intact)			
Reconstituted	2.42 [0.87,6.75] 0.090	3.85 [1.92,7.71] 0.000	1.82 [0.60,5.50] 0.291
Single Parent	3.46 [1.38,8.66] 0.008	1.79 [0.80,3.97] 0.154	0.45 [0.09,2.22] 0.329
Family Structure*Sex			
Reconstituted*Girls	0.58 [0.30,1.13] 0.104	0.94 [0.56,1.58] 0.805	1.04 [0.48,2.26] 0.914
Single Parent*Girls	0.46 [0.24,0.88] 0.019	0.87 [0.52,1.44] 0.588	1.09 [0.50,2.35] 0.834
Relative Income (ref. Average)			
High	1.23 [0.84,1.80] 0.294	1.24 [0.90,1.71] 0.184	0.63 [0.36,1.10] 0.103
Low	1.30 [0.85,1.98] 0.231	1.31 [0.91,1.88] 0.152	1.17 [0.69,1.99] 0.554
HH Income*Sex			
High*Sex	0.70 [0.41,1.19] 0.188	0.62 [0.41,0.93] 0.020	1.08 [0.55,2.13] 0.819
Low*Sex	0.71 [0.38,1.32] 0.279	0.78 [0.49,1.24] 0.294	0.87 [0.44,1.73] 0.690
Maternal Education (ref. < High School)			
High School	0.98 [0.74,1.30] 0.882	0.90 [0.73,1.11] 0.300	1.08 [0.77,1.52] 0.639
Diploma or Degree	0.68 [0.45,1.01] 0.056	0.66 [0.49,0.90] 0.009	0.85 [0.50,1.43] 0.535
Maternal Depression (ref. Not depressed)			
Depressed	1.13 [0.84,1.53] 0.416	1.26 [1.00,1.58] 0.048	1.18 [0.86,1.62] 0.306
Rurality (ref. Rural)			

	N6: Two way interaction model for neighbourhood deprivation including all significant two-way interactions		
	Improvement (n=821) vs. Maintain-High	**Decline (n=497) vs. Maintain-High**	**Maintain-Low (n=427) vs. Maintain-High**
	RRR [95% CI] p	**RRR [95% CI] p**	**RRR [95% CI] p**
Urban	1.19 [0.93,1.52] 0.165	0.99 [0.82,1.19] 0.896	1.11 [0.82,1.49] 0.495
Province (ref. Ontario)			
Maritimes*	0.98 [0.69,1.38] 0.892	1.07 [0.83,1.38] 0.608	1.06 [0.70,1.61] 0.786
Quebec	1.16 [0.83,1.63] 0.387	1.13 [0.88,1.45] 0.357	1.98 [1.33,2.95] 0.001
Manitoba	1.19 [0.77,1.84] 0.434	0.93 [0.65,1.33] 0.686	1.04 [0.56,1.91] 0.909
Saskatchewan	0.69 [0.43,1.09] 0.114	0.50 [0.34,0.75] 0.001	0.76 [0.42,1.38] 0.369
Alberta	0.68 [0.44,1.04] 0.074	0.72 [0.52,1.00] 0.048	0.72 [0.43,1.23] 0.234
British Columbia	0.65 [0.41,1.04] 0.070	0.70 [0.50,0.99] 0.045	0.96 [0.56,1.65] 0.885
Neighbourhood deprivation (ref. Least Deprived)			
Q2	0.89 [0.49,1.61] 0.696	0.95 [0.57,1.60] 0.860	0.52 [0.23,1.17] 0.113
Average	0.87 [0.48,1.57] 0.649	1.09 [0.66,1.81] 0.736	0.68 [0.32,1.45] 0.319
Q4	0.50 [0.26,0.95] 0.036	0.88 [0.53,1.49] 0.644	0.43 [0.19,0.96] 0.038
Most Deprived	0.71 [0.39,1.31] 0.276	1.03 [0.62,1.70] 0.918	0.41 [0.18,0.91] 0.029
Neighbourhood deprivation*Sex (ref. Q1/Boys)			
Q2*Sex	1.10 [0.50,2.43] 0.818	1.19 [0.63,2.22] 0.594	2.34 [0.86,6.38] 0.096
Q3*Sex	1.08 [0.50,2.33] 0.853	1.09 [0.59,2.01] 0.776	1.53 [0.61,3.86] 0.367
Q4*Sex	2.11 [0.95,4.66] 0.066	1.24 [0.67,2.29] 0.488	2.05 [0.79,5.31] 0.139
Q5*Sex	1.96 [0.92,4.21] 0.082	1.23 [0.68,2.23] 0.496	2.94 [1.13,7.67] 0.028
Neighbourhood deprivation*Family Structure (ref.Q1/Intact)			
Q2*Reconstituted	1.43 [0.44,4.66] 0.555	0.47 [0.19,1.16] 0.102	1.50 [0.39,5.77] 0.554
Q2*Single Parent	0.44 [0.13,1.49] 0.187	1.24 [0.51,3.03] 0.634	1.78 [0.28,11.08] 0.538
Q3*Reconstituted	0.26 [0.07,0.90] 0.034	0.15 [0.06,0.37] 0.000	0.47 [0.13,1.64] 0.235
Q3*Single Parent	0.44 [0.16,1.21] 0.111	0.51 [0.22,1.17] 0.110	1.64 [0.32,8.28] 0.552
Q4*Reconstituted	0.58 [0.16,2.08] 0.404	0.36 [0.15,0.84] 0.019	1.21 [0.33,4.43] 0.773
Q4*Single Parent	0.54 [0.19,1.52] 0.243	0.56 [0.24,1.31] 0.183	3.22 [0.64,16.23] 0.156
Q5*Reconstituted	0.92 [0.30,2.80] 0.878	0.32 [0.14,0.72] 0.006	0.63 [0.18,2.21] 0.470
Q5*Single Parent	0.48 [0.18,1.28] 0.145	0.52 [0.23,1.18] 0.119	2.46 [0.50,12.25] 0.271
Log likelihood		-4134	
AIC		8604	

The interactions model for social fragmentation shows that the direction and significance of the interactions for the interactions at the individual and family level are very similar.

Interactions between friendship quality and social fragmentation remained significant after adjustment, as did interactions between social fragmentation and sex. The interaction between family structure and social fragmentation was attenuated to non-significance.

The AIC *increases* for the model presented in Table 6-12 in comparison to the social fragmentation model with *no* interactions. This is attributed to the fact that the social fragmentation interactions with sex, friendship quality and family structure add complexity

to the model but little increase in fit. Models were run with the sex interactions but with each social fragmentation interaction and the respective AIC values were: sex – 8912, friendship quality – 8906, family structure – 8904. Thus each social fragmentation interaction actively decreased the statistical fit of the model to the data. Interactions are not necessarily stable in regression models. Equally, statistics should not be used arbitrarily to guide model fit. The interaction with family structure was therefore excluded from later sex-stratified models, but the friendship quality interaction was included. It is noted at this point that these interactions should be interpreted extremely cautiously.

Table 6-12: All two-way interactions and self-esteem transitions in the NLSCY (N=3421, 6621 transitions).

Table 6-12	N7: Two way interaction model for social fragmentation including all significant two-way interactions		
Covariates at t1	Improvement (n=821) vs. Maintain-High RRR [95% CI] p	Decline (n=497) vs. Maintain-High RRR [95% CI] p	Maintain-Low (n=427) vs Maintain-High RRR [95% CI] p
Baseline Age (ref. 10/11)			
12/13	1.43 [0.52,3.93] 0.488	0.35 [0.14,0.83] 0.017	0.73 [0.27,1.95] 0.527
Sex (ref. boys)	0.66 [0.12,3.48] 0.620	0.32 [0.08,1.30] 0.112	0.42 [0.05,3.26] 0.409
Sex*Age 12/13	1.59 [1.01,2.49] 0.045	1.33 [0.95,1.86] 0.097	1.73 [1.11,2.70] 0.015
Ethnicity (ref. Canadian)			
European	1.08 [0.66,1.75] 0.766	0.89 [0.67,1.19] 0.445	1.11 [0.65,1.89] 0.706
First Nations	1.65 [0.85,3.20] 0.142	1.12 [0.70,1.79] 0.632	1.19 [0.54,2.62] 0.672
Other Visible Minority	1.24 [0.47,3.22] 0.665	1.25 [0.71,2.18] 0.438	1.18 [0.40,3.46] 0.763
Ethnicity*Age			
European*Age 12/13	0.88 [0.49,1.58] 0.659	0.88 [0.59,1.32] 0.541	0.72 [0.42,1.25] 0.245
First Nations*Age 12/13	0.42 [0.17,1.02] 0.056	0.94 [0.50,1.78] 0.855	0.68 [0.29,1.58] 0.365
Other Visible Minority*Age 12/13	1.44 [0.47,4.44] 0.525	0.63 [0.27,1.46] 0.282	0.60 [0.17,2.03] 0.409
Baseline Year (ref. 1994)			
1996	1.08 [0.68,1.72] 0.734	1.91 [1.38,2.64] 0.000	2.11 [1.36,3.25] 0.001
1998	2.31 [1.47,3.62] 0.000	1.44 [1.02,2.04 0.037	1.93 [1.15,3.23] 0.012
2000	1.42 [0.87,2.33] 0.161	1.85[1.30,2.64] 0.001	1.79 [1.03,3.12]0.038
2002	1.59 [0.89,2.84] 0.115	2.06 [1.33,3.18] 0.001	1.61 [0.84,3.09] 0.155
Parental Nurture	0.84 [0.80,0.89] 0.000	0.94 [0.90,0.98] 0.007	0.77 [0.72,0.82] 0.000
Parental Nurture*Age 12/13	1.01 [0.95,1.07] 0.766	1.05 [1.00,1.11] 0.050	1.07 [1.00,1.14] 0.035
Parental Nurture*Sex	0.93 [0.88,0.98] 0.006	0.94 [0.90,0.99] 0.016	0.99 [0.93,1.05] 0.739
Parental Rejection	1.09 [1.04,1.15] 0.001	1.07 [1.03,1.11] 0.001	1.14 [1.06,1.23] 0.000
Friendship Quality	0.72 [0.66,0.79] 0.000	0.85 [0.80,0.91] 0.000	0.65 [0.59,0.72] 0.000
Friendship Quality*Sex	0.99 [0.92,1.07] 0.852	1.13 [1.06,1.20] 0.000	1.03 [0.95,1.12] 0.507
Family Functioning	0.87 [0.77,0.99] 0.028	0.83 [0.76,0.92] 0.000	0.87 [0.75,1.02] 0.090
Family Functioning*Sex	1.30 [1.10,1.53] 0.002	1.15 [1.01,1.30] 0.033	1.26 [1.03,1.55] 0.025
Family Structure (ref. Intact)			
Reconstituted	1.29 [0.60,2.79] 0.510	1.19 [0.62,2.26] 0.601	0.50 [0.14,1.73] 0.271
Single Parent	1.52 [0.67,3.43] 0.316	1.79 [1.00,3.20] 0.052	1.67 [0.62,4.47] 0.307
Family Structure*Sex			
Reconstituted*Sex	0.55 [0.29,1.06] 0.076	0.88 [0.52,1.50] 0.640	1.09 [0.49,2.43] 0.834
Single Parent*Sex	0.40 [0.21,0.77] 0.006	0.85 [0.51,1.43] 0.547	0.99 [0.46,2.12] 0.971
Relative Income (ref. Average)			
High	1.29 [0.89,1.87] 0.186	1.26 [0.92,1.73] 0.145	0.71 [0.41,1.22] 0.214
Low	1.26 [0.83,1.91] 0.286	1.34 [0.94,1.92] 0.109	1.17 [0.68,2.01] 0.567
Relative Income*Sex			
Q3*Sex	0.65 [0.39,1.09] 0.103	0.59 [0.40,0.87] 0.009	0.94 [0.48,1.84] 0.865
Low*Sex	0.76 [0.41,1.39] 0.367	0.75 [0.48,1.18] 0.218	0.92 [0.47,1.80] 0.801
Maternal Education (ref. < High School)			
High School	0.99 [0.75,1.32] 0.960	0.90 [0.73,1.11] 0.328	1.13 [0.80,1.60] 0.483
Diploma or Degree	0.72 [0.49,1.07] 0.104	0.70 [0.52,0.95] 0.020	0.88 [0.53,1.48] 0.639
Maternal Depression (ref. Not depressed)			
Depressed	1.17 [0.87,1.59] 0.299	1.27 [1.01,1.60] 0.038	1.19 [0.86,1.63] 0.289
Rurality (ref. Rural)			

Table 6-12	N7: Two way interaction model for social fragmentation including all significant two-way interactions		
Covariates at t1	Improvement (n=821) vs. Maintain-High RRR [95% CI] p	Decline (n=497) vs. Maintain-High RRR [95% CI] p	Maintain-Low (n=427) vs Maintain-High RRR [95% CI] p
Urban	1.16 [0.90,1.50] 0.244	1.06 [0.88,1.28] 0.546	1.33 [0.97,1.80] 0.073
Province (ref. Ontario)			
Maritimes*	0.97 [0.70,1.34] 0.836	1.06 [0.83,1.35] 0.628	1.02 [0.68,1.53] 0.938
Quebec	1.14 [0.81,1.60] 0.455	1.15 [0.90,1.48] 0.260	1.96 [1.31,2.93] 0.001
Manitoba	1.13 [0.74,1.73] 0.571	0.93 [0.65,1.32] 0.681	0.97 [0.53,1.78] 0.930
Saskatchewan	0.68 [0.43,1.08] 0.106	0.52 [0.35,0.78] 0.001	0.79 [0.44,1.42] 0.429
Alberta	0.70 [0.45,1.09] 0.116	0.74 [0.53,1.03] 0.073	0.74 [0.44,1.26] 0.270
British Columbia	0.62 [0.39,0.99] 0.046	0.72 [0.51,1.01] 0.061	0.99 [0.59,1.67] 0.974
Social Fragmentation (ref. Least Fragmented)			
Q2	0.46 [0.10,2.02] 0.302	0.83 [0.22,3.16] 0.788	0.46 [0.09,2.27] 0.339
Average (Q3)	0.60 [0.14,2.53] 0.485	2.07 [0.61,7.04] 0.246	0.81 [0.15,4.34] 0.802
Q4	0.65 [0.14,2.95] 0.581	1.48 [0.39,5.70] 0.565	0.32 [0.06,1.78] 0.195
Most Fragmented (Q5)	0.12 [0.02,0.68] 0.016	0.38 [0.08,1.77] 0.217	0.07 [0.01,0.46] 0.006
Social Fragmentation*Sex			
Q2*Sex	0.99 [0.50,1.94] 0.971	1.46 [0.88,2.42] 0.145	0.96 [0.43,2.17] 0.930
Q3*Sex	1.39 [0.72,2.66] 0.326	1.39 [0.85,2.28] 0.194	0.63 [0.27,1.48] 0.291
Q4*Sex	1.21 [0.60,2.43] 0.590	1.36 [0.80,2.31] 0.256	0.87 [0.36,2.08] 0.752
Q5*Sex	2.26 [1.02,5.00] 0.045	2.09 [1.07,4.10] 0.031	1.62 [0.59,4.41] 0.348
Social Fragmentation*Friendship Quality			
Q2*Friendship Quality	1.06 [0.95,1.18] 0.332	1.00 [0.91,1.10] 0.969	1.06 [0.94,1.19] 0.328
Q3*Friendship Quality	1.04 [0.93,1.16] 0.516	0.96 [0.88,1.05] 0.346	1.04 [0.92,1.17] 0.569
Q4*Friendship Quality	1.02 [0.91,1.15] 0.720	0.98 [0.89,1.08] 0.671	1.10 [0.97,1.24] 0.133
Q5*Friendship Quality	1.15 [1.02,1.29] 0.022	1.06 [0.95,1.18] 0.276	1.21 [1.04,1.39] 0.011
Social Fragmentation*Family Structure			
Q2*Reconstituted	2.02 [0.74,5.48] 0.168	1.64 [0.76,3.55] 0.206	4.71 [1.26,17.53] 0.021
Q2*Single Parent	1.71 [0.64,4.60] 0.286	0.90 [0.44,1.84] 0.782	0.56 [0.18,1.80] 0.333
Q3*Reconstituted	1.85 [0.73,4.73] 0.197	1.34 [0.62,2.88] 0.456	3.53 [0.95,13.09] 0.060
Q3*Single Parent	0.94 [0.35,2.52] 0.900	0.57 [0.29,1.12] 0.104	0.37 [0.11,1.20] 0.097
Q4*Reconstituted	0.76 [0.26,2.20] 0.609	0.75 [0.32,1.78] 0.513	3.88 [1.03,14.57] 0.045
Q4*Single Parent	1.41 [0.54,3.70] 0.479	0.59 [0.29,1.19] 0.141	0.95 [0.33,2.72] 0.918
Q5*Reconstituted	1.40 [0.40,4.91] 0.594	1.39 [0.57,3.38] 0.468	3.19 [0.73,13.91] 0.122
Q5*Single Parent	1.39 [0.51,3.81] 0.523	0.47 [0.22,1.00] 0.050	0.61 [0.20,1.91] 0.398
Log likelihood		4281	
AIC		8923	

Maintain High (4876 transitions) is reference category for each of the three outcomes. Interaction effects are underlined; statistically significant associations are underlined and formatted in bold type.

6.5.2 BYP

Owing to the very small numbers (there were less than 5 observations expected for the interaction cells concerned) of adolescents who maintained low self-esteem over two time points in the BYP data only four sex interactions could be explored empirically: age*sex, sex*family structure, sex*maternal depression, sex*rurality. Therefore, for the exploratory

analysis of interactions, the maintain-low transition was excluded, and only the 'improve' and 'decline' transition types were analysed. Inevitably, this meant that the estimating sample was reduced for these models, from 1922 adolescents (3980 transitions) to 1893 adolescents (3876 transitions). This decision was taken instead of alternatives, such as conflating the maintain-low category with the decline category, to maintain comparability with the earlier BYP and NLSCY results.

The results of this exploratory analysis (Table 6-13) show that age interacted with household income, and that sex interacted with arguments with parents, but nothing else. Neighbourhood deprivation interacted with arguments with parents and with maternal depression.

In the comparable social fragmentation models (Table 6-14) age interacted with household income, while sex interacted with arguments with parents. Social fragmentation interacted with age, household income and maternal depression.

Table 6-13.: Two-way Interactions in the neighbourhood deprivation model in the BYP (N=1922).

Covariates at t1	Improvement (n=300) vs. Maintain-High			Decline (n=260)vs. Maintain-High		
	Age*	Sex*	Neighbourhood deprivation	Age*	Sex*	Neighbourhood deprivation
Age	Ns.	Ns.	#	Ns.	Ns.	#
Sex	Ns.	Ns.	#	Ns.	Ns.	#
Ethnicity	#	#	#	#	#	#
Talking with parents	Ns.	Ns.	#	Ns.	Ns.	#
Arguments with parents	Ns.	Sig.	Sig.	Ns.	Ns.	Ns.
Happiness with friends	#	#	#	#	#	#
Happy with family	Ns.	#	#	Sig.	#	#
Family Structure	Ns.	Ns.	#	Ns.	Ns.	#
HH income	Sig.	Ns.	Ns.	Ns.	Ns.	Ns.
Maternal Education	Ns.	Ns.	#	Ns.	Ns.	#
Maternal Depression	Ns.	Ns.	Sig.	Ns.	Ns.	Sig.

All models are fully adjusted for individual, family, urban and regional effects. # indicates where insufficient numbers are available to analyse the interaction (expected n in any cell < 5)

Table 6-14:Two-way Interactions in the social fragmentation model in the BYP (N=1922, transitions = 3980).

Covariates at t1	Improvement (n=300) vs. Maintain-High			Decline (n=260)vs. Maintain-High		
	Age*	Sex*	Social Fragmentation	Age*	Sex*	Social Fragmentation
Age	Ns.	Ns.	Ns.	Ns.	Ns.	Sig.
Sex	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.
Ethnicity	#	#	#	#	#	#
Talking with parents	Ns.	Ns.	Ns.	Ns.	Ns.	Ns.
Arguments with parents	Ns.	Sig.	#	Ns.	Ns.	#
Happiness with friends	#	#	#	Ns.	Ns.	#
Happy with family	Ns.	#	#	Sig.	Ns.	#
Family Structure	Ns.	Ns.	#	Ns.	Ns.	#
HH income	Sig.	Ns.	Ns.	Ns.	Ns.	Sig.
Maternal Education	Ns.	Ns.	#	Ns.	Ns.	#
Maternal Depression	Ns.	Ns.	Ns.	Ns.	Ns.	Sig.

All models are fully adjusted for individual. family, urban and regional effects. # indicates where insufficient numbers are available to analyse the interaction (expected n in any cell < 5)

The second stage of the analysis, as with the NLSCY in section 6.5.1, tested all significant interactions from Table 6-9 and Table 6-10 were tested in two full models relating to neighbourhood deprivation and social fragmentation separately. All interactions were

attenuated to non-significance after mutual adjustment and so none were retained indicating that significance was probably attributable to chance in the first test.

6.6 Sex-stratified transitions models

Sex-stratified models are presented in the section below. These models only contain those interactions which were significant after adjustment for the main effects and the other interaction terms.

6.6.1 NLSCY

The associations between family structures and neighbourhood deprivation and transitions must be considered in the context of the interaction between the two constructs.

The neighbourhood deprivation terms in M1 and M2 in Table 6-15 indicates that there is no main effect of neighbourhood deprivation for girls or boys in the context of the interaction term. This means that neighbourhood deprivation is not associated with self-esteem for *adolescents living in intact families* (the reference group of the other term in the interaction).

Complex associations emerge between sex, change in self-esteem and family type in affluent neighbourhoods. As part of the interaction, the main effect of family structure is interpreted as the effect of family structure at the level of the reference group of neighbourhood deprivation, i.e. in the least deprived quintile (Q1). Within this interaction, living in reconstituted families is associated with considerably high relative risks for decline for boys and girls (Girls RRR = 3.97 [1.50, 10.52] p = 0.006; Boys RRR = 3.42 [1.38, 8.48] p = 0.008). For boys (but not girls) there were risks associated with both reconstituted and

single parent family structures and improvement in self-esteem (Boys in reconstituted Families RRR = 3.43 [0.94,12.59] p = 0.063; Boys in Single Parent Families RRR = 7.07 [2.04,24.55], p = 0.002; Decline RRR = 3.21 [0.99,10.36] p=0.051). No family type is associated with maintenance of low self-esteem for either boys or girls in affluent neighbourhoods. It is important to note that the confidence intervals were very wide, indicating considerable imprecision around the estimates.

The interaction term for neighbourhood deprivation and family structure in M2 in Table 6-15 suggests that relative to adolescents living in intact families in the most affluent neighbourhoods, living in a reconstituted family in more deprived neighbourhoods is associated with a *lower* relative risk of reporting decline or improvement in low self-esteem for boys. This association is not systematic with increasing levels of neighbourhood deprivation. In addition, the 95% confidence interval for the estimates indicates that there is a lack of precision in the estimates. This imprecision and inconsistency likely reflects the small numbers underlying these analyses (not reported here owing to data disclosure rules). However, the fact that this interactions term is protective and significant for both boys and girls across a number of coefficients suggests that these associations may be of substantive interest, but should be treated with caution.

In terms of household socio-economic status, the interactions analysis of the whole sample indicated that interactions were not significant for sex by maternal education. However, the interaction by household income was significant. The stratified models show that high levels of maternal education are protectively associated with decline and improvement for boys not girls. However, they are not associated with the maintenance of low self-esteem.

As expected from the interactions analysis, the results show that girls and boys differ in terms of the effects of age. While girls are more likely to improve over any given two year period, and to maintain low self-esteem than boys, boys are more likely to experience a decline in low self-esteem.

In terms of perceptions of parenting, boys and girls are not considerably different. This is despite the fact that formal interactions with sex were evident for parental nurturance, parental rejection and friendship quality.

As observed in chapter four, family functioning interacts with sex. Family functioning is associated with a higher risk of improvement in self-esteem in girls, and not with either decline or maintenance of low self-esteem, while in boys it is associated with a reduced risk of improvement or decline in self-esteem.

Table 6-15: Self-esteem change for girls in the NLSCY (Overall N=3421, 6621 transitions: Girls N = 1773, 3419 transitions). Maintain-High (2404 transitions) is reference category for each of the three outcomes

Table 6-15	M1: Girls (N=1773, 3419 transitions, maintain-high = 2404)			M2: Boys (N = 1648, 3202 transitions). Maintain-High (2472 transitions)		
Covariates at t1	**Improvement (n=509) vs. Maintain-High RRR [95% CI] p**	**Decline (n=246) vs. Maintain-High RRR [95% CI] p**	**Maintain-Low (n=260) vs. Maintain-High RRR [95% CI] p**	**Improvement (n=312) vs. Maintain-High RRR [95% CI] p**	**Decline (n=251) vs. Maintain-High RRR [95% CI] p**	**Maintain-Low (n=167) vs. Maintain-High RRR [95% CI] p**
Baseline Age (ref. 10/11-12/13)						
12/13	2.60 [1.73,3.91] 0.000	0.97 [0.76,1.23] 0.781	2.42 [1.68,3.49] 0.000	0.72 [0.49,1.05] 0.089	1.61 [1.20,2.17] 0.001	0.72 [0.48,1.08] 0.117
Ethnicity (ref.						
European	1.07 [0.70,1.65] 0.748	0.79 [0.61,1.02] 0.074	0.80 [0.52,1.23] 0.300	0.95 [0.64,1.42] 0.806	0.93 [0.67,1.29] 0.666	1.10 [0.62,1.95] 0.735
First Nations	0.77 [0.36,1.61] 0.482	0.99 [0.64,1.51] 0.947	0.85 [0.42,1.74] 0.661	1.37 [0.76,2.46] 0.292	1.33 [0.80,2.22] 0.276	1.07 [0.46,2.48] 0.871
Other Visible	1.68 [0.82,3.45] 0.160	1.14 [0.69,1.89] 0.611	0.56 [0.21,1.49] 0.249	1.49 [0.68,3.30] 0.321	0.67 [0.30,1.54] 0.348	1.38 [0.46,4.17] 0.564
Baseline Year (ref. 1994)						
1996	0.61 [0.29,1.31] 0.208	0.63 [0.36,1.08] 0.093	0.59 [0.26,1.33] 0.202	0.65 [0.28,1.51] 0.314	0.36 [0.18,0.72] 0.004	0.91 [0.28,2.93] 0.877
1998	0.70 [0.40,1.20] 0.190	0.96 [0.64,1.46] 0.866	1.16 [0.66,2.03] 0.606	0.60 [0.32,1.15] 0.124	0.74 [0.44,1.24] 0.255	1.53 [0.59,3.98] 0.386
2000	1.26 [0.73,2.16] 0.403	0.70 [0.45,1.08] 0.105	0.86 [0.48,1.52] 0.594	1.57 [0.83,2.96] 0.165	0.63 [0.37,1.07] 0.087	1.92 [0.73,5.07] 0.187
2002	0.58 [0.32,1.04] 0.067	0.87 [0.56,1.35] 0.542	0.74 [0.43,1.28] 0.280	1.28 [0.67,2.47] 0.457	0.83 [0.47,1.45] 0.508	2.23 [0.83,6.03] 0.113
Parental Nurture	0.78 [0.75,0.82] 0.000	0.92 [0.89,0.95] 0.000	0.80 [0.76,0.84] 0.000	0.84 [0.81,0.87] 0.000	0.95 [0.92,0.99] 0.015	0.80 [0.77,0.84] 0.000
Parental Rejection	1.08 [1.03,1.12] 0.000	1.04 [1.01,1.08] 0.003	1.15 [1.10,1.21] 0.000	1.13 [1.09,1.17] 0.000	1.03 [1.00,1.07] 0.057	1.13 [1.07,1.18] 0.000
Friendship Quality	0.75 [0.71,0.79] 0.000	0.94 [0.90,0.99] 0.010	0.72 [0.68,0.76] 0.000	0.74 [0.71,0.78] 0.000	0.85 [0.81,0.89] 0.000	0.69 [0.65,0.74] 0.000
Family Functioning	1.13 [1.00,1.28] 0.045	0.95 [0.87,1.03] 0.195	1.10 [0.96,1.26] 0.162	0.87 [0.77,0.99] 0.033	0.84 [0.76,0.93] 0.001	0.91 [0.78,1.05] 0.198
Family Structure (ref. Intact)						
Reconstituted	1.00 [0.24,4.22] 0.995	3.97 [1.50,10.52] 0.006	1.65 [0.40,6.79] 0.487	3.43 [0.94,12.59] 0.063	3.42 [1.38,8.48] 0.008	1.73 [0.45,6.63] 0.423
Single Parent	0.82 [0.29,2.35] 0.711	1.08 [0.48,2.46] 0.849	0.38 [0.06,2.44] 0.310	7.07 [2.04,24.55] 0.002	3.21 [0.99,10.36] 0.051	0.57 [0.04,8.23] 0.683
Relative Income (ref. Average)						
High	0.76 [0.51,1.12] 0.163	0.74 [0.56,0.98] 0.033	0.68 [0.44,1.07] 0.093	1.39 [0.93,2.07] 0.111	1.27 [0.91,1.77] 0.152	0.61 [0.35,1.07] 0.087
Low	0.90 [0.55,1.46] 0.665	0.98 [0.72,1.33] 0.899	0.99 [0.63,1.56] 0.968	1.31 [0.86,2.01] 0.213	1.35 [0.93,1.97] 0.110	1.19 [0.68,2.09] 0.546
Maternal Education (ref. < High School)						
High School	1.12 [0.75,1.69] 0.575	0.89 [0.68,1.16] 0.396	1.10 [0.70,1.71] 0.679	0.84 [0.56,1.26] 0.405	0.88 [0.62,1.25] 0.490	1.12 [0.65,1.93] 0.672

Table 6-15	M1: Girls (N=1773, 3419 transitions, maintain-high = 2404)			M2: Boys (N = 1648, 3202 transitions). Maintain-High (2472 transitions)		
Covariates at t1	**Improvement (n=509) vs. Maintain-High RRR [95% CI] p**	**Decline (n=246) vs. Maintain-High RRR [95% CI] p**	**Maintain-Low (n=260) vs. Maintain-High RRR [95% CI] p**	**Improvement (n=312) vs. Maintain-High RRR [95% CI] p**	**Decline (n=251) vs. Maintain-High RRR [95% CI] p**	**Maintain-Low (n=167) vs. Maintain-High RRR [95% CI] p**
Diploma or Degree	0.94 [0.54,1.64] 0.827	0.73 [0.49,1.09] 0.121	0.86 [0.43,1.72] 0.667	0.51 [0.28,0.91] 0.024	0.60 [0.37,0.99] 0.044	0.98 [0.44,2.16] 0.952
Maternal Depression (ref. Not depressed)						
Depressed	1.29 [0.85,1.96] 0.224	1.17 [0.87,1.58] 0.294	1.34 [0.90,2.02] 0.154	1.01 [0.64,1.58] 0.975	1.44 [1.00,2.06] 0.048	1.02 [0.61,1.71] 0.946
Rurality (ref. Rural)						
Urban	1.55 [1.09,2.21] 0.015	1.01 [0.79,1.29] 0.934	0.95 [0.65,1.39] 0.774	0.94 [0.67,1.33] 0.720	0.96 [0.72,1.29] 0.798	1.46 [0.90,2.36] 0.124
Province (ref. Ontario)						
Maritimes*	0.82 [0.51,1.32] 0.416	1.01 [0.73,1.41] 0.933	1.34 [0.76,2.34] 0.311	1.18 [0.71,1.96] 0.524	1.12 [0.75,1.66] 0.591	0.82 [0.44,1.54] 0.539
Quebec	1.09 [0.69,1.74] 0.702	1.25 [0.92,1.71] 0.155	3.28 [1.94,5.56] 0.000	1.21 [0.74,2.00] 0.449	0.87 [0.56,1.35] 0.531	0.94 [0.49,1.80] 0.860
Manitoba	1.02 [0.51,2.05] 0.952	0.70 [0.41,1.18] 0.183	1.51 [0.65,3.54] 0.338	1.40 [0.78,2.50] 0.262	1.20 [0.74,1.96] 0.454	0.61 [0.23,1.56] 0.299
Saskatchewan	0.56 [0.28,1.12] 0.102	0.46 [0.27,0.77] 0.003	1.20 [0.57,2.52] 0.629	0.77 [0.40,1.47] 0.432	0.56 [0.31,1.03] 0.064	0.40 [0.15,1.11] 0.078
Alberta	0.51 [0.27,0.95] 0.033	0.64 [0.42,0.98] 0.042	1.06 [0.54,2.05] 0.873	0.90 [0.48,1.68] 0.735	0.83 [0.50,1.38] 0.477	0.40 [0.16,1.01] 0.053
British Columbia	0.68 [0.35,1.31] 0.247	0.65 [0.41,1.03] 0.064	1.28 [0.63,2.58] 0.494	0.63 [0.32,1.22] 0.169	0.78 [0.47,1.32] 0.362	0.68 [0.29,1.58] 0.367
Neighbourhood deprivation (ref. Least Deprived)						
Q2	0.94 [0.48,1.82] 0.848	1.14 [0.71,1.84] 0.580	1.19 [0.57,2.48] 0.652	0.98 [0.49,1.94] 0.952	0.95 [0.54,1.68] 0.855	0.47 [0.19,1.17] 0.105
Average	0.83 [0.43,1.57] 0.560	1.13 [0.71,1.81] 0.600	0.95 [0.47,1.92] 0.883	1.01 [0.52,1.99] 0.969	1.20 [0.69,2.08] 0.528	0.71 [0.31,1.62] 0.417
Q4	0.95 [0.51,1.77] 0.872	1.03 [0.65,1.64] 0.897	0.62 [0.29,1.33] 0.218	0.60 [0.28,1.26] 0.176	0.97 [0.55,1.73] 0.930	0.63 [0.28,1.44] 0.271
Most Deprived	1.46 [0.75,2.81] 0.262	1.26 [0.79,2.03] 0.331	0.99 [0.48,2.07] 0.989	0.76 [0.37,1.56] 0.449	1.03 [0.58,1.83] 0.914	0.52 [0.21,1.28] 0.154
Neighbourhood deprivation*Family Structure (ref. Q1/Intact)						
Q2*Reconstituted	1.67 [0.28,9.99] 0.574	0.38 [0.11,1.36] 0.137	1.55 [0.26,9.42] 0.633	1.16 [0.24,5.61] 0.850	0.57 [0.16,2.04] 0.387	2.30 [0.33,16.08] 0.403
Q2*Single Parent	0.61 [0.10,3.92] 0.606	1.51 [0.51,4.49] 0.460	1.32 [0.12,14.65] 0.820	0.29 [0.05,1.59] 0.153	0.91 [0.21,3.88] 0.901	3.51 [0.17,74.64] 0.421
Q3*Reconstituted	0.36 [0.06,2.39] 0.292	0.14 [0.04,0.49] 0.002	0.40 [0.07,2.34] 0.309	0.18 [0.04,0.92] 0.039	0.17 [0.04,0.62] 0.008	0.73 [0.13,4.10] 0.723
Q3*Single Parent	0.99 [0.24,4.03] 0.992	0.83 [0.31,2.24] 0.712	2.26 [0.30,17.08] 0.430	0.20 [0.04,0.86] 0.030	0.22 [0.05,0.90] 0.036	1.10 [0.06,18.77] 0.948
Q4*Reconstituted	0.78 [0.11,5.33] 0.799	0.39 [0.12,1.31] 0.128	1.78 [0.32,9.98] 0.510	0.41 [0.07,2.32] 0.300	0.34 [0.10,1.22] 0.098	0.90 [0.13,6.08] 0.914
Q4*Single Parent	1.35 [0.35,5.24] 0.663	0.93 [0.33,2.62] 0.888	7.21 [0.96,54.13] 0.055	0.18 [0.04,0.82] 0.027	0.26 [0.06,1.07] 0.061	0.87 [0.05,16.30] 0.923
Q5*Reconstituted	1.38 [0.27,7.19] 0.702	0.24 [0.08,0.79] 0.018	0.98 [0.19,5.14] 0.977	0.59 [0.13,2.70] 0.500	0.43 [0.14,1.35] 0.149	0.18 [0.01,2.21] 0.179
Q5*Single Parent	0.79 [0.22,2.90] 0.721	0.74 [0.28,2.00] 0.557	2.38 [0.32,17.63] 0.396	0.29 [0.07,1.19] 0.085	0.27 [0.07,1.08] 0.064	2.83 [0.17,47.17] 0.468

The models for social fragmentation were similar to the models for neighbourhood deprivation in terms of the individual and family effects and have been discussed above. The key differences between the two sets of models are the effect of family structure (which is not interacted with anything in the social fragmentation model), friendship quality and, of course, the inclusion of social fragmentation in place of neighbourhood deprivation.

Table 6-16 shows that when family structure is analysed across all adolescents in the sample, and not just over those adolescents living in the least materially deprived areas (as in Table 6-15), it operates quite differently. Referring to Table 6-16, reconstituted family status is associated with maintaining low self-esteem for all girls (see M1), while living in reconstituted and single parent families is associated with higher relative risk of improvements in self-esteem for boys (see M2).

The interaction between social fragmentation and friendship quality is not indicative of a strong interactive relationship. For girls the relative risk ratios suggest that higher levels of social fragmentation are associated with higher risk of improvement in self-esteem over all quintiles when adolescents perceive their friendship quality as low. Similarly, for boys, there is limited evidence that when friendships are perceived to be poor, the risk associated with the highest level of social fragmentation compared to the lowest level is statistically significant.

Table 6-16: Social fragmentation and self-esteem transitions for stratified analyses of girls (M1) and boys (M2) in the NLSCY (Overall N=3421, 6621 transitions): Maintain-High (2404 transitions) is reference category for each of the three outcomes in both multinomial models

Table 6-16	M1: Girls (N=1773, 3419 transitions, 2404 Maintain-High transitions)			M2: Boys (N = 1648, 3202 transitions). Maintain-High (2472 transitions)		
	Improvement (n=509) vs. Maintain-High	Decline (n=246) vs. Maintain-High	Maintain-Low (n=260) vs. Maintain-High	Improvement (n=312) vs. Maintain-High	Decline (n=251) vs. Maintain-High	Maintain-Low (n=167) vs. Maintain-High
Covariates at t1	**RRR [95% CI] p**	**RRR [95% CI] p**	**RRR [95% CI] p**	**RRR [95% CI] p**	**RRR [95% CI] p**	**RRR [95% CI] p**
Baseline age (ref. 10/11-12.13)						
12/13	2.68 [1.78,4.03] 0.000	0.97 [0.76,1.23] 0.789	2.37 [1.66,3.40] 0.000	0.75 [0.52,1.09] 0.127	1.58 [1.18,2.13] 0.002	0.72 [0.48,1.09] 0.117
Ethnicity (ref.						
European	1.10 [0.72,1.68] 0.665	0.79 [0.61,1.02] 0.074	0.78 [0.51,1.20] 0.264	0.91 [0.61,1.36] 0.650	0.91 [0.66,1.26] 0.582	1.14 [0.63,2.05] 0.666
First Nations	0.78 [0.37,1.64] 0.510	0.98 [0.64,1.50] 0.921	0.85 [0.42,1.73] 0.659	1.30 [0.73,2.32] 0.376	1.22 [0.74,2.02] 0.441	0.98 [0.41,2.30] 0.957
Other Visible	1.70 [0.83,3.44] 0.144	1.12 [0.68,1.85] 0.649	0.53 [0.20,1.42] 0.207	1.48 [0.68,3.21] 0.325	0.71 [0.31,1.62] 0.416	1.68 [0.59,4.81] 0.335
Baseline year(ref. 199496)						
1996	0.66 [0.31,1.42] 0.287	0.65 [0.38,1.12] 0.124	0.58 [0.26,1.30] 0.184	0.97 [0.52,1.79] 0.917	1.98 [1.22,3.22] 0.006	1.54 [0.81,2.93] 0.184
1998	0.71 [0.41,1.24] 0.232	0.99 [0.65,1.50] 0.961	1.15 [0.66,2.00] 0.631	2.57 [1.42,4.64] 0.002	1.68 [0.98,2.89] 0.061	1.98 [0.92,4.28] 0.082
2000	1.30 [0.75,2.24] 0.352	0.71 [0.46,1.09] 0.119	0.87 [0.49,1.54] 0.622	2.07 [1.08,4.00] 0.030	2.21 [1.29,3.81] 0.004	2.24 [0.98,5.09] 0.055
2002	0.58 [0.32,1.04] 0.069	0.89 [0.57,1.37] 0.588	0.74 [0.44,1.26] 0.267	1.67 [0.71,3.90] 0.236	2.62 [1.31,5.25] 0.007	0.91 [0.27,3.08] 0.882
Parental Nurture	0.79 [0.76,0.82] 0.000	0.92 [0.89,0.95] 0.000	0.80 [0.76,0.84] 0.000	0.84 [0.81,0.87] 0.000	0.96 [0.92,0.99] 0.023	0.80 [0.76,0.83] 0.000
Parental Rejection	1.07 [1.03,1.12] 0.001	1.05 [1.02,1.08] 0.003	1.15 [1.10,1.20] 0.000	1.13 [1.09,1.17] 0.000	1.04 [1.00,1.07] 0.046	1.13 [1.08,1.19] 0.000
Friendship Quality	0.65 [0.57,0.74] 0.000	0.89 [0.81,0.98] 0.020	0.70 [0.62,0.79] 0.000	0.76 [0.68,0.84] 0.000	0.89 [0.83,0.96] 0.004	0.61 [0.52,0.71] 0.000
Family Functioning	1.12 [1.00,1.26] 0.060	0.95 [0.87,1.03] 0.183	1.10 [0.96,1.25] 0.186	0.87 [0.77,0.99] 0.035	0.84 [0.76,0.93] 0.001	0.88 [0.75,1.02] 0.083
Family Structure (ref. Intact)						
Reconstituted	0.94 [0.57,1.53] 0.795	1.25 [0.88,1.76] 0.210	1.75 [1.09,2.81] 0.021	1.78 [1.13,2.82] 0.013	1.41 [0.95,2.11] 0.091	1.57 [0.87,2.85] 0.138
Single Parent	0.75 [0.47,1.19] 0.217	1.01 [0.74,1.39] 0.932	1.09 [0.67,1.78] 0.717	2.00 [1.28,3.15] 0.003	1.21 [0.80,1.84] 0.365	1.03 [0.55,1.90] 0.936
Relative Income (ref. Average)						
High	0.77 [0.53,1.14] 0.194	0.74 [0.56,0.97] 0.029	0.73 [0.47,1.15] 0.178	1.36 [0.92,2.02] 0.121	1.24 [0.89,1.72] 0.202	0.65 [0.37,1.14] 0.130
Low	0.93 [0.58,1.49] 0.759	0.96 [0.71,1.31] 0.815	1.02 [0.66,1.58] 0.934	1.29 [0.84,1.98] 0.238	1.39 [0.96,2.01] 0.077	1.38 [0.78,2.45] 0.268
Maternal Education (ref. < High School)						
High School	1.08 [0.72,1.63] 0.702	0.89 [0.69,1.17] 0.414	1.11 [0.72,1.73] 0.634	0.91 [0.61,1.35] 0.642	0.91 [0.64,1.28] 0.579	1.19 [0.68,2.09] 0.546

Table 6-16	M1: Girls (N=1773, 3419 transitions, 2404 Maintain-High transitions)			M2: Boys (N = 1648, 3202 transitions). Maintain-High (2472 transitions)		
	Improvement (n=509) vs. Maintain-High	Decline (n=246) vs. Maintain-High	Maintain-Low (n=260) vs. Maintain-High	Improvement (n=312) vs. Maintain-High	Decline (n=251) vs. Maintain-High	Maintain-Low (n=167) vs. Maintain-High
Covariates at t1	**RRR [95% CI] p**	**RRR [95% CI] p**	**RRR [95% CI] p**	**RRR [95% CI] p**	**RRR [95% CI] p**	**RRR [95% CI] p**
Diploma or	0.88 [0.50,1.53] 0.649	0.74 [0.51,1.10] 0.134	0.87 [0.44,1.72] 0.688	0.58 [0.33,1.03] 0.062	0.64 [0.39,1.04] 0.072	1.10 [0.50,2.42] 0.820
Maternal Depression (ref. Not depressed)						
Depressed	1.29 [0.85,1.96] 0.240	1.18 [0.88,1.59] 0.258	1.33 [0.89,1.99] 0.162	1.01 [0.66,1.55] 0.960	1.40 [0.98,2.01] 0.064	0.99 [0.60,1.65] 0.984
Rurality (ref. Rural)						
Urban	1.24 [0.87,1.78] 0.235	1.02 [0.80,1.31] 0.854	1.01 [0.68,1.50] 0.963	1.14 [0.79,1.64] 0.491	1.12 [0.84,1.50] 0.441	1.97 [1.18,3.29] 0.009
Province (ref.						
Maritimes*	0.96 [0.61,1.50] 0.853	1.07 [0.79,1.45] 0.681	1.38 [0.80,2.39] 0.247	1.00 [0.62,1.62] 0.998	1.04 [0.71,1.53] 0.836	0.71 [0.38,1.32] 0.280
Quebec	1.13 [0.71,1.79] 0.607	1.30 [0.95,1.77] 0.101	3.11 [1.83,5.29] 0.000	1.10 [0.67,1.81] 0.714	0.91 [0.59,1.41] 0.688	0.90 [0.48,1.71] 0.751
Manitoba	1.03 [0.51,2.05] 0.941	0.73 [0.43,1.24] 0.238	1.49 [0.65,3.44] 0.348	1.24 [0.71,2.18] 0.447	1.20 [0.75,1.93] 0.450	0.52 [0.21,1.27] 0.151
Saskatchewan	0.60 [0.29,1.21] 0.153	0.49 [0.29,0.82] 0.007	1.28 [0.61,2.67] 0.515	0.76 [0.41,1.41] 0.383	0.57 [0.31,1.04] 0.066	0.41 [0.15,1.11] 0.079
Alberta	0.54 [0.29,1.00] 0.049	0.65 [0.43,1.00] 0.050	1.08 [0.56,2.09] 0.813	0.95 [0.51,1.77] 0.863	0.85 [0.52,1.40] 0.536	0.45 [0.18,1.12] 0.088
British Columbia	0.65 [0.34,1.26] 0.204	0.65 [0.41,1.03] 0.069	1.34 [0.67,2.69] 0.403	0.59 [0.30,1.15] 0.123	0.79 [0.47,1.34] 0.384	0.64 [0.28,1.46] 0.289
Social fragmentation (ref. least fragmented)						
Q2	0.12 [0.01,1.46] 0.096	0.32 [0.05,1.99] 0.221	0.78 [0.10,6.01] 0.814	1.55 [0.29,8.41] 0.610	2.19 [0.44,10.96] 0.338	0.39 [0.05,3.03] 0.370
Average	0.12 [0.01,1.03] 0.053	0.46 [0.07,3.01] 0.419	1.03 [0.12,8.84] 0.977	2.43 [0.42,14.11] 0.324	3.56 [0.85,14.98] 0.084	0.44 [0.05,3.80] 0.458
Q4	0.21 [0.02,1.86] 0.162	0.35 [0.05,2.52] 0.299	0.55 [0.07,4.19] 0.561	1.54 [0.23,10.21] 0.653	1.97 [0.39,9.91] 0.409	0.16 [0.02,1.38] 0.095
Most fragmented	0.12 [0.01,1.14] 0.065	0.37 [0.05,2.99] 0.351	0.35 [0.03,3.88] 0.390	0.22 [0.03,1.50] 0.121	0.27 [0.04,1.75] 0.170	0.01 [0.00,0.18] 0.001
Social fragmentation*Friendship quality						
Q2*friendship	1.20 [0.98,1.47] 0.221	1.10 [0.96,1.26] 0.158	1.04 [0.88,1.22] 0.644	0.98 [0.85,1.13] 0.799	0.93 [0.82,1.06] 0.267	1.14 [0.95,1.37] 0.164
Q3friendship	1.22 [1.03,1.45] 0.419	1.06 [0.93,1.22] 0.384	0.98 [0.83,1.16] 0.827	0.93 [0.79,1.08] 0.317	0.89 [0.79,0.99] 0.040	1.13 [0.93,1.37] 0.218
Q4*friendship	1.14 [0.96,1.36] 0.146	1.07 [0.93,1.24] 0.352	1.03 [0.88,1.21] 0.720	0.95 [0.81,1.12] 0.580	0.92 [0.81,1.04] 0.185	1.17 [0.96,1.41] 0.115
Q5*friendship	1.23 [1.04,1.47] 0.299	1.09 [0.94,1.27] 0.273	1.10 [0.91,1.33] 0.320	1.11 [0.94,1.30] 0.216	1.06 [0.92,1.22] 0.445	1.39 [1.10,1.76] 0.006

6.6.2 BYP

The analyses above demonstrate that the full models are the most parsimonious statistical models of the relationships between change in self-esteem and covariates. This is due to the limited power of this dataset to examine sex differences in these relationships: for all transition types it was statistically invalid to stratify by sex as many cells in the models do not have at least 5 observations. This made estimation of coefficients within the models unstable, and therefore unfit for meaningful interpretation.

6.7 Discussion

This chapter addressed the question of whether there were prospective associations between change in self-esteem and neighbourhood context and composition measured prior before the change occurred.

6.7.1 Changes in self-esteem by neighbourhood deprivation

The adjusted models presented above for both surveys highlight a relatively complex picture of what aspects of social context are associated with each type of self-esteem transition. In order to discuss these results with respect to the first research question, this complex picture is illustrated in a more accessible way in Table 6-17.

The research question relates to how far relationships between neighbourhood characteristics and / or compositional characteristics might constitute evidence for causal associations. The results from the NLSCY and BYP models with no interactions are summarised in Table 6-17 below.

Central to this thesis is the observation that patterns of change in self-esteem (either improvement or decline over time) and patterns of maintenance (of high or low self-esteem) over the two year periods were not differentiated by levels of neighbourhood deprivation or social fragmentation. This adds to the evidence in chapter five, that neighbourhood deprivation is not observably implicated in variations in self-esteem in this age group.

In terms of other work, this study was the first to undertake a prospective analysis in the UK for adolescent self-esteem *specifically.* However, recent work in the UK has examined change in self-esteem and its association with neighbourhood level deprivation (Ford et al., 2007). This work investigates patterns of association for children and adolescents aged 5-15. They find that neighbourhood deprivation is not associated with mental health outcomes but these findings cannot be used to situate the findings reported here because the equalisation theory relates to equalisation in early adolescence only. That analysis is important because it measured internalising mental health using longer measures of anxiety and depression, and also employed a different indicator of deprivation (the Carstairs Score) and still found comparable results over a similar time frame (3 year lag).

These findings are consistent with those of Weich et al., (2005a) in their prospective analysis of adult psychological distress which also considered patterns of decline and maintenance (discussed by those authors in terms of 'onset' and 'maintenance') and found no relationships with neighbourhood deprivation. This comparison is interesting because the adolescents in the BYP were drawn from a subset of Weich et al., (2005a) data.

Outside of the UK, findings for prospective work on adolescent mental health and self-esteem are mixed. Outside of the U.S., these findings are *consistent* with findings presented

by Drukker et al. (2006) who find no relationships with change in *mental health* and neighbourhood deprivation. However, in the same sample they find evidence for inverse associations between changes in *self-esteem* and neighbourhood deprivation within an interaction with maternal education. In their analysis, an inverse relationship emerges for adolescents whose mothers were well educated, but a reverse gradient emerges for those who had lower levels of education. They are also inconsistent with work by Schneiders et al. (2003) who find that changes in mental health are significantly inversely associated with neighbourhood deprivation. The findings are not consistent with work from a national sample in the United States which finds that changes in depressive symptoms are associated with neighbourhood deprivation (Wickrama, 2005a).

Overall, there is only a small, but growing literature to draw on with respect to this field. The studies reviewed above generally employ robust designs with good attention to key confounders and adequate measurement of key concepts. In addition, excluding the Weich et al., (2005a) study, the other studies refer to samples of similar age. It is notable that there is heterogeneity within as well as between studies. Drukker et al. (2006) find quite different relationships between mental health and self-esteem outcomes in the same analysis. Overall, the most productive conclusion to draw is that while these studies are informative about associations between neighbourhood deprivation and mental health and self-esteem in this age group, there needs to be more replication before wider conclusions can be drawn reliably.

Table 6-17: Summary table of adjusted findings from the NLSCY and BYP.

Covariate	Improvement NLSCY	Improvement BYP	Decline NLSCY	Decline BYP	Maintain-Low NLSCY	Maintain-Low BYP
Higher age						
Girls						
Visible ethnic minority						
Year			Inconsistent			
Positive parenting						
Negative parenting						
Friends						
Family functioning*		…		…		…
Unhappy with family *	…		…		…	
Reconstituted families						
Single parent families						
High household income						
Low household income						
Increasing maternal education						
Maternal depression						
Urban						
Neighbourhood deprivation						
Social fragmentation						
Region/ Province (except Quebec and Scotland)						
Quebec						
Scotland						

* These variables were not directly comparable. Marginal associations are those where p is around 0.05, in the range of 0.04-0.06, direction of association in brackets. Cells in red indicate significant risks, cells in blue indicate significant protective and cells in grey indicate non-significant associations

The findings only weakly support a causal role of household socio-economic status. While prospective, fully adjusted associations are observed inconsistently for household income and maternal education, no associations are observed for single parent family status which is commonly referred to as an indicator of socio-economic status in both countries (Emerson et al., 2005). In addition, no one marker of household socio-economic status was consistently associated with all the change outcomes. Indeed, only one (high household income), for example, was associated with change outcomes in more than one survey.

The weakness and inconsistency of the relationships between household socio-economic status and neighbourhood characteristics contrasts with the relative strength and

consistency of the associations between gender and social relationships. Gender is associated with all change outcomes in both surveys. So is reconstituted family status which can, owing to the similar economic power of intact and reconstituted families, be thought as marking the family social environment. Finally, adolescents' perceptions of relationships with parents, friends and family are also consistently observed to be important for all change and maintenance outcomes. Finally, maternal depression is associated with all change outcomes in the BYP and declines in the NLSCY.

The findings for the household socio-economic and social variables are consistent with a large and extensive literature which has examined the risks and protective associations of these variables. The unadjusted associations between self-esteem change and household socio-economic variables and their attenuation by family social environment variables supports a family hardship model put forward by Conger (1992, 1993) for early adolescent boys and girls. This model suggests that socio-economic hardship at the household level is mediated by variations in the social environment, such as the degree of parental responsiveness.

Few studies examine the associations between socio-economic status and changes in mental health and self-esteem. Drukker et al. (2006) analyse associations between maternal education and parental occupational status. While they report statistically significant associations between education and some of the non-mental health outcomes analysed, they do not comment on the relationships between education and the mental health outcomes. They also do not comment on any of the modelled relationships between occupational status and the other health outcome. The lack of discussion of these

coefficients means that the weak findings under discussion here cannot be situated within this other study.

Wickrama et al. (2005a) examine depressive symptoms in the United States and find that after adjustment for t1 depressive symptoms, change in depressive symptoms are associated with low income household and single parent family status. Schneiders et al. (2003) also examine family factors and find that there are strong socio-economic gradients at the family level associated with parental occupation and education with change in youth self-reported mental health problems. It is of note that both studies were inconsistent with this study at the household and neighbourhood level in terms of the relative importance of socio-economic status.

6.7.2 Interactions between family environment and neighbourhood equalisation in analyses of changes in self-esteem

The impact of neighbourhood deprivation and social fragmentation appeared to vary by the family structure that the adolescents lived in with respect to changes in their self-esteem. A large literature examines family structure as a compositional factor which might explain associations between adolescent outcomes and neighbourhood characteristics (Ford et al., 2004; Fagg et al., 2006; Wickrama et al., 2005b).

While Leventhal and Brooks-Gunn (2000) explicitly mention family structure as a potential mediator or moderator of neighbourhood deprivation, very few studies have explicitly examined this possibility. The interaction product term (family structure*neighbourhood deprivation) suggests that adolescents (both boys and girls) living in reconstituted families may be far less likely to decline in self-esteem at higher levels of neighbourhood

deprivation than adolescents living in intact families in the least deprived neighbourhoods. This is consistent with the family structure term which, within the interaction, clearly highlights very high relative risks of adolescents reporting declines in self-esteem in the least deprived neighbourhoods, again for boys and girls. Finally, the neighbourhood deprivation term indicates that neighbourhood deprivation is not a risk for those adolescents from intact families. This interaction is clearly statistically unstable, with wide confidence intervals but is discussed here because it seems consistent across both boys and girls and because it provides further insight into the finding in chapter five that the odds of low self-esteem are lower in deprived neighbourhoods.

In a recent study of the indirect pathways from perceptions of neighbourhood problems to chid behaviour, Pantin and colleagues (2009) examine differences between path models fitted for single parent families and two parent families. They find significant differences in the ways that neighbourhood problems were mediated through social support, parenting practice and child problem behaviours. The study could not inform the findings from this study as two parent family types were not broken down. For example, the mechanisms suggested by the results from that study suggested that single parent families relied more on external social support than two parent families, but this pathway may not differentiate two-parent families.

A second key interaction finding is that risk factors for a decline or maintenance of low self-esteem also often constitute a risk for an 'improvement' in self-esteem. For example, girls are more likely to report all transition types, meaning that while at age 10 a girl with high self-esteem is more likely than a boy to report decline of low self-esteem at age 12, she is simultaneously more likely to report an improvement in self-esteem, or to maintain low

self-esteem. This might simply indicate that girls are firstly on average more likely to report low self-esteem, and secondly, they may be more susceptible to change.

6.7.3 Chapter strengths and limitations

Associations between covariates and self-esteem transitions are prospective; covariates are measured at t1, 2 years prior to the outcome. This allows a stronger causal inference to be made that the variables are causally associated with low self-esteem.

The models used in this chapter give an important longitudinal dimension to the relationship between social context and self-esteem. By modelling all the explicit transitions between low self-esteem, and high self-esteem, this modelling strategy also explicitly takes account of t1 self-esteem status. In addition, the strategy expands on earlier work which has been concerned with onset and maintenance, which tends to focus attention on biomedical perspectives, to also include the more 'positive' outcome of 'improvements' in self-esteem, recognising that a return to health or high self-esteem is also of interest .

The use of prospective data in this chapter highlighted a key limitation with the adolescent-reported data used to measure perceptions of relationships between the adolescent and their parent(s). This showed that while perceptions of parents, family and friends at t1 predicted self-esteem transitions as theorised in the conceptual model, perceptions were themselves predicted by self-esteem measured at t1 when this relationship was tested in a sensitivity analysis with the BYP data (see appendix discussion and tables for chapter six). This suggests that future research of these relationships should consider an analytic strategy such as structural equation modelling which can take account of the reciprocal relationships between perceptions of social environments and mental health in adolescence.

A second key limitation of this chapter is that change in the covariates was not examined, only status at t1. Changes in household and family characteristics would be of considerable interest, although not central to the focus here. There is considerable scope for further research using the datasets to consider these transitions but this work was therefore out of scope for this thesis.

6.7.4 Summary and implications

Overall, the findings here emphasise the role of the family social environment over and above the family socio-economic environment or neighbourhood deprivation in terms of the consistency and strength of associations with self-esteem.

These findings are powerful because they take into account prior self-esteem status as well as a number of controls. They are also consistent across two national settings in terms of the broad patterns of risk and protection which are observed despite the surveys carrying quite different variables to operationalise the models under test.

Family structure and sex may moderate neighbourhood effects, in addition to the direct associations of these variables to change in self-esteem. This supports the position of Leventhal and Brooks-Gunn (2000) that adolescent neighbourhood research should not just examine interactions between neighbourhood deprivation and household socio-economic status but should also examine the moderating role of the household social environment of the household.

CHAPTER 7 – RESIDENTIAL AND SOCIO-GEOGRAPHIC MOBILITY AND SELF-ESTEEM

7.1 Introduction

The review in chapter two suggested that the socio-geographic mobility of adolescents and their families may well be important when considering the social context of variations in self-esteem. Moreover, due to the lack of studies which take a longitudinal perspective on neighbourhood effects for this age group, there is a lack of evidence in this area for younger populations.

This chapter considers two simple models of socio-geographic mobility in the NLSCY. Firstly, socio-geographic mobility between t1 and t2 is considered as a socio-geographic change which may be prospectively associated with low self-esteem at t2. Secondly, it reverses this framework to consider whether adolescent low self-esteem at t1 is prospectively associated with any particular type of socio-geographic move from t1 to t2.

Only the NLSCY had high enough rates of residential mobility to be able to disaggregate and analyse the residential moves by characteristics of the origin and neighbourhood. For the BYP, as described in section 4.3.3, the rates of *any* residential mobility between any two given cycles were only 3%, which on disaggregation by the three types of socio-geographic moves (up, down, to similar) were substantially reduced to approximately 1% of the sample undertaking any given socio-geographic move. Moreover, the descriptive estimates spanned zero, indicating that even when *all* socio-geographic moves of each type were

examined together, estimates of their relative distribution in the population were likely to be unreliable.

This chapter therefore partially addresses the third research question (i.e. for the NLSCY only) by considering the relationships between low self-esteem and socio-geographic mobility:

Is there evidence for prospective associations between adolescent self-esteem and socio-geographic processes of neighbourhood context, composition, health selective migration and socio-geographic mobility in the UK and Canada?

7.2 Socio-geographic mobility

The first set of results reports on unadjusted and adjusted analysis of associations between socio-geographic mobility (between t1 and t2) and self-esteem at t2. These show (see Table 7-1) that there is an unadjusted risk to self-esteem of moving to a neighbourhood which was more deprived than the neighbourhood of origin. No difference is observed between movers to similarly deprived or less deprived neighbourhoods. M2 shows that this all differences were attenuated to non-significance by adjustment for individual and family factors at t1 implying that any apparent risk due to deprivation mobility was due to the differential selection of particular family types into more deprived neighbourhoods.

In terms of social fragmentation, when movers are disaggregated by levels of social fragmentation at the origin and destination neighbourhoods, those who move to more fragmented neighbourhoods have higher odds of reporting low self-esteem. However, adolescents who move to less fragmented neighbourhoods also have higher odds of low self esteem. There are no differences between adolescents who move to similarly

fragmented neighbourhoods. The introduction of individual and family variables attenuates the magnitude of these associations, but the effects of fragmentation mobility remain statistically significant.

Table 7-1: Unadjusted and fully adjusted logistic regression models of contemporary self-esteem and transitions in neighbourhood deprivation and social fragmentation in the NLSCY. N= 3421. Standard errors adjusted for between-individual clustering.

	M1: Unadjusted	**M2: Adjusted Deprivation Mobility***	**M3: Adjusted Fragmentation Mobility***
Covariates at t1	**OR [95% CI] p**	**OR [95% CI] p**	**OR [95% CI] p**
Deprivation mobility (ref. Non-mover)			
..to similarly deprived	1.31 [0.88,1.95] 0.189	1.20 [0.87,1.65] 0.257	…
..to more affluent	1.31 [0.88,1.95] 0.181	1.17 [0.85,1.61] 0.342	…
.to more deprived	1.54 [1.08,2.20] 0.017	1.25 [0.94,1.66] 0.119	…
Fragmentation mobility (ref. Non-mover)			
.. to similarly deprived	0.94 [0.59,1.48] 0.777	…	0.90 [0.62,1.30] 0.565
..to less fragmented	1.67 [1.16,2.43] 0.007	…	1.35 [1.01,1.80] 0.044
..to more fragmented	1.51 [1.06,2.15] 0.022	…	1.32 [1.00,1.75] 0.051

* Adjusted for age, sex, ethnicity, year of entry, perceptions of parents and friends, family functioning, family structure, household income, maternal education, maternal depression, rurality and province at t1.

As it is possible that adolescents with low self-esteem might follow different socio-geographic mobility trajectories, and also different self-esteem trajectories, the next analyses investigated how adjusting for prior self-esteem accounted for the associations between fragmentation mobility and self-esteem at t2. The results reported suggest that prior self-esteem does attenuate the observed relationships between fragmentation mobility and self-esteem to non-significance, although the p-value indicates that the non-significance is marginal for the association between maintain-low and moving to more fragmented neighbourhoods (RRR = 1.54, p=0.059).

The associations between low self-esteem and change in low self-esteem and the individual, family and regional factors were examined and discussed in chapters four and five. These relationships were almost identical despite the replacement of the

neighbourhood characteristics at t1 with the socio-geographic mobility variables. The associations between individual and family covariates in the context of the mobility variables have been placed in the appendix relating to this chapter (see Appendix Table 4).

Table 7-2: Unadjusted associations between transitions in self-esteem, residential and socio-geographic mobility. Maintain-High (4876 transitions) is reference category for each of the three outcomes

	M1: Unadjusted Improve (n=821) vs. Maintain-High RRR [95% CI] p	Decline (n=497) vs. Maintain-High RRR [95% CI] p	Maintain-Low (n=427) vs. Maintain-High RRR [95% CI] p	M2: Adjusted model* Improve (n=821) vs. Maintain-High RRR [95% CI] p	Decline (n=497) vs. Maintain-High RRR [95% CI] p	Maintain-Low (n=427) vs. Maintain-High RRR [95% CI] p
Fragmentation mobility (ref. Non-movers)						
Moves to similarly fragmented	1.16 [0.74,1.84] 0.512	0.91 [0.61,1.36] 0.642	1.35 [0.83,2.18] 0.229	0.96 [0.59,1.58] 0.878	0.81 [0.52,1.25] 0.338	1.09 [0.61,1.94] 0.765
Moves to less fragmented	0.94 [0.60,1.48] 0.803	1.50 [1.11,2.03] 0.009	1.35 [0.89,2.05] 0.154	0.82 [0.50,1.36] 0.441	1.34 [0.96,1.88] 0.088	1.22 [0.74,2.00] 0.433
Moves to more fragmented	1.41 [0.98,2.04] 0.067	1.36 [1.00,1.84] 0.046	1.76 [1.23,2.52] 0.002	1.21 [0.79,1.85] 0.389	1.30 [0.94,1.81] 0.113	1.54 [0.98,2.40] 0.059

* Adjusted for demographics, perceptions, family environment, rurality and region at t1

Interactions between socio-geographic mobility and its association with low self-esteem were interacted with sex. No significant interaction was observed. This suggests that risks or lack of them in this sample, of socio-geographic mobility were similar for both boys and girls. As no sex-interaction was observed, the models were not stratified as this would effectively replicate analyses conducted in chapters four and five.

7.3 Health selective socio-geographic mobility

Chapter four and five showed that patterns of self-esteem in adolescents tend to be equally distributed among the population. These analyses highlighted the role of composition, whereby particular types of families actively select into particular types of areas. The analysis below explores these processes using the socio-geographic mobility variables as outcomes in multinomial regression models.

The unadjusted results presented in Table 7-3 show that adolescent self-esteem is prospectively associated with the probability of moving to similar area types, but not to more deprived areas or more affluent areas. The adjusted results show that this association remains significant despite the many significant associations between individual and family factors. This suggests that adolescents who report low self-esteem are more likely to be part of a residentially mobile household than those who are do not report low self-esteem. This residential mobility would have no implications for the geographical distribution of adolescent self-esteem by neighbourhood deprivation as it only applies to moves to similarly deprived neighbourhoods.

In terms of individual characteristics, the age and sex of adolescents did not differentiate residentially mobile families. Interestingly, adolescents with visible ethnic minority heritage were more likely to move than adolescents where both parents identified with a 'Canadian'

heritage. Interestingly, adolescents who were surveyed in 2002 were very much more likely to move to similarly deprived neighbourhoods in 2002, but otherwise year of entry was not associated with residential mobility transitions.

Levels of family functioning are not associated with any type of residential move prior to adjustment. However, when the other covariates in the model are adjusted for a positive relationship emerges between family functioning and moves to more affluent neighbourhoods. This is interesting as it suggests that family functioning must first interact with other variables in the model, possibly family structure, income or maternal education, before its effect emerges.

As expected, strong associations are found between reconstituted and single parent family status and all types of residential moves. This is consistent with previous literature which highlights that single mothers are more likely to move, and that moves are far more likely following family break up (Astone and McLanahan, 1994; South and Crowder, 1998).

Household income is associated with deprivation mobility as might be expected. Adolescents from low income families are more likely to have moved to more deprived neighbourhoods. In contrast, high income households are more likely to move to more affluent neighbourhoods. Maternal education is strongly associated with one type of neighbourhood deprivation move, to similarly deprived neighbourhoods. Overall, adolescents with highly educated mothers are much less likely to move (RRR = 0.37 [0.24, 0.58] 0.000), and a strong effect is also observed for high school versus no high school education (RRR = 0.68 [0.52, 0.89] 0.004). These findings suggest that adolescents whose mother has less than a high school education are more likely to have moved to similarly deprived places in the period under study, this may reflect the fact that mother's who don't have a high school education may be less aware of the damages that school disruption during this period may have for educational outcomes.

Families where the mother is depressed are more likely to move. After adjustment this association is only significant for adolescents who experienced a move to a poorer community. This may reflect a 'drift', or as Smith et al. (2005) might put it, a 'health discriminatory' association of maternal depression with socio-geographic mobility. This is interesting from a health geography perspective because analysis at the level of the child and implicitly at the level of the mother identifies two apparent health selection processes occurring simultaneously in the same family independently of each other and of other selection covariates.

Residential mobility in general appears to be much more common in urban areas than rural areas. The relative risk of families moving does not vary dramatically by province of residence, although families are more likely to move to similarly deprived areas in British Columbia.

Table 7-3: Unadjusted and adjusted prospective associations between low self-esteem and neighbourhood deprivation mobility. Non-Mover is the reference category for all three outcomes (5478 transitions).

Table 7-3	M1: Unadjusted			M2: Adjusted		
Covariates at t1	Moves to similarly deprived (n=260) vs. non-mover RRR [95% CI] p	Moves to less deprived (n=338) vs. non-mover RRR [95% CI] p	Moves to more deprived (n=374) vs. non-mover RRR [95% CI] p	Moves to similarly deprived (n=260) vs. non-mover RRR [95% CI] p	Moves to less deprived (n=338) vs. non-mover RRR [95% CI] p	Moves to more deprived (n=374) vs. non-mover RRR [95% CI] p
Self-Esteem (ref. high self-esteem)						
Low Self-Esteem	1.65 [1.24,2.20] 0.001	1.30 [0.96,1.77] 0.095	0.98 [0.72,1.33] 0.900	1.45 [1.03,2.04] 0.034	1.04 [0.72,1.52] 0.819	0.79 [0.55,1.14] 0.207
Age (ref. 10/11)						
12/13	1.08 [0.86,1.36] 0.510	0.95 [0.76,1.20] 0.670	0.93 [0.75,1.15] 0.495	0.88 [0.65,1.20] 0.418	0.95 [0.70,1.27] 0.709	0.92 [0.71,1.20] 0.558
Sex (ref. boys)	1.03 [0.81,1.31] 0.814	1.08 [0.85,1.36] 0.536	1.11 [0.90,1.37] 0.339	1.00 [0.78,1.29] 0.991	1.07 [0.83,1.37] 0.615	1.11 [0.89,1.40] 0.357
Ethnicity (ref. Canadian)						
European	1.22 [0.89,1.67] 0.226	1.00 [0.74,1.34] 0.995	1.26 [0.94,1.67] 0.118	1.32 [0.94,1.87] 0.111	1.05 [0.76,1.45] 0.779	1.29 [0.95,1.75] 0.102
First Nations	1.13 [0.68,1.87] 0.645	0.88 [0.54,1.44] 0.617	1.30 [0.84,2.00] 0.236	1.28 [0.73,2.24] 0.393	1.04 [0.60,1.79] 0.896	1.22 [0.75,1.96] 0.420
Visible Minority	2.95 [1.76,4.93] 0.000	1.93 [1.13,3.30] 0.017	1.96 [1.15,3.32] 0.013	2.77 [1.57,4.89] 0.000	1.70 [0.94,3.07] 0.079	1.63 [0.94,2.81] 0.081
Year (ref. 1994-96)						
1996-98	1.11 [0.76,1.62] 0.592	0.83 [0.58,1.19] 0.309	0.91 [0.67,1.24] 0.544	1.56 [0.93,2.63] 0.093	0.89 [0.56,1.43] 0.632	1.02 [0.68,1.54] 0.908
1998-00	1.19 [0.80,1.76] 0.386	1.07 [0.75,1.53] 0.710	0.89 [0.64,1.24] 0.503	1.61 [0.95,2.73] 0.075	1.34 [0.82,2.21] 0.247	1.08 [0.71,1.65] 0.705
2000-02	1.00 [0.66,1.53] 0.990	0.69 [0.46,1.05] 0.081	0.74 [0.52,1.06] 0.097	1.37 [0.78,2.41] 0.278	0.85 [0.51,1.42] 0.530	0.89 [0.56,1.40] 0.612
2002-04	2.01 [1.27,3.17] 0.003	1.29 [0.82,2.04] 0.274	0.97 [0.62,1.50] 0.880	3.19 [1.70,5.99] 0.000	1.59 [0.86,2.94] 0.143	1.18 [0.67,2.06] 0.570
Parental Nurture	0.99 [0.96,1.03] 0.655	0.98 [0.95,1.01] 0.117	0.99 [0.96,1.02] 0.627	1.00 [0.96,1.04] 0.966	0.99 [0.95,1.02] 0.477	1.01 [0.97,1.04] 0.790
Parental Rejection	1.02 [0.99,1.05] 0.319	1.00 [0.97,1.03] 0.941	1.00 [0.97,1.02] 0.707	1.00 [0.96,1.03] 0.813	0.99 [0.96,1.03] 0.704	1.00 [0.97,1.03] 0.915
Friendship Quality	0.96 [0.93,1.00] 0.083	0.96 [0.93,1.00] 0.055	0.96 [0.92,0.99] 0.013	1.00 [0.95,1.04] 0.859	0.98 [0.93,1.02] 0.338	0.97 [0.93,1.01] 0.136
Family Functioning	0.92 [0.84,1.01] 0.091	1.07 [0.98,1.17] 0.144	1.00 [0.92,1.09] 0.970	0.98 [0.88,1.08] 0.635	1.12 [1.02,1.25] 0.024	1.06 [0.96,1.16] 0.235
Family Structure (ref. Intact)						
Reconstituted	2.29 [1.61,3.25] 0.000	2.73 [1.97,3.78] 0.000	2.49 [1.86,3.33] 0.000	1.90 [1.30,2.77] 0.001	2.52 [1.78,3.57] 0.000	2.31 [1.70,3.14] 0.000
Single Parent	4.21 [3.22,5.51] 0.000	3.66 [2.77,4.83] 0.000	2.94 [2.27,3.80] 0.000	3.46 [2.48,4.82] 0.000	2.74 [1.95,3.85] 0.000	1.97 [1.46,2.67] 0.000
Household income (ref. Average)						

Table 7-3	M1: Unadjusted			M2: Adjusted		
Covariates at t1	Moves to similarly deprived (n=260) vs. non-mover RRR [95% CI] p	Moves to less deprived (n=338) vs. non-mover RRR [95% CI] p	Moves to more deprived (n=374) vs. non-mover RRR [95% CI] p	Moves to similarly deprived (n=260) vs. non-mover RRR [95% CI] p	Moves to less deprived (n=338) vs. non-mover RRR [95% CI] p	Moves to more deprived (n=374) vs. non-mover RRR [95% CI] p
High	0.62 [0.46,0.84] 0.002	0.57 [0.42,0.77] 0.000	0.80 [0.61,1.04] 0.093	0.94 [0.66,1.32] 0.702	0.66 [0.46,0.94] 0.022	0.86 [0.64,1.16] 0.318
Low	1.84 [1.39,2.43] 0.000	1.50 [1.13,1.98] 0.005	1.76 [1.36,2.27] 0.000	1.09 [0.78,1.52] 0.613	1.23 [0.87,1.72] 0.240	1.49 [1.10,2.03] 0.010
Maternal Education (ref. < High School)						
High School	0.68 [0.52,0.89] 0.004	0.96 [0.72,1.28] 0.774	0.89 [0.69,1.16] 0.387	0.73 [0.54,0.98] 0.036	1.23 [0.88,1.72] 0.236	1.04 [0.78,1.41] 0.774
Diploma or Degree	0.37 [0.24,0.58] 0.000	0.67 [0.44,1.01] 0.056	0.79 [0.56,1.12] 0.182	0.39 [0.24,0.65] 0.000	0.93 [0.58,1.49] 0.771	1.02 [0.68,1.54] 0.913
Maternal Depression (ref. Not depressed)						
Depressed	1.78 [1.32,2.40] 0.000	1.50 [1.11,2.02] 0.007	2.10 [1.64,2.69] 0.000	1.04 [0.74,1.47] 0.820	1.15 [0.83, 1.61] 0.400	1.71 [1.29, 2.26] 0.000
Rurality (ref. Rural)						
Urban	1.47 [1.14,1.91] 0.003	1.89 [1.44,2.48] 0.000	1.68 [1.33,2.13] 0.000	1.38 [1.05,1.83] 0.022	1.80 [1.32,2.47] 0.000	1.49 [1.16,1.92] 0.002
Province (ref. Ontario)						
Maritimes*	1.42 [1.00,2.03] 0.052	1.11 [0.78,1.60] 0.557	0.81 [0.59,1.11] 0.190	1.39 [0.95,2.04] 0.088	1.08 [0.71,1.63] 0.730	0.86 [0.61,1.20] 0.367
Quebec	1.37 [0.96,1.96] 0.085	1.40 [0.99,1.98] 0.056	1.06 [0.78,1.43] 0.718	1.24 [0.83,1.84] 0.294	1.20 [0.82,1.76] 0.353	1.06 [0.76,1.48] 0.737
Manitoba	1.00 [0.58,1.74] 0.986	0.64 [0.35,1.20] 0.164	0.68 [0.41,1.12] 0.127	0.94 [0.52,1.69] 0.833	0.59 [0.30,1.17] 0.129	0.76 [0.45,1.28] 0.301
Saskatchewan	0.96 [0.55,1.68] 0.887	1.21 [0.76,1.94] 0.425	0.80 [0.51,1.26] 0.337	0.88 [0.49,1.56] 0.652	1.21 [0.75,1.97] 0.434	0.84 [0.53,1.34] 0.460
Alberta	1.02 [0.62,1.67] 0.941	1.47 [0.97,2.23] 0.070	1.06 [0.72,1.55] 0.767	1.08 [0.63,1.84] 0.781	1.33 [0.84,2.08] 0.222	0.99 [0.66,1.50] 0.965
British Columbia	2.31 [1.51,3.54] 0.000	1.42 [0.90,2.23] 0.132	1.43 [0.99,2.06] 0.060	2.22 [1.40,3.52] 0.001	1.13 [0.70,1.85] 0.610	1.41 [0.95,2.09] 0.085

The unadjusted findings presented in the first model in M1 (Table 7-4) show that self-esteem is, on an unadjusted basis, associated with the likelihood of moving to more fragmented neighbourhood. This association is rendered non-significant by the inclusion of the other covariates in M2. This shows that selection may contribute to the apparent (unadjusted) risks of reporting low self-esteem and their bivariate association with neighbourhood social fragmentation in section 5.3.1. That this apparent selection process is attenuated to non-significance by adjustment is also consistent with the attenuation of the social fragmentation gradient in low self-esteem following adjustment.

Overall, the same variables tend to be significantly associated (after adjustment), with fragmentation mobility and include ethnicity, household income, maternal education, family functioning, family structure, maternal depression, rurality and province of residence prior to the move. The *patterns* of association are different from those found for the deprivation mobility. However, these will not be described in depth here as the fundamental point remains the same as that which might be made for deprivation mobility, and discussed in the following section.

Table 7-4: Unadjusted and adjusted prospective associations between low self-esteem and fragmentation mobility. Non-Mover is the reference category for all three outcomes (5478 transitions).

Table 7-4	M1: Unadjusted			M2: Adjusted		
Covariates at t1	Moves to similarly fragmented (n=260) vs. non-mover RRR [95% CI] p	Moves to less fragmented (n=338) vs. non-mover RRR [95% CI] p	Moves to more fragmented (n=374) vs. non-mover RRR [95% CI] p	Moves to similarly fragmented (n=260) vs. non-mover RRR [95% CI] p	Moves to less fragmented (n=338) vs. non-mover RRR [95% CI] p	Moves to more fragmented (n=374) vs. non-mover RRR [95% CI] p
Self-Esteem (ref. high self-esteem)						
Low Self-Esteem	1.26 [0.90,1.78] 0.181	1.05 [0.77,1.44] 0.736	1.49 [1.14,1.95] 0.003	0.99 [0.66,1.47] 0.942	0.90 [0.63,1.29] 0.566	1.23 [0.89,1.71] 0.212
Age (ref. 10/11)						
12/13	1.03 [0.82,1.29] 0.817	1.12 [0.90,1.39] 0.296	0.84 [0.68,1.04] 0.105	0.99 [0.73,1.35] 0.967	1.19 [0.89,1.59] 0.237	0.69 [0.53,0.91] 0.008
Sex (ref. boys)	0.98 [0.75,1.28] 0.873	1.20 [0.96,1.51] 0.107	1.03 [0.84,1.27] 0.756	0.93 [0.70,1.25] 0.632	1.17 [0.92,1.48] 0.214	1.08 [0.86,1.35] 0.519
Ethnicity (ref. Canadian)						
European	1.35 [0.94,1.95] 0.104	1.17 [0.87,1.58] 0.297	1.03 [0.78,1.35] 0.841	1.62 [1.07,2.44] 0.022	1.62 [1.07,2.44] 0.022	1.17 [0.86,1.60] 0.323
First Nations	1.44 [0.83,2.50] 0.198	0.81 [0.48,1.34] 0.406	1.17 [0.77,1.76] 0.460	1.88 [0.99,3.57] 0.054	1.88 [0.99,3.57] 0.054	0.93 [0.53,1.63] 0.806
Other Vis.Minority	2.31 [1.22,4.40] 0.011	2.41 [1.45,4.01] 0.001	2.04 [1.27,3.27] 0.003	2.10 [1.04,4.24] 0.038	2.10 [1.04,4.24] 0.038	2.16 [1.25,3.71] 0.006
Year (ref. 1994-96)						
1996-98	0.63 [0.43,0.92] 0.016	1.04 [0.75,1.43] 0.819	1.08 [0.78,1.49] 0.659	0.74 [0.44,1.24] 0.255	0.74 [0.44,1.24] 0.255	1.06 [0.69,1.63] 0.786
1998-00	1.13 [0.78,1.64] 0.529	0.95 [0.67,1.36] 0.786	1.02 [0.73,1.43] 0.920	1.48 [0.87,2.51] 0.147	1.48 [0.87,2.51] 0.147	1.05 [0.65,1.69] 0.834
2000-02	0.84 [0.55,1.27] 0.408	0.79 [0.53,1.16] 0.225	0.76 [0.52,1.11] 0.153	1.07 [0.61,1.89] 0.803	1.07 [0.61,1.89] 0.803	0.79 [0.49,1.28] 0.346
2002-04	1.33 [0.82,2.15] 0.250	1.30 [0.83,2.02] 0.254	1.38 [0.91,2.11] 0.132	1.80 [0.95,3.45] 0.074	1.80 [0.95,3.45] 0.074	1.26 [0.71,2.26] 0.428
Parental Nurture	0.97 [0.94,1.01] 0.096	0.99 [0.96,1.02] 0.436	1.00 [0.97,1.03] 0.899	0.99 [0.95,1.03] 0.631	0.99 [0.96,1.03] 0.601	1.01 [0.98,1.05] 0.550
Parental Rejection	1.02 [0.99,1.05] 0.293	0.98 [0.95,1.00] 0.097	1.02 [0.99,1.04] 0.235	1.01 [0.97,1.04] 0.724	0.97 [0.95,1.01] 0.103	1.01 [0.98,1.04] 0.612
Friendship Quality	0.95 [0.91,0.99] 0.014	0.99 [0.95,1.03] 0.527	0.95 [0.91,0.98] 0.002	0.97 [0.92,1.02] 0.225	0.99 [0.95,1.04] 0.681	0.98 [0.94,1.02] 0.233
Family Functioning	0.89 [0.80,0.99] 0.029	1.01 [0.92,1.10] 0.890	1.07 [0.98,1.16] 0.126	0.96 [0.86,1.08] 0.507	1.04 [0.95,1.15] 0.385	1.13 [1.03,1.23] 0.008
Family Structure (ref. Intact)						
Reconstituted	2.66 [1.85,3.83] 0.000	2.50 [1.83,3.41] 0.000	2.40 [1.78,3.24] 0.000	2.49 [1.71,3.64] 0.000	2.31 [1.65,3.22] 0.000	2.05 [1.49,2.84] 0.000
Single Parent	4.21 [3.09,5.72] 0.000	3.29 [2.52,4.31] 0.000	3.31 [2.59,4.24] 0.000	2.74 [1.93,3.89] 0.000	2.43 [1.76,3.36] 0.000	2.69 [1.99,3.64] 0.000
Household income (ref. Average)						
High	0.56 [0.40,0.80] 0.001	0.53 [0.39,0.72] 0.000	0.88 [0.68,1.13] 0.320	0.73 [0.49,1.07] 0.107	0.65 [0.46,0.92] 0.016	1.02 [0.77,1.37] 0.867

Table 7-4	M1: Unadjusted			M2: Adjusted		
Covariates at t1	Moves to similarly fragmented (n=260) vs. non-mover RRR [95% CI] p	Moves to less fragmented (n=338) vs. non-mover RRR [95% CI] p	Moves to more fragmented (n=374) vs. non-mover RRR [95% CI] p	Moves to similarly fragmented (n=260) vs. non-mover RRR [95% CI] p	Moves to less fragmented (n=338) vs. non-mover RRR [95% CI] p	Moves to more fragmented (n=374) vs. non-mover RRR [95% CI] p
Low	2.05 [1.53,2.77] 0.000	1.56 [1.20,2.03] 0.001	1.58 [1.21,2.05] 0.001	1.45 [1.02,2.07] 0.040	1.23 [0.89,1.69] 0.217	1.21 [0.88,1.65] 0.241
Maternal Education (ref. < High School)						
High School	0.78 [0.57,1.07] 0.123	0.73 [0.56,0.95] 0.021	0.99 [0.76,1.29] 0.948	0.93 [0.65,1.32] 0.679	0.94 [0.70,1.28] 0.707	1.06 [0.79,1.43] 0.696
Diploma or Degree	0.43 [0.26,0.70] 0.001	0.56 [0.38,0.83] 0.004	0.81 [0.56,1.15] 0.238	0.58 [0.33,1.02] 0.058	0.85 [0.55,1.32] 0.476	0.82 [0.54,1.25] 0.358
Maternal Depression (ref. Not depressed)						
Depressed	1.91 [1.40,2.60] 0.000	1.72 [1.30,2.27] 0.000	1.82 [1.41,2.36] 0.000	1.19 [0.83,1.72] 0.338	1.35 [1.00,1.82] 0.048	1.40 [1.04,1.88] 0.025
Rurality (ref. Rural)						
Urban	1.64 [1.23,2.19] 0.001	0.97 [0.78,1.22] 0.822	3.24 [2.43,4.30] 0.000	1.49 [1.09,2.04] 0.013	0.92 [0.71,1.18] 0.494	2.97 [2.18,4.04] 0.000
Province (ref. Ontario)						
Maritimes*	1.09 [0.72,1.64] 0.691	1.33 [0.94,1.87] 0.108	0.88 [0.65,1.19] 0.403	1.13 [0.73,1.75] 0.595	1.12 [0.77,1.64] 0.542	1.00 [0.71,1.40] 0.996
Quebec	1.36 [0.90,2.04] 0.145	1.77 [1.27,2.47] 0.001	0.84 [0.62,1.15] 0.281	1.31 [0.83,2.06] 0.248	1.45 [1.00,2.11] 0.052	0.83 [0.60,1.16] 0.285
Manitoba	0.51 [0.24,1.08] 0.078	1.13 [0.67,1.89] 0.653	0.65 [0.40,1.07] 0.089	0.48 [0.22,1.08] 0.077	1.04 [0.60,1.80] 0.895	0.72 [0.42,1.23] 0.231
Saskatchewan	1.37 [0.80,2.36] 0.250	0.92 [0.55,1.55] 0.754	0.77 [0.49,1.20] 0.252	1.27 [0.73,2.19] 0.392	0.87 [0.51,1.51] 0.630	0.86 [0.55,1.35] 0.512
Alberta	1.14 [0.67,1.96] 0.628	1.22 [0.77,1.92] 0.392	1.15 [0.80,1.67] 0.453	1.10 [0.61,1.99] 0.743	1.07 [0.65,1.74] 0.795	1.16 [0.78,1.72] 0.477
British Columbia	2.25 [1.42,3.58] 0.001	1.86 [1.21,2.86] 0.005	1.21 [0.83,1.77] 0.315	2.16 [1.31,3.57] 0.003	1.76 [1.13,2.74] 0.013	1.05 [0.69,1.60] 0.828

7.4 Chapter discussion

This chapter aimed to investigate the association between socio-geographic mobility, and low self-esteem in adolescents and partially addressed the question:

Is there evidence for prospective associations between adolescent self-esteem and socio-geographic processes of neighbourhood context, composition, health selective migration and socio-geographic mobility in the UK and Canada?

Analysing the role of health selection and socio-geographic mobility as a prospective covariate of self-esteem health has not been undertaken in the UK or Canada. This analysis therefore contributes in an original way to the international literature.

7.4.1 Implications of socio-geographic mobility

The findings suggested that both deprivation and fragmentation mobility were prospectively associated with low self-esteem two years later. This was interesting because there was no significant difference between movers and non-movers when socio-geographic movers were aggregated together (Unadjusted OR = 1.21: 95%CI 0.97, 1.52, 0.093). This therefore implied that the nature of neighbourhoods at the origin and destination may amplify, or differentially impact upon some adolescents over and above the general risks and benefits associated with this life event. The deprivation mobility association was explained by adjustment for family circumstances and rurality of residence at t1, while fragmentation mobility associations remained independent of these covariates. Fragmentation mobility was not associated with change in self-esteem, implying that control for self-esteem at t1 accounted for the association. In terms of the implications of these findings, they highlight that adolescents may

be impacted by a socio-geographic move, but that these processes are likely to be mediated by family factors at baseline.

The identification of significant associations between fragmentation mobility and low self-esteem before adjustment for prior self-esteem suggests that prior self-esteem status may be an important explanatory element which determines whether moves constitute a risk. This raises several questions. If patterns of self-esteem prior to a move are particularly unstable, then this may indicate that an adolescent is less *resilient* to a socio-geographic move, as they self-esteem may fluctuate more with changes in circumstances (Harter, 1999). The strength of the association may also conceivably impact on an adolescent through their prior self-esteem status due to earlier life course experiences which were unmeasured in this analysis (Schoon et al., 2003). These may include the history of residential moves in terms of frequency, geometric distance and socio-geographic nature (Jelleyman, 2008; Rabe and Taylor, 2009; South and Crowder, 1998). These might be expected to indirectly operate adolescent prior self-esteem through changes in relationships with peers and parents (Silver, 2008; Clampet-Lundquist et al., 2006).

The findings reported in this chapter relate to the prospective risks associated with socio-geographic mobility at an *individual level* within a restricted time period of early adolescence alone. It is therefore inappropriate to *strongly* infer how these processes might impact on the population level relationship of self-esteem and neighbourhood deprivation in early adolescence and impossible to infer how these processes will impact on self-esteem after early adolescence. However, to put these findings in a broader context, they are situated with other observations from the preceding chapters below.

Findings reported in chapter five suggested that self-esteem was not associated with neighbourhood deprivation or social fragmentation at any of the age groups analysed (10/11,

12/13, 14/15). The descriptive data from chapter four suggest that, over the two analysed transitions (ages 10/11-12/13 and 12/13-14/15), about 10% of this sample undergo a socio-geographic change in their residential neighbourhood. Moves up and down the quintile ranks of neighbourhood deprivation and social fragmentation are split equally over the whole sample, and after adjustment for self-esteem and family status at t1, do not appear to be associated prospectively with self-esteem. This therefore shows that within this period, if these findings could be generalised more strongly to the wider population, the theorised risks and benefits of socio-geographic mobility to the individuals involved would not be observed. After accounting for composition, these processes would be expected to maintain the equalised relationship observed at the start of early adolescence such that it remained throughout the period. As stated at the start of this paragraph, this was of course the case.

The literature which has also examined these types of processes is limited and heterogeneous in method. Parallels between the findings about socio-geographic mobility and the effects observed in the Moving to Opportunity study might be drawn. In the MTO, clear sex-differentiated patterns of risk were associated with children from the families who moved. Girls improved in terms of mental health outcomes, while boys reported lower mental health following the move (Kling et al., 2007). No sex-specific effects were observed in this study. Thus, the two sets of results were not consistent either across the overall sample or for the sex difference or over the whole sample. Specifically, these findings showed that moving to a less deprived neighbourhood was not associated with reduced risk of reporting low self-esteem, or of with declines or improvements in self-esteem.

There are many reasons why the two analyses are not consistent but perhaps the most important is that the MTO sample and circumstances are simply not generalisable to the national population of adolescents in Canada, and the nature of socio-geographic mobility

modelled here. Firstly, the type of neighbourhoods that MTO respondents lived in, and the population that the MTO represents means that the results cannot be sensibly compared with the findings reported here. MTO families live in some of the highest risk neighbourhoods in the developed world in absolute terms. Commentators point out that the inner city neighbourhoods in Chicago, for example, simply have no parallel in terms of crime rates, poverty and racial segregation in Canada (Oreopoulos, 2009). Secondly, the MTO families were selected owing to their social vulnerability. Again referring to the Chicago element of the sample, Sampson (2008) calculates that:

'5% of the PHDCN [Project on Human Development in Chicago Neighborhoods, a representative sample of Chicago families with children under 18 drawn in the same year as the Chicago MTO sample] population is MTO equivalent. These MTO "equivalents" establish how far into the extreme tail of the poverty and race distributions the MTO study reaches: *5% of the population does not a general test of neighborhood effects make*.' Sampson, 2008, p. 196, text in brackets added but emphasis in original

The point of both authors is that the findings from MTO should be compared with other studies only very carefully. Given the composition of the NSLCY study, it is unlikely that any of the adolescents will experience the nature of poverty and objective crime rates as that experienced by all the MTO respondents by design. Thus, while several authors comment on the processes through which MTO moves may have been variously risky or beneficial for youth (Clampet-Lundquist et al., 2006; Jackson et al., 2009) it is unlikely that these processes can reasonably be invoked to explain the ways that socio-geographic mobility has operated in these findings.

Increasingly, other work is starting to examine how neighbourhood socio-geographic change may impact on adolescent health, with socio-geographic mobility forming one pathway

through which that change occurs and changes in the overall levels of neighbourhood deprivation forming the other (Norman et al., 2005). In an analysis of neighbourhood changes, Silver et al. (2008) report models which show that increases in neighbourhood problems from time 1 to time 2 were independently associated with adolescent problem behaviours. These results are therefore inconsistent with the findings reported here, and consistent with a theory that change in neighbourhoods does have implications on a prospective basis for adolescent health. However, it is important to note key differences between the finding reported by these authors, and those reported above. Firstly, neighbourhood change is measured differently, by prospectively measured changes in maternal perceptions from one time point to the next. This informant is also used for assessments of externalising behavioural problems. Therefore, there is the possibility of same source bias in their study, while self-esteem and neighbourhood problems are measured independently. Also it is important to note that there were cross sectional associations between neighbourhood problems and behaviour in the Silver et al. (2008) study which were not observed in this thesis. This would imply that associations between *change* in neighbourhood problems and the *outcome* would also be more significant. Finally, while they control for depression and health status at time 1, they not control for prior behavioural problems as is done here.

A UK based study investigating the complex dynamics between school and residential mobility and the association between these settings and educational achievement also finds that moving to more deprived neighbourhoods is associated with declines in educational performance (Leckie, 2009). Personal communication with the author suggested that declines in deprivation were general and so, as with this study, the full size of the decline was not specified exactly. Again, key differences between this study and the findings reported here are that strong and consistent relationships were observed between educational achievement and neighbourhood deprivation while in this thesis, they were not.

Otherwise, there is limited work to draw upon which is more comparable in terms of the life span involved. Work which examines socio-geographic mobility in Canada for adults (Curtis et al., 2009) has done this through a health selection lens and is discussed below in addition to other work from the United Kingdom.

7.4.2 Implications of health selective socio-geographic mobility findings

The findings from the analysis of selection effects provided limited support for self-esteem selection effects at the level of the adolescent. Adolescents with low self-esteem were more likely to move to *similarly* deprived neighbourhoods, after adjustment for a wide range of baseline covariates. This suggests that adolescent self-esteem can be associated with a *form* of socio-geographic mobility which may keep adolescents at a particular *level in the rankings of neighbourhood deprivation.* Work examining health selective migration has examined similar processes when comparing the health of migrants and non-migrants by considering those who, by virtue of residential mobility or neighbourhood change, remain in quintiles 1, 2-4, or 5 (Norman et al., 2005). This work suggests that, on a like for like basis, non-migrants and migrants are similar for all quintiles apart from the lower quintiles. Migrants who remained in quintile five were unhealthier than those who moved from, but within the same level. Norman et al. (2005) had considerable power to investigate these types of sub-group differences, while this study was limited in numbers to 1, 427 transitions in total, and only 260 transitions to and from neighbourhoods of similar levels of deprivation. The studies are also focussed on different populations and outcomes and over quite different time periods which renders direct comparison of results problematic. However, both suggest that patterns of deprivation mobility are heterogeneous and involve important patterns of entrapment within levels of deprivation, as well as movement between. In this way, the finding here also resonates with findings from studies which emphasise the importance of the ways that people in poor health become entrapped in deprived communities (Boyle et al., 2002; Cox et al., 2007a).

Residentially mobile adolescents with low self-esteem were *not* more likely to *move up or down the quintile ranks* of neighbourhood deprivation. Thus, it doesn't support the classic health selection hypotheses that would specify, an *active deprivation amplification process* where by adolescents with low self-esteem are more likely to move to *more* deprived neighbourhoods and thus actively contribute to the development of neighbourhood deprivation inequalities in self-esteem (Bentham, 1988) . It also doesn't support the opposite hypothesis that adolescents with low self-esteem might be differentially more likely to move to *less* deprived (more affluent) neighbourhoods and therefore to diminish the relationship between health and neighbourhood deprivation (Bentham, 1988). This is referred to in this context as an *active equalisation process*. Therefore, for deprivation mobility, the findings suggest that the overall effect is to neither actively *produce* inequality, or equality, but rather passively to *maintain* existing relationships between self-esteem and neighbourhood deprivation prior to the periods of socio-geographic transition which were analysed.

No fragmentation mobility processes were identified in these findings, suggesting that these processes are differentiated from deprivation mobility and that they would have little impact on the population level distribution of adolescent self-esteem across levels of social fragmentation.

These findings are interesting because independent effects of adolescents low self-esteem upon subsequent socio-geographic mobility have been demonstrated independently of a wide range of relevant social selection criteria (discussed below).This is important because it highlights that this health selective migration should be considered for members of the household, such as adolescents who might not be expected to exert any influence over the residential mobility or socio-geographic mobility process. This resonates with work from children's geographies which aims to highlight how children and adolescents are not simply

adults in the making, but active agents in the world whose views are influenced by people and places, but also actively constitute those social contexts (Matthews and Limb, 1999).

A second point of particular interest for the health selection debate is perhaps the adjusted relationship between maternal depression and socio-geographic mobility to more deprived neighbourhoods. This finding was consistent with analyses undertaken for adult psychological distress by Curtis et al. (2009). These authors conduct a similar analysis of Canadian adults, using nationally representative data on psychological distress (among other outcomes). Specifically, they examine how psychological distress predicts upward or downward socio-geographic mobility on an unadjusted, and then individual and family adjusted basis. In common with the analyses in this chapter, psychological distress was prospectively associated with the relative risk of moving to a more deprived quintile compared to those who didn't change (combination of non-movers and those movers who moved to similar neighbourhoods). These associations were attenuated to marginal non-significance by the addition of key individual and household level covariates (Curtis et al., 2009) possibly because these authors draw upon a wider and more relevant set of controls.

The findings presented here do highlight weak but independent effects of both adolescent and maternal health selection processes. No other studies have been found which investigated the possibility of these processes operating simultaneously, and it is interesting to reflect the degree to which health selection literature should consider how the health of all household members might guide the socio-geographic trajectory of that household. To some extent this is examined by Smith and Easterlow (2005) in qualitative work which explores the processes underlying these 'compositional geographies' in more depth.

Social selection processes are of course important in addition to health when considering the factors which push and pull families away from and towards particular neighbourhoods.

Factors which are widely cited with respect to literature discussing socio-geographic mobility relate primarily to family structure (Astone et al., 1994) and socio-economic status (South and Crowder, 1998). These factors are found to have strong prospective associations with socio-geographic moves in the analyses reported above.

7.4.3 Strengths and limitations

This analysis has very particular strengths. As is evident from chapter two and the discussion, few studies have the capability to examine how change in residential circumstances as a consequence of residential mobility is associated with change in health status. This analysis has utilised a longitudinal sample large enough to examine a total of 1427 residential moves. This has meant that there was sufficient sample to undertake a relatively unusual analysis of prospective associations between socio-geographic mobility and health in this age group. It also adjusted for a large range of covariates of self-esteem and socio-geographic mobility which allowed for conclusions to be drawn about the relative importance of social and health selection in this age group.

There were several ways that it could have been refined to understand the nature of socio-geographic moves and their relationships to health. For example, continuous data on the origin and destination neighbourhood could have been used to calculate the percentage change in deprivation. This might have been a more sensitive measure than the quintile change measure used and less sensitive to threshold (where some children experience large changes in deprivation while others shift up the rankings only slightly). The analysis did not control for floor and ceiling effects. However, one of the comparison groups was 'moving to similarly deprived neighbourhoods'. Therefore, the analysis retained and analysed the residential mobility experiences of those in the top and bottom quintiles and explicitly modelled these relative to non-movers.

Sensitivity analyses could have examined the whether associations were similar in very specific sub-groups defined by socio-economic status and family structure. However, these would have been unstable in the regression models where samples were already relatively low for each socio-geographic mobility outcome.

Further information about the nature of moves could have added interesting details to the analysis of socio-geographic mobility. For example, GIS analyses could have been used to establish how socio-geographic moves and health interacted with geometric distance as the distance of moves is known to exacerbate the impacts of moves on adolescent outcomes (DeWit et al., 1998). However, this additional analysis was out of scope for this project but would provide interesting avenues of further work with this dataset.

While change variables were constructed in order to analyse neighbourhood socio-geographic change, covariates were measured at baseline only. This means that the effects of residential mobility might capture not just the effects of residential mobility per se, but also the transitions in individual and household level variables which might be expected to occur in the residentially mobile. For example, a household may be residentially mobile after a marriage breaks down and a parent moves to a new household with their teenage child. This process will be associated not just in terms of change in neighbourhood, but also changes in household income, family structure, perhaps maternal depression. It may also lead to stresses on the adolescent-parent relationships and thus a change in these variables, and remove the adolescent from supportive (or possibly negative) friendship networks. Analysing how these associated transitions are distributed amongst the residentially mobile population of adolescents was beyond the scope of this thesis but again would constitute interesting further research.

CHAPTER 8 – DISCUSSION AND CONCLUSIONS

8.1 Introduction

This thesis aimed to explore relationships between neighbourhood deprivation and self-esteem for contemporary UK and Canadian adolescents. Chapter two framed this discussion in terms of two theories, deprivation *amplification* and socio-economic *equalisation*. The chapter highlighted that there seemed to be support for deprivation amplification in the United States, while similar studies in the UK supported the equalisation hypothesis.

The empirical review in chapter two identified that U.S based studies were socio-economically diverse, nationally representative and consistently supported deprivation amplification. Outside the U.S, the literature was limited to regionally-based studies and tended to support equalisation. This suggested that equalisation might be observed because the full range of socio-economic variation between families and neighbourhoods may not have been measured outside the U.S. Over the whole sample, this may have limited the power of these analyses to observe associations between neighbourhood deprivation and psychological outcomes. In addition, West and Sweeting (2004) recommend that research should examine whether the equalisation hypothesis could be generalised beyond the UK. Given the apparent differences in findings between the UK and U.S, Canada was an appropriate candidate for comparison given its socio-geographic links to both the UK and U.S. Overall, the general exploration of the relationship between neighbourhood deprivation and self-esteem was framed by the first research question:

Is there support for socio-economic equalisation in early adolescence in the UK and Canada across household socio-economic status and neighbourhood deprivation?

The lack of socio-economic and social variation in previous samples may also have hindered the ability of investigators to examine whether equalisation was consistent for salient sub-populations of adolescents. This study, given the large samples sizes available to investigate sub-group interactions, was well placed to examine this possibility, framed by the following research question:

Is support for equalisation *consistent* across the socio-geographic levels of family, neighbourhood, region and nation?

Using a longitudinal design, the study could also examine how socio-geographic processes might operate to produce the pattern of inequalities observed in the sample. This was framed in the following research question:

How do socio-geographic *mechanisms* produce socio-economic equalisation in youth at the neighbourhood level?

The findings contribute to the debate about health inequalities in adolescent mental health. The implications of these findings for both the deprivation amplification and the equalisation hypotheses, and to health geography as a discipline, are discussed below. Finally, the limitations of the study are considered before the implications of the findings for future research and policy are drawn out.

8.2 Contributions to debates about inequalities in adolescent mental health and self-esteem

8.2.1 Support for the deprivation amplification hypothesis

Deprivation amplification is an influential hypothesis for considering how socio-geographic context impacts upon health. The hypothesis suggests that self-esteem in early adolescence would be inversely associated with neighbourhood deprivation (section 2.4.2). There is little support for this hypothesis in the UK and Canada based on the findings of this thesis. There was no evidence of an inverse gradient between self-esteem and neighbourhood deprivation in either Canada or the UK across the whole sample, sub-groups, or across varying levels of social fragmentation or rurality.

In contrast to the findings from this thesis, U.S. studies with closely comparable age ranges, self-reported outcomes, samples and socio-historical era *do* support deprivation amplification (Wickrama and Bryant, 2003; Wickrama et al., 2005b; Turley, 2002b). Thus, we can speculate that deprivation amplification as a process may not affect adolescent self-reported self-esteem outside of the U.S.. Interpreted more broadly, this might be extended to depression outcomes, especially in the light of recent evidence from the UK (Collishaw et al., 2009) (discussed in more detail below) and two independent systematic reviews of neighbourhood studies of depression (Mair et al., 2008; Kim, 2008). This contributes to arguments that deprivation amplification is only consistently observed in the U.S. context (Cummins and Macintyre, 2006; Macintyre, 2007; Macintyre et al., 2008; Lynch et al., 2001; Ross et al., 2005; Ross et al., 2000b; Oreopoulos, 2008).

In terms of explanation, the UK and Canada both have lower levels of income inequality than in the United States (Ross et al., 2000b; Lynch et al., 2001; Ross et al., 2005). This, coupled with

the more extensive provision of social safety nets such as health services and social security that are not available in the United States may be expressed at the neighbourhood level in the form of higher rates of perceived and reported neighbourhood crime, racial segregation and concentrated poverty in the U.S. (Ross et al., 2000a; Oreopoulos, 2008). Other work highlights the particularly consistent and high correlations between neighbourhood deprivation and lower quality food and physical activity environments in the U.S compared to other developed world countries (Cummins and Macintyre, 2006; Macintyre et al., 2008). Taken together, this leads to speculation that socio-historical context and contemporary income inequalities in the U.S. may have led to a specific national situation where neighbourhood deprivation is more consistently associated with greater health damaging and fewer health promoting resources than in other countries where national and local policies are more focussed on income and resource redistribution (Mair et al., 2008, Kim, 2008).

Deprivation amplification may be hypothesised to influence mental health through the social environment (section 2.4.2). The social environment is multi-faceted and it is possible that it may not be measured precisely through the use of composite neighbourhood deprivation scores. This may mean that any observed equalisation across neighbourhood deprivation may simply be due to imprecise measurement of the deprivation variable rather than the absence of any real 'effect'. The thesis considered this possibility by testing all models for the effects of neighbourhood deprivation with a parallel set of models for social fragmentation. The findings from chapters five and six suggested that deprivation amplification was not supported even when the social fragmentation scores, indices designed specifically to measure aspects of the social environment were used. This is consistent with the available literature which has also tested social fragmentation in adolescents in this way (Fagg et al., 2006). These results are not consistent with adult literature which has examined the influence of social fragmentation on psychological distress and depression (Matheson et al., 2006; Ivory, 2009; Fagg et al., 2008).

This suggests that social fragmentation may only be salient in adulthood or that the measurement of the construct could be refined to consider which social resources are specifically important to adolescents.

There are overlaps between deprivation amplification and equalisation theory in that a lack of an inverse relationship simultaneously indicates support for equalisation and a lack of support for deprivation amplification. However, there are specific features of equalisation which are examined in depth. The discussion now focuses on support for the equalisation hypothesis, having established that the findings do not support a deprivation amplification model of inequalities in adolescent self-esteem.

8.2.2 Support for socio-economic equalisation hypothesis

To restate the central findings, this thesis suggests that adolescents are not more likely to report low self-esteem, or any particular transition in self-esteem, by levels of neighbourhood deprivation when these patterns are examined across the whole sample. This finding was found for both the NLSCY and the BYP for unadjusted models in a way which was consistent with findings from the UK (West and Sweeting, 2004; Collishaw et al., 2009). The findings were not changed after adjustment for individual and family factors, and therefore are also consistent with earlier conclusions by Fagg et al. (2006) and Drukker et al., (2003, 2006).

The demonstration of equalisation over two nationally representative studies of adolescents was an important addition to the empirical support for the hypothesis because, as discussed above, previous work outside the U.S. (Fagg et al., 2006; Drukker et al., 2006; Drukker et al., 2003; Schneiders et al., 2003) only examined how neighbourhood settings are associated with adolescent mental health in socio-economically restricted regions. Therefore, the findings contribute significantly to this empirical gap, as the BYP and NLSCY include respondents from

across the socio-economic spectrum and thus have substantial power to observe any statistical association.

Collishaw et al. (2009) present a recent analysis of a survey which measures adolescent psychological distress as it is reported by three types of informant: parents, teachers and adolescents themselves. All three informants rate psychological distress of the adolescent on a standard list of symptoms from the Strengths and Difficulties Questionnaire. The authors report that a statistically significant inverse gradient with neighbourhood deprivation was observed for parent and teacher-reported psychological distress, but not for adolescent-reported mental health. This is extremely important for the findings from this thesis, as although the findings are consistent with equalisation theory for *self-reported* psychological outcomes (and therefore consistent with the findings in this thesis), they support the deprivation amplification hypothesis when psychological distress is reported by parents and teachers. Collishaw et al. (2009) suggest that either parents or teachers overestimate adolescent distress, perhaps expecting more deprived adolescents to be more distressed. Alternatively, they suggest that adolescents living in deprived neighbourhoods and families may underestimate their mental health problems. These findings are important, as they suggest that the support for equalisation or deprivation is conditional on the source of the report of psychological distress in this age group.

The longitudinal design used in this thesis allowed it to make a contribution to several areas of the equalisation debate. In particular, the study was able to examine trends in the strength of the relationship between neighbourhood deprivation, and household socio-economic status over the course of early adolescence. West and Sweeting (2004) hypothesised *a priori* that equalisation will become more apparent over early adolescence (West and Sweeting, 2004) but this was not apparent in the findings which reported no trend in relationships between

neighbourhood deprivation or markers of family socio-economic status with increasing age. This supports the empirical work in the West and Sweeting (2004) paper which described that, even at age 11, there was relative equality in relationships between socio-economic status and malaise symptoms (West and Sweeting, 2004).

This thesis contributed to the equalisation debate by testing whether the relationships between peer and family *social* contexts also showed trends associated with age. In the NLSCY, parental nurturance weakened with age while no interactions were observed for relationships with friends in the BYP. This suggests that the influences of parents may decline slightly with age, but that they remain as important as peer influences. This is consistent with the hypothesis that associations between peer relationships and self-esteem would strengthen relative to parental influences, as children enter adolescence and progress through to later periods in youth (West and Sweeting, 2004). This is not consistent with other work conducted by Greene et al., (2005) which finds that over the same period, the family is the more important than the peer and family context. It is important to note that unlike the BYP and NLSCY samples used here, Greene et al., (2005) were interested in the self-esteem trajectories of adolescents from ethnic minority groups, and that the associations between self-esteem and family environment may vary quite dramatically by ethnicity.

Boys in affluent areas reported significantly higher odds of low self-esteem, consistent with a *reverse* gradient. This provides further support for *equalisation* in youth as the hypothesis is currently specified. West and Sweeting (2004) specifically argue that any associations in *mental health* that do emerge would be expected to be *reverse* gradients, such that self-esteem would decrease as neighbourhood deprivation increases. Sex differences would also be expected, and girls would be more likely to report *reverse* gradients than boys (West and Sweeting, 2004). Thus, the findings from chapter five broadly support the hypothesis for

neighbourhood deprivation, but not the *specifics* of how that might operate for boys and girls. It is of note that earlier work with the NLSCY sample at the ages of 4-11 also found a reverse gradient in parent reported mental health problems in children, by neighbourhood disadvantage (Boyle and Lipman, 2002). Taken together, these two studies suggest that neighbourhood deprivation may be equalised over childhood *and* adolescence in young Canadians in ways which do not support the life course aspect of equalisation proposed by West (1997). However, it is important to note that this study has not tested this aspect directly through analysis of data for younger age groups and that such an analysis would be an interesting avenue for future work.

The thesis finds that while low household income is associated on a bivariate basis with low self-esteem in both surveys, this is attenuated to non-significance by the inclusion of social relationship factors (such as perceptions of parenting and reconstituted family status) in the NLSCY. This is the same for other indicators which strongly overlap with socio-economic status such as lone parent family status. However, in the UK there was stronger evidence of socio-economic inequalities at the household level even after adjustment, with weak associations between maternal educational status and household income even after adjustment for socially-oriented factors. Overall, findings from both surveys are consistent with the *family process model* of economic hardship which was formulated specifically with reference to early adolescents (Conger et al., 1992; Conger et al., 1993) and which is also demonstrated in studies of adolescents from the National Child Development Study (Sacker et al., 2002).

8.2.3 Consistency of support for equalisation in youth

A second research question was posed by chapter two and drew on conceptual models of neighbourhood effects which emphasise the importance of cross-level interactions (Cummins et al., 2007). Of particular interest was the adolescent health and neighbourhood effects

framework proposed by Jencks and Mayer (1990) and extensions to that framework proposed by Leventhal and Brooks-Gunn (2000).

Neighbourhood deprivation is theorised to interact with family socio-economic status in its influence upon adolescent health (Jencks and Mayer, 1990). These interactions were tested extensively in the thesis and the results suggested that equalisation was consistent across all levels of household socio-economic status, i.e. there were no significant interactions between neighbourhood deprivation and family socio-economic status variables. These results are inconsistent with Drukker et al. (2006) who found evidence of non-significant trends in the interaction between maternal education and neighbourhood deprivation. The results reported by Drukker et al., also indicate that neighbourhood deprivation was associated with an increase in self-esteem for adolescents whose mothers were well educated, and a decrease for those who were less well educated. The finding is also inconsistent by work from the United States that there are apparent significant *reductions* in risk of depression associated with relative deprivation (Wickrama and Bryant, 2003; Turley, 2002a). However, all the findings run counter to the relative deprivation and competition hypotheses specified by Jencks and Mayer (1990). These both predict that adolescents would report worse outcomes when comparing themselves to, or competing with more affluent peers. Thus, the combination of the findings emphasises that socio-economic status and neighbourhood deprivation appear to operate quite differently in adolescence than adulthood even when (as in Wickrama and Bryant, 2003; Turley, 2002a), deprivation amplification is supported over the whole sample.

Relationships between adolescent self-esteem and the family social environment are also theorised to interact with neighbourhood deprivation (Leventhal and Brooks-Gunn, 2000). However, no robust interactions were observed in these analyses to support such a framework. This is in line with other work which investigates these interactions (Wickrama

and Bryant, 2003) and which found that adolescent-reported relationships with parents did not interact with neighbourhood deprivation. However, in the same study parental reported relationships with depressive symptoms weakened with increasing levels of neighbourhood deprivation. This firstly suggests that social factors at the household level may vary, and be observed qualitatively between different neighbourhoods (Furstenberg, 1993). It also aligns with the work by Collishaw (2009), Currie (2000) and Curtis (2004) which suggests that the source of measurement of mental health, household socio-economic status, and neighbourhood environment is likely to be critical in determining whether relationships emerge.

Equalisation was not observed to vary with levels of social fragmentation and rurality in either Canada or the UK. This is in contrast to the findings of Caughy (2003) and Drukker et al. (2005) and shows that even when social fragmentation was high, self-esteem remained equalised by levels of neighbourhood deprivation. These differences in responses may again be attributable to life stage because the samples in the Caughy (2003) and Drukker et al. (2005) studies related to young children and adults respectively. Even though these interactions were not significant, this contributes to the health geography debate which emphasises that associations between neighbourhoods and health should be examined in the context of their wider socio-spatial context (Cummins et al., 2007; Boyle et al., 2004).

Thus, the interactions analysis addressed the second research question. The relationship between neighbourhood deprivation and self-esteem do not appear to interact strongly with either the family or socio-spatial contexts and this suggests that the finding of equalisation is *consistent* for all adolescents in the samples analysed here, and that this inference can be drawn about the contemporary general household populations of adolescents in the UK and Canada.

8.2.4 Explanation of equalisation

To return to the third research question, the thesis, having established a consistent pattern of equalisation, aims to explain it with reference to four socio-geographic mechanisms: neighbourhood context, neighbourhood composition, socio-geographic mobility and health selective migration.

Neighbourhood context is *not* prospectively associated with change or maintenance of self-esteem for either the findings relating to the BYP or the NLSCY (chapter six). These prospective findings suggest that neighbourhood deprivation does not *differentiate* individuals by their propensity to subsequently decline, improve, maintain high, or to maintain low self-esteem.

These findings are consistent with prospective work in the UK (Ford et al., 2007) which has examined these relationships using the parent-reported child and adolescent mental health outcomes. The conflation of 5-15 year olds in that study precluded anything but broad comparisons with the findings presented here. The findings are not consistent with work from the Netherlands which has examined change in self-esteem as this highlighted relationships between maternal education, neighbourhood deprivation and the outcome (Drukker, 2006), and other work examining change in mental health (Schneiders, 2003). Finally, they are not consistent, as expected, with work examining change in depressive symptoms in the United States (Wickrama, 2005a; Wickrama, 2005b).

Overall, therefore, the findings reported here suggest that neighbourhood deprivation does not *cause* individual level variation in self-esteem. Therefore, neighbourhood context is unlikely to be a mechanism which actively equalises, *or* actively amplifies processes acting at other levels on self-esteem.

In terms of neighbourhood composition, the household and peer *social environment* and *gender* were found to be of principal interest in explanations of self-esteem. However, those variables were *not* systematically distributed by neighbourhood deprivation. In contrast, household socio-economic status *was* distributed by neighbourhood deprivation, but was not associated with self-esteem. No variables were associated with both neighbourhood deprivation and low self-esteem: the prerequisite for a compositional effect. This of course corresponds that self-esteem is equally distributed across levels of neighbourhood deprivation. This is in contrast to many studies in which demonstrate that individual and family levels attenuate observed contextual effects in a way which is indicative of compositional effects (Pickett and Pearl, 2001; Sloggett and Joshi, 1994; Curtis and Rees Jones, 1998).

Two further mechanisms were theorised which might be expected to *exacerbate* but not entirely produce socio-geographic health inequalities: socio-geographic mobility and health selection. These processes were examined in chapter seven of the thesis and the findings showed that neither process would be likely to produce inequalities in health. These types of processes have not been investigated widely in the literature and therefore contribute to debates in health geography and the wider literature.

The findings discussed in chapter seven suggested that low self-esteem was associated with moving to a more deprived neighbourhood. After adjustment for family characteristics at baseline, this effect was attenuated, but *not to non-significance*. These findings are thus consistent with work which suggests that after adjustment for age and sex, rates of health *were* systematically different for movers and non-movers to different levels of neighbourhood deprivation (Norman et al., 2005). The findings suggest that adolescent well being may play a small independent role in parents' decisions to move to similarly deprived neighbourhoods, perhaps to change schools if an adolescent is unhappy, supported in literature which

investigates why individuals move across levels of deprivation (Rabe and Taylor, 2009). The idea that health may 'entrap' individuals at one level of deprivation is also noted in the literature (Cox et al., 2007a), although in that case it refers to those individuals who remain in the neighbourhood of origin while here it refers to movers to similarly deprived neighbourhoods.

Health selection is demonstrated in this study at two levels, for the adolescent and for their mother. This analysis focuses on two individuals and finds independent effects for both independently of other family factors. This is an interesting contribution to the literature on health selection because it demonstrates that health selection is a process which, like other types of selection processes, would be expected to operate for all individuals in a household. Interestingly, the maternal depression findings are not consistent with contemporary work which investigates Canadian adults between 1998 and 2001, and which finds that after adjustment, health selection due to psychological distress in adults is attenuated to non-significance (Curtis, 2009). The difference is likely to be because that analysis was focussed on adults and therefore controls for selection were also more comprehensive for an adult-centred analysis (including marital status for example) and therefore more likely to attenuate the effect.

Of course other family factors lead families to be socio-geographically mobile. These relate to family structure, socio-economic status, First Nations and other visible ethnicity, and urban/rural status and were generally consistent with the residential mobility literature (Jelleyman, 2008; Astone and McLanahan, 1994; South and Crowder, 1998). The strong associations observed with these factors highlight that social selection effects should be investigated as a central part of work on adolescent mental health, particularly the effects of

changes in families undergoing residential and socio-geographic mobility (Silver and Sussman, 2008).

Few studies are available which have investigated the health impacts of socio-geographic moves on adolescent health. The findings here are inconsistent with findings from the Moving To Opportunity Study which suggested that improvements in neighbourhood conditions from socio-geographic moves led to significant improvements in mental health for girls, and declines for boys (Kling et al., 2007). The inconsistency between the results is not surprising. The MTO intervention sample is high risk in terms of family and neighbourhood characteristics, and the change in the socio-geographic conditions resulting from the residential move was large. The transitions occurring in a natural setting would be much less dramatic, more heterogeneous over all the groups. Further analysis might productively explore whether MTO patterns could be reproduced more accurately in observational surveys in order to facilitate a naturalistic comparison.

In recent work with a nationally representative sample, Silver et al. (2008) present findings which suggest that increases in the number of neighbourhood problems perceived by mothers of adolescents are associated with decline in the mental health of adolescents (also reported by mothers). These findings are inconsistent with the findings from the thesis, but this inconsistency may be explained by the source of the report, and also the same-source bias, whereby mothers report on their neighbourhood, and on their children's health.

Recent work in the UK which examines the impacts of socio-geographic mobility on educational outcomes also finds that adolescents who move to more deprived neighbourhoods perform less well on educational outcomes (Leckie, 2009). This is inconsistent with the findings here, but as with the other studies it must be noted that the outcomes are quite different and the study also found strong neighbourhood deprivation associations with

educational achievement which were not found with respect to self-esteem. All three studies which were found which have investigated these types of relationships have been methodologically very different from each other and from this study. As has been shown throughout this discussion, this heterogeneity makes it difficult to draw consistent conclusions about this emergent literature.

Overall, the evidence in chapter five showed that there are no patterns of self-esteem across levels of neighbourhood deprivation at the ages of 10/11. These patterns do not change with age, indicating that equalisation is consistent across the period for both individuals and populations. This picture is supported by the analysis of socio-geographic mechanisms. This analysis investigated how neighbourhood context and neighbourhood composition, socio-geographic mobility, and socio-geographic health selection might be prospectively associated with self-esteem. The discussion above highlights that neighbourhood context; composition and socio-geographic mobility were not independently associated with self-esteem after adjustment for social selection processes at the family level. Health selective migration *was* weakly associated but only to apparently entrap residentially mobile adolescents such that they moved from levels of deprivation that were the same at origin and destination. All manifestations of these processes are therefore consistent with the pattern of equalisation being already established before early adolescence, and passively or actively maintained by socio-geographic processes in the course of early adolescence.

These findings make an important contribution to the mental health inequalities debate. They highlight that equalities may exist for some outcomes and that socio-geographic processes may just as well contribute to the development of those equalities as to inequalities. More broadly, it highlights the value of longitudinal research for considering questions of causality, although there are several other aspects of causality which are not addressed here.

8.3 Wider contributions of the thesis

This section considers how a health geography perspective has proved to be valuable and to identify how the thesis has made a contribution to the subdiscipline more widely. The relational geography model of place and health was important, providing a guiding framework to integrate diverse theories and methods from health geography, psychology, sociology, and social epidemiology. The thesis contributed to the overall understanding of health and place through the theoretical development and empirical findings relating to adolescent self-esteem. In addition, the global and local linkages prompted by the relational perspective (Massey, 1994; Katz, 1998) are emphasised here. The possibility that the U.S. (for example) is a possible 'special case' in neighbourhood research is critical for a field where the majority of neighbourhood effects studies are conducted on samples from this country (Pickett and Pearl, 2001; Riva et al., 2007; Sellstrom and Bremberg, 2006; Mair et al., 2008).

8.4 Limitations

Equalisation might reflect imprecise measurement of neighbourhood or mental health factors (Torsheim et al., 2004; Weich, 2005) or possibly systematic response bias between members of particular neighbourhoods (Collishaw et al., 2009). While this may of course be true, the study uses techniques which are acknowledged to be methodologically imperfect, but which are also widely used in other studies which *have* found *in*equality in health. In addition, every effort was made in the course of the thesis to establish internal and external validity of the measures.

The complex causal pathways conceptualised here might have been more precisely estimated using structural equation modelling (Stafford, et al., 2008c). This type of technique was not chosen as the development of the analytic strategy suggested that there would be complex

multilevel and longitudinal variation in the data which, at the time, could not be modelled at the same time as building a structural equation model (SEM) in Stata version 9. This was addressed for Stata by a user-written program (Rabe-Hesketh et al., 2004) and is now integrated such that Multilevel Structural Equation Modelling is now accessible for mainstream applied researchers of neighbourhood effects (Stafford et al., 2008c).

8.5 Further work

The NLSCY could now be used to undertake a life course test of equalisation in this survey which would productively link the findings from this study to those studies conducted when these adolescents were young children (Boyle and Lipman, 2002; Georgiades et al., 2007; Curtis et al., 2004; Boyle and Lipman., 2002). Life course work could also productively explore how the BYP adolescents make the transition to young adulthood in the BHPS.

Work should examine *how* individuals derive both their ideas of self-esteem, mental health, family and neighbourhood and the ways that this relates to that provides by informants such as parents and teachers, independent reports of investigators and independently measured area conditions. This would involve cross-disciplinary and mixed methods designs, and might significantly contribute to understanding the substantial heterogeneity in findings between different types of studies.

The findings reported here highlight the strong relationships between family structure and socio-geographic mobility. The systematic selection by family structure into different types of socio-geographic setting has considerable wider importance. In addition to this long term process, an adolescent in non-intact settings may well be living in a situation where they spend allocated days of the week in multiple households. This has clear implications for the ways that their relationship with socio-geographic context may be dynamic over several time scales.

Moreover, examination of these multiple and dynamic contextual transactions is likely to become increasingly important as the proportions of non-intact families continues to grow.

8.6 Policy recommendations

Policy makers should be aware that the effects of neighbourhood-based policies and programmes may not be equally important for all health outcomes. In particular, the findings here suggest that differences by neighbourhood deprivation in self esteem are not sufficient to warrant policies aimed at reducing adolescent exposure to neighbourhood deprivation. However, neighbourhood deprivation is not the only aspect of place context which may be important, and interventions in the more adolescent-focussed areas of the school, peer network, and neighbourhood youth culture environments warrant further investigation in this age group.

In this thesis, for a general population, socio-geographic mobility to more affluent or socially cohesive neighbourhoods was not associated with benefits for the sample. This finding suggests that policy makers should consider residential relocation programs cautiously as potential policy interventions in health. This is emphasised by recent critiques of U.S. residential mobility programs such as Moving to Opportunity which highlight that, while beneficial for some groups, namely women, these interventions can be detrimental to boys (Jackson et al., 2009) and effects may be highly specific to the United States neighbourhood context (Oreopoulos, 2008). Policies might be more cost-effective, and beneficial for population health if targeted at improvements to neighbourhoods as this involves the geographic redistribution of resources not people (Jackson et al., 2009).

Overall, policy makers should treat with considerable caution the assumption that neighbourhood deprivation relates universally, across all national settings with health of local

residents in a detrimental way. This thesis shows that the evidence base may be highly variable between different nation-states and that findings from one setting should not be generalised to another uncritically (Oreopoulos, 2008).

8.7 Conclusion

This thesis has contributed to debates about inequalities in adolescent mental health, to health geography and to adolescent self-esteem and socio-geographic public policy. The findings indicate that the relationship between adolescent self-esteem and neighbourhood deprivation and social fragmentation support of a theory of socio-economic equalisation. The thesis finds strongest support for arguments for the importance of the social environment of the household with consistent associations found for parenting and reconstituted family status. The socio-economic status of the family is found not to be consistently related to self-esteem in prospective analyses for this age-range independently of these social processes. On balance, the extant evidence suggests that gender and household level social environment should remain the central focus of policy initiatives to improve adolescent self-esteem and wellbeing.

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APPENDICES

Appendix 1

Studies of symptoms in early childhood reported by parents suggest that there is a neighbourhood deprivation gradient in mental health in this period, supporting the first assumption of both the equalisation and the deprivation amplification theories.

Xue et al. (2005) examine these patterns in a U.S. sample aged 5-11 and find strong gradients in prevalence of internalising disorders (depression, anxiety) between low, medium and highly disadvantaged neighbourhoods after adjustment for composition. Household socio-economic status was also independently associated with the outcome adding further support for the equalisation theory.

Kalff et al. (2001) report on a similar analysis, finding independent inverse gradients for both neighbourhood deprivation and family socio-economic status and problem behaviours measured by the parent reported child behaviour checklist (CBCL). This was found for problem behaviours among children aged 5-7 and therefore provides strong support for the theory as a whole. However, it is important to remember when considered in terms of self-esteem, externalising, or problem behaviours do not correlate as strongly with self-esteem as internalising disorders such as depression.

Caughy et al. (2003) add an interesting dimension to the discussion. They report that levels of internalising symptoms in very young children do not vary by degrees of neighbourhood impoverishment. However, when this is considered as an interaction with the degree that the children's parents know other people in the neighbourhood (a measure of social integration and the inverse, conceptually of social fragmentation), a clear social gradient in the

relationship between neighbourhood deprivation and internalising disorders emerge. This interaction is not evident for externalising symptoms, further emphasising that the finding from Kalff et al. (2001) should be extrapolated only cautiously to internalising disorders.

Work from Canada in early childhood (aged 4-11) suggests that there is an *reverse* gradient between neighbourhood disadvantage and child internalising and externalising mental health outcomes (Boyle and Lipman, 2002). However, in this case, there was also a strong association between family income, so although the neighbourhood disadvantage finding could be taken as evidence that there is equalisation in youth, there are clear socio-economic inequalities at the family level. A second analysis of the same dataset also found an inverse gradient with family socio-economic status, but utilising an indicator of neighbourhood disadvantage which included elements of neighbourhood deprivation and social fragmentation, they also found a distinct neighbourhood gradient in both parent and teacher reported internalising and externalising mental health (Georgiades et al., 2007).

No work from the UK was available for this age group aside from a study which spanned both early childhood and early adolescence (Ford et al., 2004). This suggested that neighbourhood deprivation was associated with depression and anxiety prior to adjustment, although it is not clear whether that was because neighbourhood deprivation was associated with child or adolescent mental health problems. However, this association was adjusted to non-significance by a range of individual and family characteristics. Unfortunately as results were not stratified by 5-10 and 11-15 year olds, these findings could not directly inform this thesis as they could arise from the averaging of inverse gradients in childhood combined with equalised or reverse gradients in adolescence. In a later study of the same dataset the authors also report longitudinal analyses and report no bivariate prospective association between

neighbourhood deprivation and change mental health at follow up three years later (Ford et al., 2007).

It is hard to draw firm conclusions from the available evidence describing the relationship between neighbourhood deprivation and internalising mental health in early childhood. The majority of the evidence shows that there are clear socio-economic gradients at the family and neighbourhood levels. However, as the study by Caughy et al. (2003) shows, these are not necessarily consistent across all children in a given population. As the study by Boyle and Lipman (2002) suggests, the presence of strong family effects might completely account for associations between neighbourhood deprivation and self-esteem or mental health.

Appendix 2: Chapter 6 models and sensitivity analysis

Neighbourhood social fragmentation and change in self-esteem

The table below is given to illustrate that associations between all covariates in the model other than social fragmentation were similar to those presented in Table 6-6.

Appendix Table 1: Fully Adjusted multinomial regression models of self-esteem change and social fragmentation in 10-15 year olds in cycles 1-6 of the NLSCY.

Appendix Table 1	**Reference: Maintain High (4,876 transitions)**								
	Improve (497 transitions) vs. Maintain High			**Decline (821 transitions) vs. Maintain High**			**Maintain Low (427 transitions) vs. Maintain High**		
Covariates	**RRR**	**[95% CI]**	**P**	**RRR**	**[95% CI]**	**P**	**RRR**	**[95% CI]**	**P**
Age Transition (ref. 10/11-12.13)									
12/13-14/15	1.86	[1.42,2.45]	0.000	0.82	[0.68,0.99]	0.034	1.95	[1.50,2.53]	0.000
Sex (ref. boys)	1.82	[1.45,2.28]	0.000	2.04	[1.73,2.41]	0.000	3.54	[2.67,4.69]	0.000
Ethnicity (ref. Canadian)									
European	1.00	[0.75,1.33]	0.990	0.83	[0.68,1.01]	0.067	0.88	[0.63,1.23]	0.458
First Nations	1.03	[0.66,1.62]	0.883	1.07	[0.77,1.48]	0.687	0.96	[0.56,1.65]	0.894
Other Visible Minority	1.52	[0.90,2.56]	0.115	0.98	[0.64,1.50]	0.934	0.78	[0.38,1.58]	0.489
Transition Year (ref. 1994-96)									
1996-98	0.98	[0.64,1.52]	0.936	1.64	[1.22,2.21]	0.001	1.71	[1.14,2.56]	0.009
1998-00	2.11	[1.39,3.19]	0.000	1.26	[0.91,1.75]	0.158	1.60	[0.98,2.60]	0.062
2000-02	1.33	[0.84,2.09]	0.222	1.61	[1.16,2.23]	0.004	1.47	[0.87,2.50]	0.150
2002-04	1.61	[0.92,2.80]	0.093	1.86	[1.22,2.83]	0.004	1.38	[0.73,2.60]	0.317
Parental Nurture	0.82	[0.80,0.84]	0.000	0.94	[0.91,0.96]	0.000	0.81	[0.78,0.83]	0.000
Parental Rejection	1.10	[1.07,1.13]	0.000	1.04	[1.02,1.07]	0.000	1.14	[1.11,1.18]	0.000
Friendship Quality	0.75	[0.73,0.78]	0.000	0.90	[0.87,0.93]	0.000	0.71	[0.68,0.74]	0.000
Family Functioning	0.99	[0.91,1.08]	0.883	0.90	[0.85,0.96]	0.001	1.00	[0.90,1.11]	0.983
Family Structure (ref. Intact)									
Reconstituted	1.36	[0.98,1.89]	0.068	1.31	[1.01,1.69]	0.041	1.69	[1.17,2.46]	0.006
Single Parent	1.23	[0.89,1.70]	0.205	1.10	[0.86,1.41]	0.461	1.10	[0.75,1.60]	0.625
Relative Deprivation (ref. Average)									
High	1.04	[0.80,1.37]	0.762	0.92	[0.75,1.14]	0.461	0.71	[0.50,0.99]	0.046
Low	1.08	[0.79,1.48]	0.635	1.10	[0.87,1.39]	0.414	1.10	[0.78,1.55]	0.600
Maternal Education (ref. < High School)									

Appendix Table 1	**Reference: Maintain High (4,876 transitions)**								
	Improve (497 transitions) vs. Maintain High			**Decline (821 transitions) vs. Maintain High**			**Maintain Low (427 transitions) vs. Maintain High**		
Covariates	**RRR**	**[95% CI]**	**P**	**RRR**	**[95% CI]**	**P**	**RRR**	**[95% CI]**	**P**
High School	0.98	[0.74,1.30]	0.877	0.91	[0.73,1.12]	0.350	1.11	[0.79,1.55]	0.551
Diploma or Degree	0.71	[0.48,1.05]	0.082	0.69	[0.51,0.92]	0.013	0.87	[0.52,1.45]	0.593
Maternal Depression (ref. Not depressed)									
Depressed	1.15	[0.85,1.54]	0.367	1.26	[1.00,1.58]	0.046	1.14	[0.84,1.56]	0.400
Rurality (ref. Rural)									
Urban	1.15	[0.89,1.48]	0.276	1.06	[0.88,1.27]	0.561	1.28	[0.95,1.73]	0.101
Province (ref. Ontario)									
Maritimes*	0.99	[0.72,1.38]	0.966	1.05	[0.83,1.33]	0.681	1.02	[0.68,1.52]	0.940
Quebec	1.12	[0.80,1.57]	0.504	1.14	[0.89,1.46]	0.296	1.93	[1.30,2.88]	0.001
Manitoba	1.17	[0.76,1.79]	0.484	0.94	[0.66,1.34]	0.734	0.98	[0.54,1.79]	0.961
Saskatchewan	0.65	[0.41,1.03]	0.068	0.50	[0.34,0.75]	0.001	0.76	[0.42,1.36]	0.351
Alberta	0.70	[0.45,1.07]	0.099	0.72	[0.52,0.99]	0.046	0.73	[0.43,1.24]	0.247
British Columbia	0.63	[0.40,1.01]	0.053	0.72	[0.51,1.01]	0.055	0.97	[0.57,1.66]	0.917
Social Fragmentation (ref. Least Fragmented)									
Q2	1.21	[0.88,1.68]	0.247	1.05	[0.83,1.33]	0.679	1.31	[0.89,1.92]	0.168
Average	1.18	[0.85,1.62]	0.327	0.96	[0.76,1.23]	0.762	0.99	[0.66,1.49]	0.951
Q4	1.01	[0.71,1.43]	0.974	0.81	[0.62,1.06]	0.121	0.75	[0.49,1.15]	0.188
Most Fragmented (Q5)	1.14	[0.76,1.72]	0.531	0.87	[0.64,1.19]	0.399	0.82	[0.50,1.35]	0.444

Adolescent-reported relationships with parents and friends and low self-esteem – a test of the direction of causality

Multinomial models are fitted with the parenting perceptions variables as outcomes (models M1 and M2), predicted by baseline self-esteem, after adjusting for demographics, family environment and geographical environment. Analogous binary logistic regression models are fitted for the happiness with family (M3) and peer variables (M4).

This analysis shows that baseline self-esteem *prospectively* predicts all four perceptions variables strongly. Interestingly, when the relative risks of hardly ever arguing or talking with parents are examined, there are no adjusted associations, whereas low self-esteem at baseline is strongly associated with arguing and talking most days with parents.

This shows that the perceptions variables should ideally be modelled in a modelling framework which would take account of their reciprocal relationship with self-esteem.

These analyses also highlight that girls report their relationships with their parents and friends more negatively than boys. Increasing age is also inversely associated with frequency of arguments and talking and positively associated with unhappiness with family. There are no consistent relationships between family structure, household deprivation, maternal education or maternal depression and perceptions of parenting. There are no consistent relationships between rurality, neighbourhood deprivation or region of residence.

Appendix Table 2: Sensitivity analysis of same-source bias between low self-esteem and perceptions of parents, family and friends in the BYP (N=1922).

	M1: Frequency of arguments with parents		M2: Frequency of talking with parents		M3:Happiness with friends	M4: Happiness with family
Covariates at t1	**Hardly ever (n=1774) vs. Normal (n=1824) RRR [95% CI] P**	**Most days (n=457)s vs. Normal (n=1824)**	**Hardly ever (n=1257) vs. Normal (n=1759) RRR 95% CI] P**	**Most days (n=1042) vs. Normal (n=1759) RRR 95% CI] P**	**Unhappy (n=211) vs. Happy (n=3846) OR [95%CI] p**	**Unhappy (n=338) vs. Happy (n=3720) OR [95%CI] p**
Self-esteem (ref. High)						
Low	0.84 [0.63,1.12] 0.227	2.45 [1.73,3.46] 0.000	0.96 [0.67,1.36] 0.811	1.89 [1.41,2.53] 0.000	2.98 [1.96,4.52] 0.000	2.10 [1.39,3.16] 0.000
Age (ref. 11)						
12	0.84 [0.72,0.98] 0.027	1.02 [0.79,1.32] 0.890	0.82 [0.68,1.00] 0.047	0.87 [0.74,1.03] 0.110	1.00 [0.70,1.43] 0.993	1.36 [1.00,1.84] 0.046
13	0.82 [0.70,0.97] 0.019	0.95 [0.73,1.25] 0.734	0.77 [0.63,0.93] 0.008	0.88 [0.73,1.06] 0.170	0.97 [0.65,1.43] 0.873	1.40 [1.02,1.91] 0.035
Sex (ref. Boys)						
Girls	0.79 [0.65,0.95] 0.015	1.35 [1.00,1.80] 0.047	2.48 [2.00,3.08] 0.000	0.65 [0.52,0.81] 0.000	1.59 [1.12,2.26] 0.010	1.33 [0.98,1.81] 0.068
Ethnicity						
Visible minority	1.14 [0.74,1.76] 0.551	1.20 [0.58,2.49] 0.622	0.94 [0.54,1.65] 0.832	0.85 [0.50,1.46] 0.563	2.13 [1.10,4.14] 0.025	1.72 [0.91,3.26] 0.097
Year (ref. 1994)						
1995	0.90 [0.68,1.19] 0.460	0.56 [0.35,0.90] 0.017	0.72 [0.50,1.03] 0.071	0.77 [0.56,1.07] 0.116	0.82 [0.47,1.42] 0.476	0.87 [0.56,1.35] 0.536
1996	1.05 [0.77,1.45] 0.745	0.85 [0.51,1.41] 0.527	1.01 [0.69,1.48] 0.972	0.79 [0.55,1.12] 0.180	0.95 [0.51,1.75] 0.862	0.73 [0.45,1.19] 0.211
1997	1.21 [0.87,1.70] 0.261	0.84 [0.49,1.46] 0.541	0.99 [0.66,1.49] 0.974	0.74 [0.51,1.08] 0.124	0.51 [0.24,1.06] 0.072	0.58 [0.34,1.01] 0.056
1998	1.20 [0.87,1.65] 0.273	0.83 [0.49,1.40] 0.481	1.16 [0.79,1.71] 0.456	0.99 [0.70,1.42] 0.977	0.59 [0.31,1.15] 0.120	0.52 [0.30,0.90] 0.020
1999	1.05 [0.76,1.45] 0.756	0.95 [0.58,1.56] 0.845	1.20 [0.82,1.76] 0.342	0.92 [0.65,1.31] 0.646	0.91 [0.50,1.64] 0.745	0.66 [0.39,1.11] 0.121
2000	1.22 [0.88,1.68] 0.236	0.92 [0.55,1.51] 0.729	1.23 [0.84,1.81] 0.282	1.02 [0.72,1.45] 0.901	0.87 [0.48,1.60] 0.659	0.71 [0.42,1.19] 0.189
2001	1.07 [0.77,1.49] 0.676	1.20 [0.74,1.95] 0.459	1.24 [0.84,1.84] 0.273	1.15 [0.81,1.64] 0.435	0.43 [0.21,0.85] 0.016	0.83 [0.49,1.39] 0.469
2002	1.05 [0.75,1.46] 0.788	1.37 [0.84,2.23] 0.214	1.18 [0.80,1.73] 0.409	1.02 [0.72,1.46] 0.897	0.47 [0.23,0.94] 0.033	0.92 [0.56,1.52] 0.745
Family Structure (ref. Intact)						
Reconstituted	1.01 [0.78,1.31] 0.934	1.56 [1.06,2.29] 0.025	1.00 [0.76,1.32] 0.975	1.35 [1.03,1.76] 0.030	1.20 [0.73,1.99] 0.478	1.21 [0.83,1.76] 0.316
Single Parent	0.84 [0.65,1.09] 0.191	1.19 [0.79,1.78] 0.412	1.08 [0.80,1.47] 0.609	1.55 [1.17,2.06] 0.002	1.47 [0.92,2.34] 0.104	1.76 [1.19,2.61] 0.005
HH income						
High	0.70 [0.57,0.88] 0.002	1.01 [0.74,1.39] 0.938	1.13 [0.90,1.41] 0.305	0.94 [0.75,1.18] 0.587	0.77 [0.51,1.18] 0.228	1.35 [0.98,1.84] 0.063
Low	1.14 [0.91,1.43] 0.267	1.20 [0.84,1.70] 0.317	0.91 [0.69,1.21] 0.517	1.26 [0.98,1.62] 0.071	0.65 [0.40,1.06] 0.082	0.96 [0.65,1.42] 0.838
Maternal education (ref <GCSE)						
GCSE	1.03 [0.81,1.30] 0.829	0.62 [0.44,0.87] 0.006	0.92 [0.71,1.19] 0.528	0.83 [0.64,1.07] 0.152	1.24 [0.80,1.91] 0.335	0.97 [0.65,1.45] 0.875

Covariates at t1	M1: Frequency of arguments with parents Hardly ever (n=1774) vs. Normal (n=1824) RRR [95% CI] P	 Most days (n=457)s vs. Normal (n=1824)	M2: Frequency of talking with parents Hardly ever (n=1257) vs. Normal (n=1759) RRR 95% CI] P	 Most days (n=1042) vs. Normal (n=1759) RRR 95% CI] P	M3:Happiness with friends Unhappy (n=211) vs. Happy (n=3846) OR [95%CI] p	M4: Happiness with family Unhappy (n=338) vs. Happy (n=3720) OR [95%CI] p
A-level	1.09 [0.76,1.55] 0.649	0.59 [0.30,1.15] 0.119	0.69 [0.46,1.03] 0.071	0.70 [0.48,1.02] 0.062	0.59 [0.28,1.26] 0.174	0.73 [0.40,1.33] 0.299
Diploma or degree	0.78 [0.59,1.03] 0.081	0.65 [0.45,0.95] 0.027	0.92 [0.68,1.25] 0.597	0.76 [0.57,1.02] 0.069	1.32 [0.81,2.15] 0.260	1.23 [0.82,1.84] 0.311
Maternal depression (Not depressed)						
Depressed	0.94 [0.78,1.12] 0.468	1.36 [1.02,1.80] 0.035	1.04 [0.85,1.28] 0.675	1.18 [0.97,1.44] 0.099	1.01 [0.72,1.41] 0.972	1.44 [1.07,1.94] 0.017
Rurality (ref. Rural)						
Urban	0.90 [0.69,1.17] 0.429	0.72 [0.49,1.05] 0.087	0.88 [0.66,1.17] 0.394	1.03 [0.77,1.37] 0.856	1.02 [0.64,1.62] 0.941	0.81 [0.55,1.20] 0.291
Region (ref. South of England)						
Midlands/East of	1.35 [1.02,1.79] 0.034	0.84 [0.56,1.28] 0.421	1.13 [0.82,1.55] 0.457	0.82 [0.61,1.10] 0.189	0.75 [0.46,1.21] 0.238	0.77 [0.50,1.19] 0.237
London	0.90 [0.59,1.36] 0.622	0.75 [0.39,1.42] 0.378	1.59 [1.02,2.47] 0.041	0.83 [0.52,1.33] 0.445	1.37 [0.75,2.51] 0.304	1.02 [0.56,1.87] 0.945
North West of England	1.05 [0.73,1.50] 0.802	1.00 [0.59,1.68] 0.989	1.05 [0.71,1.56] 0.788	0.76 [0.52,1.12] 0.165	0.70 [0.34,1.45] 0.341	1.05 [0.62,1.80] 0.846
North of England	1.04 [0.76,1.42] 0.829	0.93 [0.56,1.55] 0.786	0.98 [0.69,1.40] 0.929	0.71 [0.50,1.01] 0.059	0.50 [0.27,0.92] 0.025	0.72 [0.43,1.22] 0.222
Scotland	1.04 [0.71,1.52] 0.844	1.37 [0.80,2.35] 0.251	1.04 [0.69,1.59] 0.841	0.96 [0.65,1.40] 0.823	0.80 [0.42,1.53] 0.500	1.05 [0.62,1.76] 0.863
Wales	0.88 [0.60,1.29] 0.514	0.92 [0.55,1.55] 0.763	1.11 [0.72,1.71] 0.644	1.00 [0.67,1.48] 0.995	0.50 [0.25,1.00] 0.051	0.86 [0.48,1.52] 0.598
Neighbourhood						
Q2	1.23 [0.83,1.81] 0.300	1.27 [0.71,2.27] 0.423	0.72 [0.47,1.09] 0.120	0.86 [0.56,1.31] 0.478	1.11 [0.54,2.28] 0.786	1.64 [0.87,3.07] 0.126
Average	0.96 [0.66,1.40] 0.836	1.02 [0.59,1.75] 0.941	0.77 [0.52,1.16] 0.214	0.78 [0.52,1.17] 0.223	1.17 [0.57,2.40] 0.676	1.44 [0.79,2.64] 0.236
Q4	1.07 [0.72,1.59] 0.735	1.08 [0.61,1.91] 0.800	0.82 [0.54,1.27] 0.376	0.99 [0.65,1.52] 0.971	1.33 [0.62,2.83] 0.461	1.74 [0.94,3.22] 0.077
Most Deprived	1.10 [0.73,1.67] 0.642	1.14 [0.63,2.07] 0.667	1.18 [0.76,1.83] 0.471	1.02 [0.65,1.60] 0.936	1.20 [0.55,2.61] 0.649	1.29 [0.66,2.53] 0.456

All models control for clustering of observations within individuals.

Appendix 3: Chapter seven models

Appendix Table 3: Fully adjusted random effects logistic regression models of contemporary self-esteem and transitions in neighbourhood deprivation and social fragmentation in the NLSCY. N= 3421.

Appendix Table 3 Covariates at t1	M1: Unadjusted OR [95% CI] p	M2: Adjusted Deprivation Mobility OR [95% CI] p	M3: Adjusted Fragmentation Mobility OR [95% CI] p
Age (ref. 10/11)			
12/13		0.97 [0.83,1.13] 0.676	0.97 [0.83,1.13] 0.682
Sex (ref. boys)		2.17 [1.87,2.53] 0.000	2.17 [1.86,2.52] 0.000
Ethnicity (ref. Canadian)			
European		0.84 [0.70,1.00] 0.054	0.84 [0.70,1.01] 0.058
First Nations		1.02 [0.75,1.37] 0.920	1.02 [0.76,1.38] 0.889
Other Visible			
Minority		0.79 [0.54,1.16] 0.229	0.79 [0.54,1.15] 0.218
Year (ref. 1994)			
1996		1.67 [1.31,2.14] 0.000	1.67 [1.30,2.13] 0.000
1998		1.20 [0.90,1.58] 0.211	1.20 [0.91,1.59] 0.201
2000		1.53 [1.15,2.04] 0.004	1.53 [1.15,2.05] 0.004
2002		1.52 [1.05,2.19] 0.027	1.52 [1.05,2.20] 0.025
Adolescent Perceptions			
Parental Nurture		0.92 [0.91,0.94] 0.000	0.92 [0.91,0.94] 0.000
Parental Rejection		1.06 [1.04,1.08] 0.000	1.06 [1.04,1.08] 0.000
Friendship Quality		0.87 [0.85,0.89] 0.000	0.87 [0.85,0.89] 0.000
Family Functioning		0.93 [0.88,0.98] 0.012	0.93 [0.88,0.98] 0.011
Family Structure (ref. Intact)			
Reconstituted		1.30 [1.04,1.63] 0.022	1.30 [1.04,1.64] 0.021
Single Parent		1.01 [0.81,1.26] 0.922	1.01 [0.82,1.26] 0.901
Household Income (ref. Average)			
High		0.87 [0.72,1.04] 0.129	0.87 [0.72,1.04] 0.126
Low		1.07 [0.88,1.31] 0.511	1.07 [0.88,1.31] 0.490
Maternal Education (ref. < High School)			

High School			0.96 [0.80,1.16] 0.675	0.96 [0.80,1.15] 0.669
Diploma or Degree			0.78 [0.60,1.03] 0.076	0.78 [0.60,1.02] 0.071
Maternal Depression (ref. Not depressed)				
Depressed			1.16 [0.96,1.40] 0.127	1.16 [0.96,1.40] 0.130
Rurality (ref. Rural)				
Urban			1.01 [0.86,1.18] 0.923	1.01 [0.86,1.18] 0.929
Province (ref. Ontario)				
Maritimes*			1.06 [0.86,1.32] 0.591	1.06 [0.85,1.31] 0.602
Quebec			1.27 [1.02,1.59] 0.032	1.27 [1.02,1.59] 0.033
Manitoba			0.93 [0.68,1.28] 0.667	0.93 [0.68,1.28] 0.649
Saskatchewan			0.61 [0.44,0.86] 0.004	0.62 [0.44,0.86] 0.004
Alberta			0.78 [0.58,1.04] 0.089	0.78 [0.58,1.04] 0.089
British Columbia			0.82 [0.60,1.10] 0.186	0.82 [0.61,1.11] 0.198
Deprivation mobility (ref. Non-mover)				
Similarly deprived	1.31 [0.88,1.95] 0.189		1.20 [0.87,1.65] 0.257	…
Moves to more affluent	1.31 [0.88,1.95] 0.181		1.17 [0.85,1.61] 0.342	…
Moves to more deprived	1.54 [1.08,2.20] 0.017		1.25 [0.94,1.66] 0.119	…
Fragmentation mobility (ref. Non-mover)				
Moves to similarly deprived	0.94 [0.59,1.48] 0.777		…	0.90 [0.62,1.30] 0.565
Moves to less fragmented	1.67 [1.16,2.43] 0.007		…	1.35 [1.01,1.80] 0.044
Moves to more fragmented	1.51 [1.06,2.15] 0.022		…	1.32 [1.00,1.75] 0.051

Appendix Table 4 :Fully adjusted multinomial regression models of self-esteem change and fragmentation mobility in 10-15 year olds in cycles 1-6 of the NLSCY.

Appendix Table 4	**Reference: Persistently High (4,876 transitions)**								
	Increase (497 transitions)			**Decrease (821 transitions)**			**Persistently Low (427 transitions)**		
	RRR	**[95% CI]**	**P**	**RRR**	**[95% CI]**	**P**	**RRR**	**[95% CI]**	**P**
Age (ref. 10/11-12.13)									
12/13-14/15	1.88	[1.43,2.47]	0.000	0.82	[0.68,0.98]	0.033	1.97	[1.52,2.56]	0.000
Sex (ref. boys)	1.83	[1.46,2.29]	0.000	2.02	[1.71,2.39]	0.000	3.50	[2.64,4.64]	0.000
Ethnicity (ref. Canadian)									
European	1.01	[0.76,1.34]	0.959	0.83	[0.68,1.01]	0.069	0.88	[0.63,1.23]	0.444
First Nations	1.03	[0.66,1.61]	0.897	1.08	[0.78,1.50]	0.642	0.95	[0.56,1.64]	0.867
Other Visible Minority	1.52	[0.90,2.57]	0.116	0.95	[0.62,1.47]	0.824	0.74	[0.36,1.49]	0.397
Transition Year (ref. 1994-96)									
1996-98	0.97	[0.63,1.50]	0.891	1.63	[1.21,2.19]	0.001	1.71	[1.14,2.56]	0.009
1998-00	2.08	[1.37,3.15]	0.001	1.26	[0.91,1.75]	0.159	1.59	[0.97,2.60]	0.066
2000-02	1.31	[0.83,2.07]	0.245	1.62	[1.17,2.25]	0.004	1.50	[0.89,2.55]	0.131
2002-04	1.57	[0.90,2.73]	0.113	1.86	[1.22,2.83]	0.004	1.28	[0.68,2.42]	0.438
Parental Nurture	0.82	[0.80,0.84]	0.000	0.94	[0.91,0.96]	0.000	0.81	[0.78,0.83]	0.000
Parental Rejection	1.10	[1.07,1.13]	0.000	1.04	[1.02,1.07]	0.000	1.14	[1.11,1.18]	0.000
Friendship Quality	0.75	[0.72,0.78]	0.000	0.90	[0.87,0.93]	0.000	0.71	[0.68,0.74]	0.000
Family Functioning	0.99	[0.91,1.08]	0.874	0.90	[0.84,0.96]	0.001	1.00	[0.90,1.11]	0.985
Family Structure (ref. Intact)									
Reconstituted	1.36	[0.98,1.89]	0.067	1.27	[0.98,1.64]	0.073	1.63	[1.12,2.38]	0.011
Single Parent	1.24	[0.90,1.71]	0.195	1.06	[0.82,1.35]	0.665	1.03	[0.70,1.52]	0.872
Household income (ref. Average)									
High	1.04	[0.79,1.36]	0.787	0.94	[0.76,1.15]	0.542	0.73	[0.52,1.03]	0.072
Low	1.09	[0.80,1.48]	0.600	1.09	[0.86,1.37]	0.477	1.08	[0.77,1.51]	0.665

Appendix Table 4	**Reference: Persistently High (4,876 transitions)**								
	Increase (497 transitions)			**Decrease (821 transitions)**			**Persistently Low (427 transitions)**		
	RRR	**[95% CI]**	**P**	**RRR**	**[95% CI]**	**P**	**RRR**	**[95% CI]**	**P**
Maternal Education (ref. < High School)									
High School	0.98	[0.73,1.29]	0.864	0.89	[0.72,1.10]	0.282	1.13	[0.80,1.58]	0.489
Diploma or Degree	0.71	[0.48,1.05]	0.084	0.68	[0.50,0.92]	0.012	0.91	[0.55,1.51]	0.713
Maternal Depression (ref. Not depressed)									
Depressed	1.15	[0.86,1.55]	0.343	1.24	[0.99,1.56]	0.065	1.10	[0.80,1.50]	0.569
Rurality (ref. Rural)									
Urban	1.14	[0.91,1.45]	0.259	0.99	[0.83,1.18]	0.910	1.13	[0.85,1.51]	0.409
Province (ref. Ontario)									
Maritimes*	0.99	[0.71,1.37]	0.937	1.05	[0.83,1.32]	0.708	1.03	[0.69,1.54]	0.890
Quebec	1.13	[0.81,1.57]	0.463	1.09	[0.86,1.39]	0.476	1.84	[1.24,2.73]	0.002
Manitoba	1.16	[0.76,1.78]	0.483	0.93	[0.66,1.33]	0.707	0.99	[0.55,1.81]	0.986
Saskatchewan	0.63	[0.40,1.00]	0.052	0.50	[0.34,0.74]	0.001	0.72	[0.40,1.31]	0.283
Alberta	0.69	[0.45,1.06]	0.093	0.72	[0.52,1.00]	0.048	0.75	[0.44,1.27]	0.283
British Columbia	0.63	[0.40,1.00]	0.052	0.70	[0.50,0.98]	0.039	0.93	[0.55,1.60]	0.803
Social Deprivation Transitions (ref. Non-mover)									
Moves to Same	0.96	[0.59,1.58]	0.878	0.81	[0.52,1.25]	0.338	1.09	[0.61,1.94]	0.765
Moves to More Cohesive	0.82	[0.50,1.36]	0.441	1.34	[0.96,1.88]	0.088	1.22	[0.74,2.00]	0.433
Moves to More Deprived	1.21	[0.79,1.85]	0.389	1.30	[0.94,1.81]	0.113	1.54	[0.98,2.40]	0.059