Where you live makes a difference- quantifying neighbourhood effects on the health of young people

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Declaration

I, Kenisha Samantha Russell Jonsson, confirm that the work presented in this dissertation is my own. Where information has been derived from other sources and/or the efforts have been collaborative, I confirm that this has been indicated in the dissertation.

Dedication

This dissertation is dedicated to Äskil**.**

Although you are too young now to understand, I want you to know that dreaming is about setting the most 'far-fetched' goals humanly possible and then working towards them with optimism. It is important for you to know that dreams are what fuel us, giving us strength and the motivation to carry on through the toughest of times. So, my dearest son, don't let anyone tell you that you are dreaming too big. By the way, just so you know, dreams do not have deadlines!

'Everyone in life suffers a loss but it's the one who can overcome the loss and make a success of himself that is really doing something '

----Billy Crystal's Muhammad Ali Tribute-15 Rounds 1979

Abstract

The aim of this dissertation was to investigate the geographic and individual/family-level factors influencing the development of psychopathological problems in young people aged between 10 and 15 years old residing in England and Wales. It includes three multilevel model studies based on data from a nationally representative longitudinal study linked to the 2011 UK census. The two outcome measures investigated were mental health and life satisfaction. Aggregated data from the census captured indicators of social capital, ethnic composition, and the socioeconomic and physical conditions of the neighbourhood. Individual/family-level variables included in the models were: youth age, gender and ethnicity, as well as measures relating to parental health, socioeconomic status and demographic characteristics. *Study I* revealed that the effects of social capital on deprivation depend on whether it is analysed in terms of mediation or moderation. Social capital attenuated the negative effects of socioeconomic deprivation on mental health and life satisfaction. Specifically, the effect of deprivation is reduced by homogenous friendship networks (bonding), civic engagement (bridging), and low average neighbourhood worry about crime (indicator of general trust). As a moderator, homogenous friendship networks and civic engagement buffered young people residing in more deprived neighbourhoods from greater mental health difficulties and low life satisfaction, whilst having little or no impact on those living in less deprived neighbourhoods. These results highlighted the importance of cultivating various forms of social capital because different components appear to offer different benefits. *Study II* revealed a negative association between socioeconomic deprivation and mental health among White British youths compared to their ethnic minority counterparts, and that ethnic density had a small but mitigating effect on these outcomes, while parental behaviour increased the gap in mental health

differences between the two groups. *Study III* found a strong association between life satisfaction and ethnicity whereby Asian and Black youths reported better life satisfaction than their White counterparts. This differential association was attenuated by ethnic density and neighbourhood socioeconomic status. Overall, the results point to a strong relationship between the social and physical contexts of the neighbourhood, and mental health and life satisfaction. Although much of the observed variability in outcomes was explained by individual/family-level characteristics, the empirical evidence suggested that it was the intersection between neighbourhood composition and the individual/family predictors, which ultimately determined the direction and strength of mental health difficulties and life satisfaction among young people. The findings also suggest that the neighbourhood is an important arena for policies and initiatives targeted at improving the mental health and life satisfaction of young people.

Keywords: life satisfaction; mental health; children/adolescents; neighbourhood; young people; socioeconomic deprivation; ethnic composition; parental behaviour; social capital; strengths and difficulties questionnaire (SDQ); England and Wales

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List of Abbreviations

BAMEs	Blacks, Asians and other ethnic minorities
Coeff	Coefficient
MSOA	Middle Super Output Area
ONS	Office of National Statistics
SDQ	Strengths and Difficulties Questionnaire
SF-12	Short Form Health Survey 12
UKHLS	United Kingdom Household Longitudinal Study
UK	United Kingdom
WHO	World Health Organisation

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I would like to acknowledge Mike Jones who provided instructions and codes for downloading the relevant tables for creating the Townsend deprivation index used through this thesis (https://philmikejones.wordpress.com/2014/02/21/).

I am a strong believer in hard work, but I am convinced that without a bit of luck even the greatest of efforts may not give the expected returns. Well, how extremely lucky I have been! So lucky that there have been so many people who have been willing to give me their time, advice and support.

Without you all, this thesis would not have been possible.

Introduction

This dissertation presents the results from three studies conducted to improve our understanding of the geographic and individual/family-level predictors influencing the development of psychopathological problems among children/adolescents (henceforth referred to as "young people") aged between 10 and 15 years old residing in Britain. Specifically, the studies were designed to determine how the mental health and life satisfaction of young people aged 10-15 residing in England and Wales are affected by the social, economic and ethnic composition of their areas of residence (i.e. neighbourhoods).

Since the early 1990s, there has been a wealth of studies linking neighbourhoods and health, most of which have identified modest[1] contextual effects over and above individual/family characteristics (Diez Roux and Mair 2010; Macintyre and Ellaway 2003; Ellaway and Macintyre 2010). There are however some gaps in the scholarship.

First, although the overall literature on the associations between neighbourhoods and health has grown extensively, there has been much less research on these effects in young people than in adults. Yet, research into the influence of neighbourhood composition on the health and well-being of young people is a relevant and necessary line of enquiry because as a group, they have less mobility and autonomy when compared to their adult counterparts (Allison et al. 1999).This means that they may spend a disproportionate amount of time within their neighbourhoods. Neighbourhoods in which young people reside may also impact their health because this is where important social processes, interactions and the institutional resources relevant to their development is found (Leventhal and Brooks-Gunn 2001; Leventhal, Dupéré, and

[1] The modest nature of these effects might be partially due to the limitations of this type of research, as discussed in the section on the strengths and limitations of this dissertation.

Brooks-Gunn 2009; Roosa et al. 2003). Prior studies have suggested that during this critical phase of development where young people are experiencing physical, psychological and cognitive changes on their way toward adulthood, experiences and relationships such as those within the neighbourhood has a strong influence on a range of outcomes (Allison et al. 1999; Leventhal and Brooks-Gunn 2001; Leventhal, Dupéré, and Brooks-Gunn 2009; Roosa et al. 2003). The literature also points to possible lifelong effects of exposure to the neighbourhood (Evans and Kim 2007; Diez Roux 2001). If it is indeed so, that disadvantage accumulates over the life course, research into whether and how the neighbourhood influences the health of young people may have an even greater relevance for our understanding of the development and treatment of mental health. Moreover, an investigation into the factors which might impact the well-being of young people is necessary because these may differ from the factors influencing the well-being of adults, and thus a reliance on adult findings might lead us to draw misleading conclusions as it relates to young people.

Second, research relating specifically to the outcomes examined in this study is also lacking, with only a small body of studies demonstrating a connection between neighbourhood composition and mental health among young people in Britain (Astell-Burt et al. 2012; Maynard, Harding, and Minnis 2007; Maynard and Harding 2010; Harding et al. 2015; Fagg et al. 2006; Green et al. 2005; Meltzer, Gatward, Goodman, et al. 2000). Furthermore, to my knowledge, there is no published research on the relationship between neighbourhood effects and life satisfaction among this age group in Britain. The current literature also lacked an investigation of ethnicity, as one of the factors contributing to the unequal distribution of mental health and life satisfaction among young people.

Third, despite the strong interest in this field, research in this area has largely focused on explaining the 'how' of these relationships on individual outcomes rather than the 'why'. While the answers to 'how' questions provide descriptions of possible associations, research focused on explaining 'why' would help us to understand the processes through which neighbourhood effects are transmitted, and how this in turn influence individual outcomes. As such, several aspects related to the mechanisms through which the socioeconomic and physical neighbourhood conditions are transmitted to young people remain under researched in the British context.

It is therefore hoped that the studies in this dissertation will contribute to the current discourse by addressing the question of why through an investigation of neighbourhood predictors as both mediators and moderators. This may allow us to disentangle the differences in outcomes among individuals exposed to similar levels of risk.

In addition, this study aims to contribute to the question of why, by using repeated measurements of the same characteristic for the sample over time - longitudinal data. Longitudinal data is particularly useful for evaluating the relationship between the development of a health problem and possible risk factors. Further, the use of longitudinal data in the current studies has allowed for the exploration of changes in individual/family circumstances over time and therefore greater understanding of the intervening processes. One drawback is that the neighbourhood measures were taken from a single census, therefore it was not possible to observe any direct changes in this context. But, through the interaction between the neighbourhood and the changes in individual/family factors, we are at least able to take a step closer to disentangling the mechanisms at work.

Prior studies (see for e.g. Odgers et al. 2009; Edwards and Bromfield 2010; Aminzadeh et al. 2013; Drukker et al. 2005) have shown that a neighbourhood's social,

economic, ethnic characteristics, and even its physical structures, presumably operate via synergistic processes that create and recreate each other. More empirical investigations into these processes and their potential impact on youth well-being would contribute further to the question of why. This is however a difficult issue to study because of the complex relationships between the relevant predictors, such as the correlation between the neighbourhood contexts within which young people reside and their individual and family characteristics. The difficulty in disentangling neighbourhood contextual factors from their compositional make-up might have hampered research efforts in this area.

Besides the obvious point that as researchers we want to explain and understand societal problems, the processes through which young people might develop mental health difficulties, and the factors that affect their life satisfaction, the research presented in this dissertation was motivated by reports showing that:

(a) approximately 10% of children in the UK (Green et al. 2005) and 20% worldwide (WHO 2016) suffer from mental health difficulties;

(b) a global epidemiological study which describes mortality and morbidity from major diseases, injuries and risk factors to health has found that mental health difficulties among young people is one of the most significant contributors to the global burden of disease (Lancet 2017; Gore et al. 2011);

(c) young people who suffer from mental health difficulties are subject to an elevated risk of smoking, drug use, and having problems with alcohol (Department of Health 2011) which in turn has been linked to a wide range of negative health outcomes and socioeconomic inequalities in the transition from adolescence to adulthood (Viner and Taylor 2007; Green, Doherty, and Ensminger 2017);

(d) the onset of mental illness among a large majority of individuals who suffer from mental ill-health in later life first occurred during adolescence. For instance, studies have shown that 50% of individuals who suffer from mental ill-health (excluding dementia) showed some symptoms by the age of 14 (Breslau et al. 2005; Kessler et al. 2005; De Girolamo et al. 2012);

(e) mental health issues impose significant social and economic costs. For example, mental health difficulties in the UK have been estimated to cost between £11,000 and £59,000 annually per child (Davies et al. 2013). As it relates to social costs, young people who suffer from mental health difficulties have a lower risk of having good physical health; to have attained requisite educational qualifications; they have lower employment prospects and they are less likely to form social relationships (Department of Health 2011) and these factors have all been shown to have an adverse and long-lasting impact on individual quality of life.

These reports all point to the fact that increasing our understanding of the mechanisms that lead to the development of psychopathological problems could enable improvements in the prevention, early diagnosis, and treatment of mental health issues. The consequence of which could be a reduction in long-term suffering among affected groups and a reduction in the social and economic costs.

The aim of this dissertation is to therefore address some of this gap in the scholarship by providing empirical evidence that sheds light on mechanisms that may affect the mental health and life satisfaction of young people aged 10-15 residing in England and Wales. I do this by empirically investigating the interplay between indicators of neighbourhood social capital, individual and neighbourhood socioeconomic deprivation, and their shared impact on the reported mental health and life satisfaction of young people. In addition, I assess whether neighbourhood effects are evenly

distributed across the various ethnic groups in Britain given the heterogeneous socioeconomic conditions and ethnic composition of the British population. To examine these questions, multilevel methods were applied to a nationally representative longitudinal study, *Understanding Society*: *The UK Household Longitudinal Study (UKHLS*), which is linked to aggregate area-level measures from the 2011 UK census. The data from the survey included information on two outcome measures (mental health and life satisfaction) together with various individual/family predictors that were used in the analyses (for details of these predictors, see Table 1). Aggregated data from the census were used to capture area-level heterogeneity in measures such as ethnic composition, socioeconomic deprivation and other aspects of the social and physical living environment.

Studies in neighbourhood research have often been driven by theory and the geographic level at which data are available for assessment. The next two sections of this introduction outlines the definition of neighbourhoods and the theoretical framework used in this thesis.

Defining neighbourhoods

Before explaining the theoretical approaches through which neighbourhood conditions might operate to influence the mental health of young people, it is necessary to operationalize the term neighbourhood in the context of this dissertation. Several attempts have been made to define and explain the term "neighbourhood" and the consequences of its various operationalizations (see for e.g. Lupton 2003; Van Ham et al. 2012). These efforts will not be recapitulated here; instead, neighbourhoods are defined strictly in terms of the chosen unit of analysis used in this dissertation.

Nevertheless, it should be noted that the definition adopted in this work is by no means new, and has been used in many peer-reviewed publications (see for e.g. Fagg et al. 2006; Bécares, Nazroo, et al. 2012; Bécares, Nazroo, and Stafford 2009; Knies, Nandi, and Platt 2014).

Neighbourhoods have been operationalized as a Middle Super Output Area (MSOA), which are a class of geographic output areas defined for the purposes of reporting UK census estimates. MSOAs were primarily created for administrative purposes and are part of the system used to monitor the social, economic, and general living conditions in which the people of Britain reside. They were designed such that all MSOAs have similar population sizes, with a minimum residential size of between 5000 individuals and 2000 households, and an average population of 7500 individuals. They were also designed to be as socially homogenous as possible based on household tenure and dwelling type (ONS 2017). The use of MSOAs made it possible to link aggregated area-level variables taken from the 2011 census to the *UKHLS*.

Despite the widespread usage of MSOAs to delineate neighbourhood geographic boundaries in academic studies from across the UK, this measure is not without limitations. As stated above MSOAs were created with a particular purpose in mind, this means that the 'artificial' delineation does not accurately capture or measure all the aspects relevant to how people live. Using MSOAs could limit for instance measures such as social capital or ethnic density used in this study. As such, lower geographic measures could potentially lead to stronger effects. However, request for lower level geographic measures were denied as a precaution against revealing the identity of participants.

Theoretical approaches to neighbourhood effects on youth outcomes

While the literature offers several plausible explanations for the transmission and influence of neighbourhood conditions on a range of outcomes (including health) in young people (Jencks and Mayer 1990; Roosa et al. 2003; Leventhal and Brooks-Gunn 2000), the three proposed pathways that informed this dissertation were drawn from the work of Leventhal and Brooks-Gunn (2000).The theoretical models outlined by these authors was chosen because they offer a method for performing analyses using more theoretically driven models that more clearly define the level(s) at which various mechanisms (individual, family, neighbourhood, etc.) might operate. Moreover, both the neighbourhood and the family offer relevant starting points for identifying and explaining factors that may affect the well-being of young people during their formative years, when familial, legal, socioeconomic, and mobility issues bind them to the areas in which they live. The chosen theoretical models offered a succinct way to explain the intricate relationships between these factors. The models provided were the *institutional resources model*, the *relationships model*, and the *norms and collective efficacy model*.

The *institutional resources model* outlines how the quality, availability, accessibility, and affordability of the physical and material conditions of the neighbourhood environment might influence the health of young people in different neighbourhoods. In particular, visible signs of socioeconomic deprivation such as the neighbourhood facilities have been associated with risk-taking, school-readiness and achievement, and participation in physical activity (Minh et al. 2017). The expectation is therefore that the neighbourhood resources would have an indirect influence on the association on mental health and life satisfaction among young people.

The *relationships model* deals with the indirect transmission and influence of neighbourhood effects on the well-being of youths based on their relationships with their caregivers, and the relationships that these care-givers in turn have with the wider society. As such this model is concerned with the quality of the youth's home life, parental characteristics, parental behaviour (extended to include parenting style,supervision and monitoring, routines and structure, see e.g. Edwards and Bromfield 2010), and parental social and support networks (Leventhal and Brooks-Gunn 2000, 2001). In this dissertation this theoretical proposition has been tested by exploring the relationship between the frequency with which parents undertake certain activities with their children and assessed whether this varied by the composition of the neighbourhoods in which one resided. In line with the literature (Byrnes and Miller 2012; Ceballo and McLoyd 2002; Burton and Jarrett 2000; Sampson, Morenoff, and Earls 1999) it was assumed that the parental style adopted would vary by neighbourhood socioeconomic status, and this would have a direct impact on the mental health of young people.

The third and final model is the *norms and collective efficacy model*, which describes the way neighbourhood social processes contribute to and exacerbate and/or attenuate potential risks to individual well-being in the neighbourhood through formal and informal neighbourhood institutions. Although the original formulation of this model largely focused on physical risks, it was extended in this work to encompass psychological risks. This extension was considered appropriate because several studies have demonstrated significant health impacts related to 'softer' less objective neighbourhood measures and has shown specifically that perceptions of a neighbourhood can have similar health effects to that of objective measures (Booth,

Ayers, and Marsiglia 2012; Wen, Hawkley, and Cacioppo 2006; Ellaway, Macintyre, and Kearns 2001; Snedker and Hooven 2013).

Two of the research studies that make up this thesis were prompted by, and address some of the puzzling findings in the research on ethnicity and mental health in young people in Britain.

Inter-ethnic variations in mental health

It is estimated that 10 % of young people in Britain have mental health problems (Green et al. 2005; Meltzer, Gatward, Goodman, et al. 2000). However, numerous studies indicate that these problems are unequally distributed across the population, and that their prevalence varies with ethnicity. A systematic review examining differences in children's mental health by ethnicity in Britain, indicated that Black African and Indian children had better mental health than White British children, while children categorized as being of Mixed race, Black Caribbean, Pakistani, or Bangladeshi origin have similar mental health (Goodman, Patel, and Leon 2008). Similar results have been found in other studies. For example, an earlier assessment of the mental health of young people aged 5-15 found that Indian children had the lowest rates of mental health problems, with a prevalence rate of 4%, followed by Pakistanis and Bangladeshis at 8%. Only Black youths were found to have higher rates of mental health problems (12%) than White youths (Meltzer, Gatward, Goodman, et al. 2000). Although the findings of these two studies differed[2] somewhat, they both indicate that some ethnic minority youth groups have a mental health advantage over their White British

[2] The results of these studies may have differed due to several reasons, such as differences in the timing of the studies, the ethnic categorizations that they used, and their methodologies.

counterparts (Green et al. 2005; Meltzer, Gatward, Goodman, et al. 2000; Goodman, Patel, and Leon 2010; Astell-Burt et al. 2012; Harding et al. 2015).

This was surprising because the overall narrative in the literature suggests that ethnic minorities generally have worse health than the White British majority (Higgins 2008; Becares 2015; Nazroo 1997; Bhopal 2002; Bhopal 2007), although some groups fare worse than others. South Asians have a 50 % higher risk of cardiovascular disease and a higher risk of type-II diabetes compared to other ethnicities, whereas minorities of Caribbean origin have high risks of mortality from stroke. An especially puzzling finding given the inter-ethnic differences in mental health among young people is that ethnic minority adults (with the exception of those of Chinese origin) are known to face significantly elevated risks of mental health problems and diagnosis with mental illness (Whincup et al. 2010; Becares 2015; Nazroo 1997; Bhopal 1997; Bhopal 2002; Green et al. 2005; Meltzer, Gatward, Goodman, et al. 2000; Breslau et al. 2005; Rees et al. 2016).

It thus appears that there are opposing trends among youths and adults with respect to the relative mental health risks facing different ethnic groups. For instance, the risk of common mental disorders among Black women (29.3%) is appreciably greater than that for Non-British White women (15.6%), and White British women (20.9%). There were no significant differences in mental health illness among men by ethnicity. (McManus et al. 2016; Mental Health Foundation 2016). There is also some evidence that depression is more prevalent among Black women, and that panic disorder is more prevalent among women in Black, Asian and mixed or other ethnic groups than in Whites. Additionally, the first-time contact rates for psychotic disorder are three to five times higher for Blacks than for other ethnic groups (Rees et al. 2016; McManus et al. 2016)

It should be noted that there are various alternative explanations for the inter-ethnic differences in mental health highlighted here, and these arguments are relevant both for adults and young people alike. It has been suggested that the ethnic classifications used in certain studies could account for some of the reported variation (Bhopal 1997; Bhopal 2002; Bhopal 2007). For instance, a recent study by Stewart-Brown and colleagues indicated that individuals of African-Caribbean, Indian and Pakistani backgrounds had better mental well-being when compared to other groups (Stewart-Brown et al. 2009). The results indicated however that when other subjective well-being measures including life satisfaction, happiness and anxiety are examined among Blacks (which was made up of Black, African, Caribbean and Black British people) and Bangladeshis, they were found to have low satisfaction and higher levels of anxiety compared to the White ethnic group (Hicks 2013).

An alternative explanation for the variation may be due to the specific associations being investigated. In an assessment of the interplay between racism and a range of neighbourhood compositional factors, Astell-Burt et al. (2012) found that ethnic minority youths, in particular Ghanian/Nigerian boys and Indian Girls had better mental health relative to their White British counterparts after adjusting for age, socioeconomic position, racism and context.

Moreover, there may be inherent differences in the way that various ethnic groups assess their health, as well as measurement error arising from the way questions are posed or the response styles of these various ethnic groups (Van Herk, Poortinga, and Verhallen 2004; Marin, Gamba, and Marin 1992; Ross and Mirowsky 1984; Kam and Zhou 2014). However, the implications of these differences for both individual and public health mean that further studies in this area are warranted.

Inter-ethnic variation in life satisfaction

The literature demonstrates that inter-ethnic variations in health persist even in assessments using more subjective measures such as self-reported health and life satisfaction, which are indicators of morbidity and mortality (Kahneman and Krueger 2006; Idler and Benyamini 1997). Specifically, studies examining global assessments of life satisfaction that provide an overall evaluation of an individual's quality of life have revealed a disparity in life satisfaction among ethnic minority adults when compared to the majority population (Shields and Wailoo 2002; Burton and Phipps 2008; Knies, Nandi, and Platt). Furthermore, evidence from research on adult populations strongly suggests that lower life satisfaction is linked to various dimensions of individual and neighbourhood economic and social inequality (e.g. unemployment, income, deprivation, neighbourhood quality and resources, health, health care provision and services, among other factors) (Knies, Nandi, and Platt 2014; Shields and Wailoo 2002). A question arising from these findings is whether the effects are the same for young people. This dissertation seeks to answer this question, and examines life satisfaction because of its importance in research on the psychological well-being of young people.

There is a broad consensus in the literature that measures of life satisfaction cover a wide spectrum of individual functioning, capturing both positive and negative aspects of well-being (Gilman and Ashby 2003; Diener 2000; Proctor, Linley, and Maltby 2009). This stands in contrast to more traditional measures of psychological well-being, which have been criticised for lacking options for reporting positive feelings or behaviours and for focusing primarily on capturing the frequency and intensity of problems. Secondly, knowledge about more positive aspects of individual psychology may provide relevant information about factors that should be strengthened among

individuals, and that could potentially provide a buffer against the development of mental health problems (Veenhoven 1988). Finally, previous studies have found that life satisfaction is a predictor of future mental health problems (Lewinsohn, Redner, and Seeley 1991). In short, research into the determinants and stability of life satisfaction among different groups could reveal ways of creating a long-lasting positive impact on young people's mental health and might even provide guidance for the development of longer-term interventions to reduce the burden of mental ill-health over time.

A literature search revealed no studies in England and Wales exploring possible ethnic variation in life satisfaction and its relationship with the neighbourhood context among young people. This indicated the existence of a gap in the current scholarship that required further examination.

Ethnicity, health and neighbourhood composition

Numerous studies have highlighted the growing diversity of Britain (Simpson 2015; Jivraj and Simpson 2015b). Figures from the 2011 census indicate that young people aged 10-15 account for 7% of the population. This segment of the population is ethnically diverse: 82.4 % self-identify as White British, 8.3% as Asian, 5.5 % as Black, and 4.3 % as belonging to a Mixed ethnic category (Office of National Statistics (ONS), 2011). Consequently, there has been a strong interest in the political sphere, the media, and the scholarly literature in examining the effects of this diversification on individual outcomes in terms of the job and housing markets, employment, education, social cohesion, and social capital and its societal correlates (for e.g. crime, quality of neighbourhood facilities), among other things. There has also been renewed interest in the causes and consequences of ethnic inequalities in health as they relate to these

issues. It must be noted that some of this interest stems from a belief that this more diverse population is imposing a larger-than-expected strain on the resources of the National Health Services, leading to a shortage of resources (Casey 2016).

The interest in problematizing ethnic health differences has made questions regarding the ethnic composition of residential areas into a focal point in the growing societal debate among those who view place of residence as playing an integral role in health. On the one hand, ethnic residential segregation has been argued to be one of the main contributors to the poorer health outcomes of ethnic minority individuals (Williams and Collins 2001; Wilson 1996, 1987). For instance, residential segregation has been associated with socioeconomic deprivation, which correlates with the social and physical conditions of the neighbourhood, the quality and accessibility of facilities, physical deterioration, crime, risky behaviours (e.g. excessive alcohol consumption, smoking, and risky sexual behaviour) and unhealthy life styles, which have in turn been linked to various negative health outcomes (Turner 2009). According to these arguments, residential segregation can be seen as a cyclical process that perpetuates the conditions that adversely affect individuals' health.

On the other hand, since the seminal work of Faris and Dunham (1939)[3], proponents of the ethnic density hypothesis have suggested that the ethnic concentration of minorities buffers and protects individuals from adversities by mitigating some of the negative effects of being a minority such as racism and discrimination (Pickett and Wilkinson 2008; Bécares, Shaw, et al. 2012; Halpern and Nazroo 2000). Moreover, by living in areas with a high proportion of co-ethnics, residents are more likely to find established services that they need such as remittance agencies, a job market, rental and housing markets that cater to their needs, and services tailored to their native languages.

[3] They explored the relationship between the ethnic concentration of minorities in a given geography and the incidence of mental health disorders.

These neighbourhoods might also offer some sense of familiarity and community, and thereby mitigate some of the stressors often associated with migration/migrants, which in turn may lead to better health outcomes[4] (Pickett and Wilkinson 2008; Bécares, Shaw, et al. 2012; Bécares, Nazroo, and Stafford 2009).

This debate about the effects of neighbourhood ethnic concentration has gone on for decades, with both sides presenting evidence to support their claims. However, most investigations into these effects have yielded mixed results. For instance, while some researchers exploring the ethnic density hypothesis related to young people have identified a beneficial effect (Gieling, Vollebergh, and van Dorsselaer 2010; Wickrama and Bryant 2003; Zhang et al. 2017), at least one study indicated that this effect may be negative if the group is too large (Fagg et al. 2006), another found a generally negative effect (Abada, Hou, and Ram 2007), and others found no effect of ethnic density on young people's mental health (Xue et al. 2005; Astell-Burt et al. 2012).
Whether all the theoretical positions discussed above are plausible, inter-ethnic differences in health due to ethnic composition of place of residence could have important public health and public policy implications given the growing diversification of the British population. Additionally, neighbourhood characteristics (including ethnic composition) may have more significant effects on young people than on other age groups because they spend disproportionate amounts of time in their area of residence due to their relative immobility (Allison et al. 1999; Jackson and Mare 2007).

Area-level effects are estimated to account for 5-10% of the variation in health (Roosa et al. 2003). While this is relatively small compared to the effect of individual

[4] This may be particularly important for specific groups such as recent migrants, who are more at risk of homesickness and require more help to transition into their receiving countries (Alba and Foner 2016; Friedberg 2000). Ibid.

predictors, it is important to characterize the mechanisms responsible because of the sheer number of people at risk and the as-yet unknown long-term effects of childhood exposure to adverse conditions related to place of residence. Accounting for the varying compositions and conditions of the neighbourhoods in which young people reside could reveal significant gaps in our understanding of the mechanisms contributing to ethnic disparities in the mental health. Finally, if it were shown that the factors affecting the mental health and life satisfaction of young people differ from those for adults, it could confirm that applying adult findings to young people would yield misleading results.

Based on the theoretical assumptions and gaps in the literature discussed above, seven research questions were formulated to address the research aims of this thesis.

Research questions

(1) Is the relationship between neighbourhood socioeconomic deprivation, mental health difficulties, and life satisfaction mediated by neighbourhood social capital[5]?

(2) Is the relationship between neighbourhood socioeconomic deprivation, mental health difficulties, and life satisfaction moderated by neighbourhood social capital?

(3) To what extent might ethnic variations in mental health among youths be attributed to individual and family characteristics?

[5] In this study (Study I), six separate measures based on the parents' perceptions were used to capture various components of social capital at the neighbourhood level. These were worry about crime, social cohesion, the quality of the neighbourhood facilities and amenities, trust and cooperative norms, homogenous friendship networks and civic engagement. Similar usage may be found in earlier studies (Odgers et al. 2009; Edwards and Bromfield 2010; Aminzadeh et al. 2013; Drukker et al. 2005).

(4) To what extent are ethnic variations in mental health associated with neighbourhood composition and parental behaviour?

(5) Does ethnic density or neighbourhood socioeconomic status explain the inter-ethnic variation in life satisfaction across different ethnic groups?

(6) What is the effect of ethnic density and neighbourhood socioeconomic status on ethnicity-specific age trajectories in life satisfaction among ethnic minority youths?

(7) How stable are the effects of life satisfaction across ethnic minority youths over time when compared to majority White youths?

Materials and methods

Data

The research in this thesis drew on data from two sources. *Understanding Society*: *The UK Household Longitudinal Study* (UKHLS) (Institute for Social and Economic Research and National Centre for Social Research, 2015) and administrative data based on the 2011 UK census (ONS 2017).

The *individual-level data*, which include information on the young people, their parents and households, were taken from the UKHLS - an annual longitudinal household panel survey that began in 2009/2010 with a nationally representative, stratified, clustered sample of around 40,000 households and 70,000 individuals from across the UK (Knies 2017b).

The second source of data - the *neighbourhood-level measures* - were aggregated geocoded measures derived from the 2011 UK census at the middle super output area (MSOA) level. The Office of National Statistics provides geographical data at three

output levels - lower, middle, and upper. To assess neighbourhood effects for the purposes of this thesis, permission was requested and granted to link the UKHLS to aggregated measures collected at the MSOA level. As stated above, MSOAs was used to delineate neighbourhood boundaries because the use of lower geographic levels would increase the risk that specific individuals might be identified in the analysis, while higher output levels might not provide sufficient granularity to capture the shared experiences and social and/or physical contextual effects under study.

Ethical standards

Data access was granted through a Special Licence/Conditional Access Agreement by the UK Data archive and the data holder – the Institute for Economic and Social Research, Essex University – after completion of the requisite checks to ensure that the relevant ethical standards for data usage (which relate to issues such as anonymity and secure storage) would be fulfilled. A copy of the approved application for the data is available from the author on request. Further information regarding data access and ethical considerations regarding its use can be found at www.ukdataservice.ac.uk

Statistical analysis

Multilevel modelling techniques were used to achieve the aims discussed above. This approach made it possible to capture nested relationships within the data. The most prominent of these nested relationships was the hierarchical and dependent relationship between the repeated measurement occasions, the individual, and the neighbourhood. Using a multilevel model made it possible to account for the fact that the *UKHLS*

sampled young people from the same MSOAs and to thereby control for the similarities between these neighbourhoods while increasing the precision of the estimates.

Analytical Sample

The participants in the youth survey were drawn from households where adults were interviewed, and oral consent for their participation was obtained from their parents or guardians. The sample consisted of young people from these households who chose to complete a pencil-and-paper self-reported questionnaire. The survey data were derived from a longitudinal study, repeated survey responses were obtained from the same group of participants for a maximum of 5 years. However, some changes in the survey sample occurred due to listwise deletion of variables with missing information, attrition and new participants included in the survey. Attrition may have occurred across the waves because the survey team lost contact with a family who participated in an earlier wave, a young person decided not to respond the survey, or an individual initially classified as a youth (aged 10-15) was surveyed as part of the adult sample. New participants became eligible to participate in the youth survey when they turned 10 years old or when an eligible youth became a member of a household that was already a part of the survey.

The analyses presented in this dissertation were restricted to youths/young people, that is individuals aged 10-15 year old. The age range falls within the World Health Organization definition of 'young people', which covers the age of 10-24 (WHO 2018). This wide age range poses some challenges from a theoretical and analytical perspective. It is a period in the life stage, characterised by neurodevelopmental, psychological and social challenges, that could affect health. Furthermore, it is clear that as this group gets older the way in which they interact with the wider environment,

whether it be family, school or neighbourhood, is constantly evolving. For example, although 10 and 15 year olds are both similarly defined as youths, a 15 year old would have greater autonomy in their day-to-day interaction with their neighbourhood. This may in turn influence their health in ways, which are not applicable to the 10 year old. Controlling for age in the analyses should reduce the potential risk of bias.

Dependent variable

Three different outcome measures were selected to examine neighbourhood effects on the psychopathological development of young people: a measure of mental health and two separate measures of life satisfaction.

Mental health difficulty was measured using the responses provided in waves 1, 3 and 5 of the self-reported version of the Strengths and Difficulties Questionnaire (SDQ). At the time of application for data usage, only five waves of UKHLS data were available, spanning the period 2009/2010 to 2013/2014. However, participants are asked to complete the items relating to the SDQ on a rotating basis, i.e. every other wave, as such only three waves were included in the study.

The SDQ is a widely-used cross-nationally (Kersten et al. 2016; Goodman et al. 2011; Hoosen et al. 2018) and multi-ethnic (Richter et al. 2011; Mieloo et al. 2013) validated screening instrument that includes 25 items and five subscales suggested to capture four areas of potential difficulty (emotional symptoms, conduct problems, hyperactivity-inattention, peer relationship problems) and one area of strength (prosocial behaviour) (Goodman 1997; Goodman, Meltzer, and Bailey 1998). Respondents were able to identify the severity of their problems by choosing one option from a 3-point Likert scale, ranging from 0 (not true) to 2 (certainly true). The summed scores ranged from 0 to 40, with higher scores indicating greater mental health

difficulties. A list of the items used to create this measure may be found in Appendix A1.

An overall assessment of *life satisfaction*, was measured by a single item that asked respondents to choose from seven pictorial representations expressing greater or lesser levels of satisfaction with their life as a whole. Responses were reversed coded so that higher scores indicated greater life satisfaction.

The second measure of *life satisfaction* comprised six items measuring how satisfied respondents were with several aspects of their lives: their school work, appearance, family, friends, school, and life as a whole. Respondents were provided with depictions of more or less smiling faces, representing 1 (very satisfied) to 7 (not very satisfied).The measure ranged from 1 to 43, and was coded in a similar way to that of earlier studies (see for e.g. Knies 2017a), with higher scores indicating greater life satisfaction.

Although there are no studies that has specifically sought to examine the cross-cultural validity of the particular measures of life satisfaction used in this dissertation, both single and multi-item measures of life satisfaction has been widely used and accepted as an indicator of overall well-being (Van Praag, Frijters, and Ferrer-i-Carbonell 2003; Kahneman and Krueger 2006; Proctor, Linley, and Maltby 2009; Shields and Wailoo 2002; Diener 2000). As it relates to the multi-item measure of life satisfaction, the six items had a correlation ranging from r=0.25 to a maximum r=0.51, and which loaded onto a single factor (see supplementary appendix SA1). Moreover, the items had a relatively high internal consistency and reliability, as measured by the Cronbach's alpha (α=0.77), indicating that it was appropriate to sum the items to create a single summary scale.

Individual/family level variables

Based on the above descriptions of the proposed pathways and on prior research (See for e.g. Green et al. 2005; Meltzer, Gatward, Goodman, et al. 2000; Fagg et al. 2006; Astell-Burt et al. 2012; Maynard, Harding, and Minnis 2007; Maynard and Harding 2010; Harding et al. 2015), it is clear from a measurement/analytical perspective that there exists an intricate relationship between the individual/family measures, which would be difficult to exclude in any analysis of neighbourhood effects. As such, several of these measures were included as predictors/confounders in this dissertation.

In addition, several of the individual/family-level predictors included in the dissertation have been shown to be associated with the mental health and life satisfaction of young people, they were therefore included in the models as a means of reducing the risk of identifying spurious relationships between youth life satisfaction and neighbourhood characteristics (Webb et al. 2017; Knies 2017a; Proctor, Linley, and Maltby 2009; Bradshaw and Richardson 2009; Scott and Chaudhary 2003).

Further, as it relates specifically to Study 1, in order to examine whether social capita mediates and/or moderates the effect of socioeconomic disadvantage six separate measures of social capital were calculated at the neighbourhood level. These were measured as not worried about crime, social cohesion, the quality of the neighbourhood facilities and amenities, trust and cooperative norms, homogenous friendship networks and civic engagement and were based on parental perceptions of neighbourhood conditions and social processes. Similar usage can be found in earlier studies (Odgers et al. 2009; Edwards and Bromfield 2010; Aminzadeh et al. 2013; Drukker et al. 2005). The individual/family-level and neighbourhood variables included in the various analyses in are summarized in Table 1.

Table 1: Individual, parental/family and neighbourhood sociodemographic predictors

Variables	Type	Categories	Description & Notes	Study
Individual/family-level measures				
Youth Sex	Binary	Girl or Boy		*Study I, Study II, Study III*
Youth Cohorts	Categorical	199;1995;1996;1997;1998;1999	Derived from information provided on date of birth	*Study 1*
Youth Age	Continuous	10-15.	Derived from information provided on date of birth	*Study I, Study II, Study III*
Youth Ethnicity	Categorical	White; Mixed; Asians; Blacks; All other ethnicity	Self-identified ethnicity, was measured using the responses to a list of 18 ethnic identity categories, similar to those provided in the 2011 census.	*Study I, Study II, Study III*
Length of residency	Categorical	1 year or less; 2 - 3 years; 4-10 years; 10 years or more	Indicator for number of years residing in a given MSOA. Length of residency is calculated as date of survey minus the date each family moved into current residence. If an individual had always resided at their current address, time of residence equals age. After averaging the length of residency between parents, the variable is discretized.	*Study I, Study II, Study III*
Single parent households	Binary	Indicator for households that have a single registered parent	Household are coded as being a single parent household if the identity variable for either mother or father is missing.	*Study I, Study II, Study III*
Household income	continuous (log)/Categorical	Tertile 1; Tertile 2;Tertile 3		*Study I, Study II, Study III*
Parent's age	Continuous		Derived from information provided on date of birth	*Study II*
Parents highest education		No qualification; Other qualification; GCSE etc.; A-level etc.; Other higher degree; Degree; missing		*Study I, Study II, Study III*
Parents' mental well-being	Continuous	The scale ranges of 0 (low functioning) to 100 (high functioning).	Measured using the Mental Component Summary scales of the 12-item Short Form Health Survey (SF-12).	*Study I, Study II, Study III*

Parents' physical well-being	Continuous	The scale ranges of 0 (low functioning) to 100 (high functioning).	Measured using the Physical Component Summary (PCS) of the 12-item Short Form Health Survey (SF-12).	*Study II*
Parent's employment status	Binary	At least one parent employed or coded for all other employment statuses		*Study I, Study II, Study III*
Parents' Nativity	Categorical	Both parents UK born; One parent non-UK born; Both parents non-UK born		*Study I, Study II, Study III*
Parental behaviour	Categorical	Leisure time; Eat dinner; Talk about important matters; Praise; Cuddle; Involve youth in rule setting Shouting; Spanking or slapping	measured by a series of questions regarding the frequency of certain activities/behaviours undertaken between parents and their children; average parental behaviour	*Study II*
Neighbourhood level measures				
Overall ethnic density	Continuous	Higher proportion indicates higher proportion of ethnic minorities	The proportion of all the ethnic minority adults living in the respondent's MSOA. This was calculated for each ethnic group separately.	*Study II, Study III*
Co-ethnic density	Continuous	Higher proportion indicates higher proportion of individuals from the same ethnic minority	This is the proportion of all the individuals living in the respondent's MSOA who were of the same ethnic group. This was calculated for each ethnic group separately	*Study III*
Economically active	Continuous	Higher proportion indicates higher proportion of economically active labour market participants	Aggregate measure of the proportion of economically active participants in the labour market (aged 16-74) is an indicator of respondents' availability for employment, whether employed, actively looking for work, waiting to start a new job, available to start a new job, not employed or not seeking employment. It is calculated by dividing the number of economically active individuals in a MSOA by the total number of residents	*Study I*

Townsend index Deprivation	Continuous/Categorical	Higher scores indicated a greater level of socioeconomic deprivation within a given MSOA.	a measure of socioeconomic disadvantage consisting of four aggregate level variables gathered in the census: the percentage of households without access to a car or van; percentage of households with more than one person per room (overcrowding); percentage of households not owner-occupied (tenure); and the percentage of economically active residents who are unemployed, excluding students (Townsend et al., 1988)	*Study I, Study II, Study III*
Crime	Categorical	Higher scores indicated a greater risk of personal and material victimisation.	Aggregated measure created from responses to the 2011 census. The domain consists of the recorded crime rate for four major types of crime (burglary, theft, criminal damage and violence)	*Study II*
Living environment	Categorical	Higher scores indicated a greater deprivation of both the indoor and outdoor quality of the local environment within a given MSOA.	This measure was created from combination of four indicators (an assessment of social and private housing in poor condition, houses without central heating, air quality, road traffic accidents involving injury to pedestrians and cyclists) taken from the 2011 census.	*Study II*
English language proficiency	Continuous	Higher scores indicated a greater proportion of individuals within a given MSOA that are proficient at English even though English is not their mother tongue	This aggregated measure classifies individuals whose main language was not English according to their ability to speak English. The following categories were used: can speak English very well, can speak English well, cannot speak English well, or cannot speak English. Higher scores indicated the proportion of individuals in the neighbourhood proficient in English but for whom English was not their main language	*Study III*
Newly arriving immigrants	Continuous	Higher scores indicated a greater proportion of individuals who had migrated to England and moved into a particular area in the past 5 years.	An aggregated measure indicating the proportion of migrants residing in a given MSOA who had moved into the UK in the past 5 years	*Study III*

Routine/semi-routine workers	Continuous	Higher scores indicated a greater proportion of routine/semi-routine workers within a given MSOA.	Aggregated measure which was calculated based on responses to the 2011 census and derived from the National Statistics Socio-Economic Classification (NS-SEC), which provides an indication of socioeconomic position based on an individual's occupation	*Study III*
Not worried about crime	Continious	Higher scores indicated leass worry about crime.	This was measured using a single question, which asked respondents if [they] ever worry about the possibility, that [they], or anyone else who lives with you, might be the victim of crime? The initial variable was recoded into a dichotomous measure, where 1 was an indication of individuals who were not worried about being victims of a crime.	*Study I*
Social cohesion	Continuous	Higher scores indicated a greater sense of social cohesion within a given MSOA.	This was an aggregated area level measure created using individual responses to several items related to cohesiveness of the neighbourhood. The relationship between these measures were assessed using the Cronbachs alpha (α=0.86). The items included in the measure were: belong to neighbourhood; Local friends mean a lot; Advice obtainable locally; Can borrow things from neighbours;Willing to improve neighbourhood; Plan to stay in neighbourhood; Am similar to others in neighbourhood; Talk regularly to neighbours. Each included item was initially coded from 1 [strongly disagree] to 5 [strongly agree].	*Study I*
Neighbourhood facilities & amenities	Continuous	Higher scores indicated a greater perception that the standards of the neighbourhood facilities and amenities were of good quality.	This was an aggregated area level measure created using individual responses to several items related to the quality of the facilities and amenities at the neighbourhood level. These included the standard of: local services: primary schools; medical; shopping; leisure; secondary schools and local transport. The items have been coded from 1 [poor facilities] to 4 [excellent facilities], and the Cronbachs alpha was shown to be α=0.66.	*Study I*

Homogenous friendship network	Continuous	Higher scores indicating neighbourhoods with higher levels of perceived homogeneity in friendship networks.	This is an aggregated area level measure created using individual responses to several items related to the quality of the facilities and amenities at the neighbourhood level. These included the proportion of friends of similar age; education, job, income, local area, and family. Items 3, 4, 6, 7 range from 1 [less than half] to 4 [all similar] whilst Items 1, 2 and 5 range from 1 [none] to 5 [all similar]. The Cronbachs alpha for this measure was α=0.43.	*Study I*
Trust & cooperative norms (α=0.78)	Continuous	Higher scores indicated higher neighbourhood trust and cooperative norms	Aggregated standarddised mean level of trust and cooperation in s given MSOA as measured by the four following items: Close-knit neighbourhood; People willing to help their neighbours; People in this neighbourhood can be trusted. Several items in this measure were reversed coded (1, 2 and 3) in order to capture aspects that are more positive. All items ranged from 1 [strongly disagree] to 5 [strongly agree]	*Study I*
Civic engagement	Continuous	Higher scores indicated higher levels of participation within a given MSOA.	This was measured by a single question asking respondents about their membership or lack thereof in 16 types of organizations, including political, voluntary, professional, and recreational clubs. Responses were coded as a binary measure where 1 was equal to participation in at least organisation.	*Study I*

Note: MSOA: Middle super output area. Source UKHLS (2015) [Waves 1-5], Linked adult and youth questionnaire aggregated at the MSOA-Level data from 2011 UK Census.

To answer the research questions, three empirical studies were conducted.

Outline of studies

Study I

In the first study of this dissertation, I gathered empirical evidence from multilevel linear regression models based on a random sample of 10,559 young people across 2685 neighbourhoods who participated in waves 1, 3, and 5 of the UKHLS survey. This study examined the interplay between indicators of neighbourhood social capital, individual and neighbourhood socioeconomic deprivation, and their shared impact on the reported mental health and life satisfaction of young people aged 10-15 years residing in England and Wales. More specifically, I investigated whether neighbourhood social capital mediated and/or moderated the effects of socioeconomic deprivation on mental health and life satisfaction among young people.

This study adopted a broader perspective than *Study II* and *Study III.* The main reason for this was to investigate specifically the theoretical models of the effects of the neighbourhood on youth outcomes outlined by Leventhal and Brooks-Gunn (2000). Additionally, the impact of deprivation was investigated for both of the outcomes used in this study, and the initial results from these analyses suggested that there were significant ethnic differences. Therefore, more emphasis was given to disentangling the ethnic variations in mental health and life satisfaction in *Study II* and *Study II.*

Despite what might first be viewed as a more narrow perspective, *Study II* and *Study III* captured several aspects of the theoretical framework proposed by Leventhal and Brooks-Gunn (2000). By investigating the relationship between a broad range of indicators of neighbourhood composition as measured by socioeconomic

deprivation, crime and disorder, the living environment, ethnic density; parental characteristics and parental behaviours related to mental health and life satisfaction. These analyses however took a step further by exploring whether these effects were varied by ethnicity, and through in-depth assessment of the possible moderating effects of factors such as parental behaviours and ethnic density on these outcomes. The addition of ethnicity was also integral for investigating the observed social inequalities in mental health and life satisfaction in light of studies (Bécares, Nazroo, et al. 2012; Knies, Nandi, and Platt 2014) indicating that socioeconomic disadvantage was associated with mental health difficulties and low life satisfaction among adults from various ethnic minority groups, and that these groups are overrepresented in socioeconomically deprived neighbourhoods.

Study II

The focus of this study was somewhat narrower than that of *Study I*. Its purpose was to investigate the impact of neighbourhood composition (measured by socioeconomic deprivation, an indicator for crime, the living environment and ethnic density) and parenting behaviour on mental health difficulties in young people. As in *Study I*, individual-level geocoded data from waves 1, 3 and 5 of UKHLS were merged with small area aggregated data from the 2011 UK census. To examine the relationship between neighbourhood composition and mental health difficulties, three level multilevel linear regression models were fitted to a sample of 5,513 (7,302 observations) 10–15-year-olds of varying ethnicity residing in England and Wales. Despite the rapid growth in studies on the effects of the spatial concentration of ethnic minority groups within a given geography-so-called ‘ethnic density’ on mental health problems among adults, studies on these effects among young people remain sparse.

Moreover, of the studies that have examined these effects, few used a national representative sample that spans the age groups examined in this study; instead, several have used regional data based in large metropolitan areas such as London (see Fagg et al. 2006; Astell-Burt et al. 2012; Harding et al. 2015; Maynard and Harding 2010; Maynard, Harding, and Minnis 2007). The effects found in such studies may reflect 'urban effects' rather than true neighbourhood effects. Consequently, this study contributes to the literature by providing additional evidence for the relationships examined and the factors most relevant for the mental health of young people.

Study III

This third and final study in this dissertation explored the determinants and stability of reported life satisfaction among ethnic minority youths aged 10-15 years residing in England and Wales, and compared these findings with those for majority White youths. The research draws on the literature which implicates the high spatial concentration of ethnic minorities in a given area – 'ethnic density' effects and neighbourhood socioeconomic status on health. The analyses were conducted using data from the first five waves of the UKHLS merged with administrative data based on the 2011 UK census. Time trends, inter and intra-individual-level changes were examined using three-level multilevel growth models from data consisting of n=5,700 (12,468 observations) young people of varying ethnicities.

Like *Study II*, this investigation adopted a more narrow perspective to delve deeper into the development of psychopathological issues among the studied group. It was also intended to shed new light on how neighbourhood mechanisms impact young people across different ethnic groups in society. The heterogeneity of living

conditions across Britain's various geographies is readily apparent from even a cursory assessment, and this variation could potentially influence the health of different groups. This study can be seen as an extension of its predecessor: *Study II* which provided evidence about how the neighbourhood, individual/family characteristics, and parental behaviour may contribute to the observed inter-ethnic variations in mental health difficulties among young people. *Study III* has on the other hand sought to identify factors that might contribute to young people holding both negative and positive perceptions of their lives. Knowledge of the factors that influence young people positively could be used to design targeted interventions that would buffer them against these difficulties and protect them from perceived negative factors.

Study I

Neighbourhood socioeconomic deprivation and social capital influences on reported mental health difficulties and life satisfaction among young people: a multilevel study from England and Wales

Neighbourhood socioeconomic deprivation and social capital influences on reported mental health difficulties and life satisfaction among young people: a multilevel study from England and Wales

Abstract

This study investigated whether neighbourhood social capital mediated and/or moderated the effects of socioeconomic deprivation on mental health and life satisfaction among young people aged between 10 and 15 years old residing in England and Wales. The research draws on data from two sources: *Understanding Society: The UK Household Longitudinal Study* (UKHLS), and administrative data taken from the 2011 UK census. The analysis comprised three-level multilevel linear regression models from a random sample of 10,559 young people across 2,685 neighbourhoods who participated in waves 1, 3, and 5 of the UKHLS survey. The results revealed that the effects of social capital on deprivation depend on whether it is analysed in terms of mediation or moderation. Social capital attenuated the negative effects of socioeconomic deprivation on mental health and life satisfaction. Specifically, the effect of deprivation is reduced by homogenous friendship networks (bonding), civic engagement (bridging), and low average neighbourhood worry about crime (indicator of general trust). As a moderator, homogenous friendship networks and civic engagement buffered young people residing in more deprived neighbourhoods from greater mental health difficulties and low life satisfaction, whilst having little or no impact on those living in less deprived neighbourhoods. Taken together, these results suggested that social capital plays a role in transmitting the effects of neighbourhood deprivation on mental health and life satisfaction among young people. The empirical evidence also highlights the importance of cultivating various forms of social capital in the neighbourhood because different components of social capital appear to offer different benefits. Finally, the results presented here suggest that future studies should

consider the possible negative effects of social capital and that the effects of social capital may be non-linear.

Keywords: life satisfaction, mental health, social capital, socioeconomic deprivation, children and adolescents, young people, strengths and difficulties questionnaire (SDQ), England and Wales.

Introduction

There is a wealth of evidence indicating that the onset of common mental disorders, such as self-harming, personality disorders and attention-deficit disorders, usually begin at an early age and persist well into later life (Kessler et al. 2007; De Girolamo et al. 2012). The literature indicates that a growing number of young people, approximately 20% world-wide (WHO, 2016) and 10% in the UK (Green et al. 2005; Meltzer, Gatward, Goodman, et al. 2000), suffer from some kind of mental disorder. Consequently, mental health issues impose significant social and economic costs (Department of Health 2011; Davies et al. 2013). It is therefore important to understand the determinants of these patterns and the possible mechanisms influencing young people's mental health.

Research into factors influencing the psychological health and well-being of young people, and their successful transition to adulthood, may be more balanced and effective if it examines patterns and factors related to positive indicators of well-being as well as those associated with negative functioning. Whilst there is a clear public health need to study factors that adversely affect young people's mental health, it is equally important to identify factors that promote overall well-being and can potentially buffer and protect them from mental health difficulties. A measure of life satisfaction could provide such an indication, given its purported capacity to capture both the negative and positive aspects of individual well-being and psychological functioning. Furthermore, among young people, life satisfaction has been shown to be a predictor of mental health problems such as depression up to two years before diagnosis (Lewinsohn, Redner, and Seeley 1991).

Young people are exposed to many contextual factors, and their reported mental health and life satisfaction are affected by the collective contexts that shape these

interactions. Over the past two decades, a growing body of research has identified the neighbourhood as an important context for understanding and explaining observed health inequalities. Current theory identifies neighbourhood social capital as a variable that may plausibly explain the pathways through which deprivation at the area level influences the health of young people. However, few studies in the European context have investigated if, and to what extent social capital may mediate or moderate the effects of neighbourhood socioeconomic deprivation and its impact on the psychological well-being of adolescents (Some exceptions are De Clercq et al., 2012; Drukker, Buka, Kaplan, McKenzie, & Van Os, 2005; Odgers et al., 2009). This work addresses this gap in the literature by providing empirical evidence on whether the variation in social capital among neighbourhoods may explain the potential differences in mental health and life satisfaction among adolescents aged 10–15 residing in England and Wales. More specifically, two research questions were examined:

(1) Is the relationship between neighbourhood socioeconomic deprivation, mental health difficulties, and life satisfaction mediated by neighbourhood social capital?

(2) Is the relationship between neighbourhood socioeconomic deprivation, mental health difficulties, and life satisfaction moderated by neighbourhood social capital?

Defining Social Capital

In the past three decades, social capital has become an increasingly popular lens through which health disparities are investigated. It is also viewed as an important asset or set of resources, which could help with the promotion of improved health outcomes. Despite widespread usage, there is no consensus on a definition and the term is used to describe several interrelated and overlapping phenomena concerning social relations at both individual and neighbourhood levels (Coleman, 1988; Putnam et al., 1994). Social

capital is described as the resources of the social structures that are accessed and mobilized for purposive actions (Kim, Subramanian, & Kawachi, 2006) and is characterized by trust, civic engagement, community reciprocity, and a sense of belonging Putnam et al. (1994).

Another commonly used distinction in the social capital literature is between bonding versus bridging social capital, and both have been shown to influence health and well-being (De Silva, McKenzie, Harpham, & Huttly, 2005b; Gilbert, Quinn, Goodman, Butler, & Wallace, 2013; Kim et al., 2006; Stafford, De Silva, Stansfeld, & Marmot, 2008). These measures have particular importance for social support, and for mobilizing solidarity (Kawachi et al., 2008a).

Bonding is often measured in terms of the relationships between similar others, homogeneity and strong norms, examples of this type of capital is the relationship between family, friends and other close-knit groups. Bridging social capital, on the other hand, is often used to describe more heterogeneous group relationships measured through indicators of civic engagement and/or trust and cooperation between groups of dissimilar status and is generally more outward focused, examples of this type of relationship are those found among colleagues, or other members of certain group organisations.

One of the most notable disagreements in the social capital literature is whether it can be described as a property of the individual or the collective (Poortinga 2006). The current study adopts the approach of Coleman (1988), who suggests that social capital is a resource of social relations between families and communities. As such social capital, may be viewed as a reciprocal and complex relationship that is shaped both by the individual and the groups in which the individual is a member (De Silva, McKenzie, Harpham, & Huttly, 2005a).

Why and how social capital matters for health

Social capital has been hypothesised to be creator and facilitator of health in several ways (Szreter and Woolcock 2004; Halpern and Nazroo 2000). One mechanisms identified is the reduction of individual physiological responses to stress by influencing self-esteem and health beahviours (e.g. smoking, exercise, and health service utilization) (Berkman, Glass, Brissette, & Seeman, 2000). Another is the related to the idea that social capital buffers and protects individuals from adverse life events and risks that might negatively influence their health (Drukker et al., 2005; Ungar, 2011).

These mechanisms may operate directly and indirectly. Young people who possess their own social capital (Morrow, 1999; Weller & Bruegel, 2009), for instance based on their social media networks or through participation in sporting activities and other voluntary organisations, accrue direct benefits. However, these may operate in ways that this study was not able to capture due to a lack of measures.

As an indirect recipient of social capital, parents play a vital role in the development and facilitation of their children's capital, by providing them with access to a wider social context (Leventhal & Brooks-Gunn, 2000; Roosa, Jones, Tein, & Cree, 2003). For instance, they may be the recipient's neighbourhood level of social capital. By residing in neighbourhoods with higher levels of certain aspects of social capital, residents may be better able to organize and create opportunities for acquiring, improving and maintaining facilities that are linked to, and important for health such as housing education and health care.

Furthermore, as an indirect recipient of social capital, they may also derive benefits from neighbourhood social capital by participating in networks through which they may obtain support, encourage, and/or benefit from the transference of knowledge

directly by gaining contact through their parents social networks (Edwards and Bromfield 2010; Aminzadeh et al. 2013; De Clercq et al. 2012).

Mediators of social trust, such as worry about crime, deter residents from actively partaking in outdoor activities or having the opportunity to participate in wider community activities. These activities would for example be more likely to occur within neighbourhoods with no worry about crime. Therefore, neighbourhoods characterised by social trust, social cohesion and worry about crime, might affect the residents opportunity for participation in these activities and as a consequence their health (Sampson, Raudenbush, and Earls 1997).

Social capital influences the health of young people through its interaction with wider social, political, economic and environmental determinants of health. The evidence indicates that identical socioeconomic conditions may affect the health of adolescents differently depending on individual circumstances, as well as, the amount of social capital to which they are exposed (De Clercq et al., 2012; Drukker et al., 2005; Kerri et al., 2013; Vyncke et al., 2013). Indeed, prior studies found that social capital mediated the negative effects socioeconomic deprivations; after taking into account individual, family and neighbourhood characteristics individuals residing in these neighbourhoods reported better mental health outcomes (De Silva et al., 2005a; Kerri, Kerr, Cheater, & Morgan, 2013).

Several studies indicate that the impact of social capital is not equally distributed. For instance, Drukker et al. (2005) found that the interaction between social capital and higher levels of deprivation was associated with lower levels of perceived health. When indicators of mental health are examined, the quantity and quality of young people's social network was associated with fewer internalising problems but these results varied by neighbourhood deprivation (Kerri et al. 2013). Similarly, there is some

evidence that factors that are protective in lower risk contexts may not be as powerful in contexts of extreme risks. In fact, several studies have found that some protective factors are diminished in the context of severe disadvantage (De Clercq et al., 2012; Vanderbilt-Adriance & Shaw, 2008). It is therefore important to determine whether protective factors work similarly across levels of neighbourhood disadvantage or whether the benefits are limited to specific contexts.

Theoretical framework

From a theoretical perspective, parental social capital has been suggested to be an intermediate measure in the relationship between social capital and youth health outcomes (Leventhal and Brooks-Gunn 2000; Roosa et al. 2003). Parental social capital may influence the values, attitudes and attributes of parents that will ultimately affect youth outcomes. This type of capital may be especially important at the neighbourhood level. This is because parents are better placed to affect social and structural changes, which in turn, may affect factors such as the quality of schools, street lighting, and other facilities, and which then have important consequences for the development of young people. In line with this, Leventhal and Brooks-Gunn (2000) proposed several models to explain these relationships.

The first of these, they referred to as the institutional resources model and this outlines how material conditions in the neighbourhood influences the accessibility, availability and quality of vital services and facilities. They posit that the combination of these factors together with individual, family and the characteristics of the neighbourhood affect young people's health. This model suggests further that the physical and psychosocial conditions of the neighbourhood are intricately linked due to factors such as selective sorting into neighbourhoods. In this study, institutional

resources are conceptualised as (a) the quality of neighbourhood facilities (schools, leisure, shopping, medical, and transport), and (b) worry about crime in the neighbourhood (Aminzadeh et al., 2013; Flouri, Midouhas, Joshi, & Sullivan, 2015; Sampson, Raudenbush, & Earls, 1997). These resources are commonly referred to in the literature and have been shown to be an important mediator of social trust (Putnam, 2007; Sturgis, Brunton-Smith, Read, & Allum, 2011) and social cohesion respectively (Drukker et al. 2005)

The second model proposed by Leventhal and Brooks-Gunn (2000) norms and collective efficacy model suggests that neighbourhood socioeconomic deprivation erodes the relationships needed to produce and facilitate the growth of social capital within a neighbourhood, and this in turn affects youth outcomes (Leventhal & Brooks-Gunn, 2000, 2001). Evidence that socioeconomic disadvantages may undermine social capital is demonstrated by research showing a social gradient in the patterning of social capital, whereby low individual socioeconomic status is associated with low levels of civic engagement and communal participation, less diverse social networks and weaker social support (De Clercq et al., 2012; Marmot, 2004). In this work, norms and collective efficacy are conceptualized as (a) trust and cooperative norms, (b) social cohesion, (c) civic engagement, and (d) friendship networks.

Hypotheses

Based on the above discussion, and the research questions outlined, the current study considers two pathways (mediation and moderation) through which neighbourhood social capital might influence the relationship between neighbourhood socioeconomic deprivation and mental health difficulties and low life satisfaction among young

people. Figure 1, provides an illustration of the models examined. In addition, a brief discussion of the contribution of each of these models.

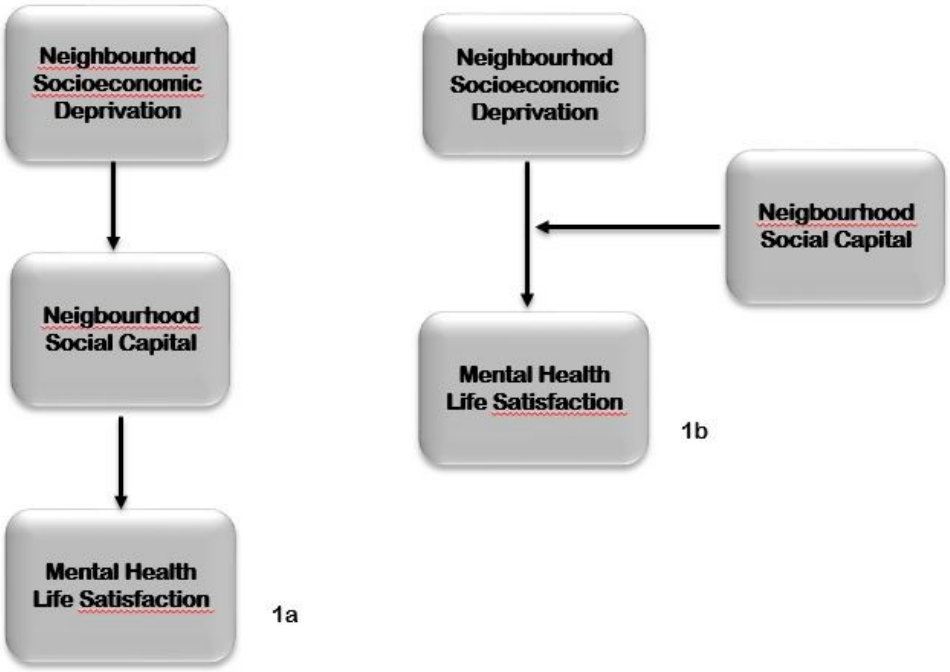

Figure 1: Conceptual models of the influence of neighbourhood social capital as (a) mediator of neighbourhood deprivation (b) a moderator of neighbourhood socioeconomic deprivation on reported mental health and life satisfaction among young people (aged 10-15)

The model depicted in Figure 1a assumes that deprivation is mediated by neighbourhood social capital. Mediation effects are determined by whether the magnitude or sign in the variable of interest increases or decreases when additional predictors are included in the model. By doing so, evidence on whether neighbourhood social capital explains variations in mental health and life satisfaction of young people might be obtained.

Figure 1b assumes however, that deprivation is moderated by neighbourhood social capital. The moderation effects, refers to the multiplicative (interaction) effect of neighbourhood social capital and deprivation on the mental health and life satisfaction

of young people. By investigating moderation effects, it is possible to explore the differential influence of social capital, given various levels of neighbourhood socioeconomic deprivation. Moderation models of social capital may provide insights into how social intervention programmes may be best designed to target groups most in need. The three hypotheses tested are outlined below.

Hypothesis 1: High levels of neighbourhood social capital protects (mediation) young people from mental health difficulties and low life satisfaction by mediating the effects of living in more socioeconomically disadvantaged neighbourhoods.

Hypothesis 2: High levels of neighbourhood social capital buffers and protects (moderation) adolescents from mental health difficulties and low life satisfaction by moderating the effects of living in more socioeconomically disadvantaged neighbourhoods.

Over and above, these hypotheses we also considered the effect of deprivation at varying levels of social capital through an examination of the marginal mean effects at representative values. This therefore leads us to the third and final hypothesis.

Hypothesis 3. High levels of neighbourhood social capital have a weaker effect on the mental health and life satisfaction of young people living in less deprived neighbourhoods.

It is important to note that while this discussion focuses on two conceptual models, there is also a third and very real possibility that mental health, life satisfaction and social capital share a common cause: neighbourhood socioeconomic deprivation. However, such a model would be empirically indistinguishable from the model proposed in figure 1a, this was therefore was not considered further.

Methodology

Data and study sample

Data for this analysis were drawn from multiple sources. Individual-level data were taken from waves 1, 3, and 5 of *Understanding Society*, the *UKHLS* (University of Essex – Institute for Social and Economic Research 2015), while neighbourhood-level data were based on geocoded administrative data collected in the 2011 UK census (ONS 2017).

Individual data: The *UKHLS* is an annual longitudinal household panel survey that started in 2009, with a nationally representative and stratified cluster sample of around 40,000 households living in the United Kingdom. Within households where adults were interviewed, oral consent was obtained from parents and/or guardians for household members aged 10–15 to complete a self-reported questionnaire. The sample for this study therefore consisted of children of adult panel members, for whom parental consent to participate was granted, and who responded to the questionnaire (Knies 2017b).

Neighbourhood data**:** Neighbourhood data were derived from geocoded, census-defined small area statistics at the so-called middle super output area (MSOA) level. MSOAs have a minimum residential size of 5,000 individuals and 3,000 households, with an average population size of 7,500. The use of MSOAs made it possible to link aggregated area-level variables taken from the 2011 census to the *UKHLS*.

Despite the widespread usage of MSOAs to delineate neighbourhood geographic boundaries in academic studies from across the UK, this measure was created with a particular purpose in mind. This means that the 'artificial' delineation may not accurately capture or measure all the aspects relevant to how people live. Using MSOAs could limit for instance measures such as social capital used in this study. As

such, lower geographic measures could potentially lead to stronger effects. However, this was the lowest level of aggregation permissible for this study due to concerns surrounding the identification of study participants.

Final sample: The final analytical sample for this study was an unbalanced panel consisting of 10,559 young people (i.e. children aged between 10-12 years old and adolescents 13-15 years old) clustered in 2,685 neighbourhoods. Changes in the survey sample arose because of list-wise deletions due to internal data missing on relevant variables, attrition and new participants included in the survey. Attrition may have occurred across the waves because: (a) the survey team lost contact with a family who participated in an earlier wave; (b) a young person deciding not to respond to the survey; (c) or an individual classified initially as being a youth (aged 10-15) became ineligible to participate in the survey as a part of the youth panel (i.e. turned age 16). Sample changes also occurred when younger children became eligible for inclusion upon reaching the age of 10 and thus entered the youth panel, and when children of an appropriate age joined households participating in the survey.

Dependent variables

Two dependent variables were assessed from data available at the time of the study. The first, *Mental health difficulty* was measured using the responses provided in waves 1, 3 and 5 of the self-reported version of the Strengths and Difficulties Questionnaire (SDQ). At the time of application for data usage, only five waves of UKHLS data were available, spanning the period 2009/2010 to 2013/2014. However, participants are asked to complete the items relating to the SDQ on a rotating basis, i.e. every other wave. As such, only three waves were included in the study.

The SDQ is a widely-used, cross-nationally (Kersten et al. 2016; Goodman et al. 2011; Hoosen et al. 2018) and multi-ethnic (Richter et al. 2011; Mieloo et al. 2013) validated screening instrument that includes 25 items and five subscales suggested to capture four areas of potential difficulty (emotional symptoms, conduct problems, hyperactivity-inattention, peer relationship problems) and one area of strength (prosocial behaviour) (Goodman 1997; Goodman, Meltzer, and Bailey 1998). Respondents were able to identify the severity of their problems by choosing one option from a 3-point Likert scale, ranging from 0 (not true) to 2 (certainly true). The summed scores ranged from 0 to 40, with higher scores indicating greater mental health difficulties. A list of the items used to create this measure may be found in Appendix A1.

The second dependent variable, an overall assessment of *life satisfaction*, was measured by a single item that asked respondents to choose from seven pictorial representations expressing more or less satisfaction with ones life. Similar to other studies, responses were reversed coded so that higher scores indicated greater life satisfaction (see for e.g. Knies 2017a; Shields and Wailoo 2002). This particular measure of life satisfaction has not been cross-culturally validated. But, single-item measures of life satisfaction has been widely used and accepted as an indicator of overall well-being both among adults and young people (Van Praag, Frijters, and Ferrer-i-Carbonell 2003; Kahneman and Krueger 2006; Proctor, Linley, and Maltby 2009; Shields and Wailoo 2002; Diener 2000)

Individual and family measures

Indicators previously shown to be related to young people's mental health and life satisfaction (youth age, gender and ethnicity), alongside the socioeconomic and

demographic characteristics of their parents were included in the models (Meltzer, Gatward, Goodman, et al. 2000; Green et al. 2005; Fagg et al. 2006; Webb et al. 2017; Maynard, Harding, and Minnis 2007; Astell-Burt et al. 2012). The parental measures included were: lone parent households; household income in tertiles; parents' nativity; at least one parent in the household working; length of residency in the neighbourhood; parents' highest education; and parental mental health (see SF-12 , Appendix A2), where a zero score indicates the lowest level of health and 100 indicates the highest level of health. Earlier studies have indicated that these parental characteristics may predispose families to live in particular neighbourhoods (Fagg et al. 2006; Stansfeld et al. 2004; Maynard, Harding, and Minnis 2007; Astell-Burt et al. 2012) and may influence their relationship with the wider neighbourhood environment, as such controlling for these factors should reduce somewhat selection bias (Van Ham et al. 2012) .

All parental variables were averaged between the two parents, with the exception of education, where an indicator for the parent with the highest level of educational attainment was included in the models. If a child resided in a single-parent household, then the information for that parent is used. Across all the waves, 92% of this information came from the mothers. Finally, an indicator for time of data collection (*wave*) was included in the models.

Neighbourhood measures

Social capital

This was measured at wave 3 of the UKHLS survey and was based on six separate indicators of the parental perceptions of various aspects of social capital within their neighbourhoods. The measures were created by aggregating the standardized mean

responses at the neighbourhood level (i.e. within each MSOA), and was coded so that each indicator coded reflected higher levels of social capital. Further given that each indicator represented the aggregated score across each MSOA, they may be considered as the average social and physical resources available in the neighbourhood. Similar operationalisation of social capital may be found in earlier studies (Odgers et al. 2009; Edwards and Bromfield 2010; Aminzadeh et al. 2013; Drukker et al. 2005).The measures were as follows:

Not worried about crime: was measured using a single question, which asked respondents if they ever worry about the possibility, that they, or anyone else who lives with [you], might be the victim of crime? The initial variable was recoded into a dichotomous measure, where 1 was an indication of individuals who were not worried about being victims of a crime. After averaging this measure across all the neighbourhoods, the scale ranged from 0 to 1 (mean = 0.52, *SD* = 0.22), with respondents less worried about being victims of crime reporting higher scores.

Quality of the neighbourhood facilities and amenities: was measured by assessing the standard of six local services: primary schools, secondary schools, medical services, shopping, leisure and local transportation. Responses were scored on a four point scale ranging from 1 [poor facilities] to 4 [excellent facilities]. The Cronbach's alpha indicated a relatively high internal consistency ($\alpha = 0.66$) and averaging across neighbourhoods gives a scale that ranges from -0.75 to 0.53 (mean = -0.01; SD = 0.14). Higher scores indicated a greater perception that the standards of the neighbourhood facilities and amenities were of good quality.

Social cohesion: was measured using the responses to 8 items which asked respondent to indicate the degree to which they agree with statements related to how they feel about their neighbourhoods. In particular, respondents were asked about their feelings of

belonging; friendships and associations; the possibility of getting advice; borrowing things and exchanging favours; willingness to work together to make improvements; plans to remain a resident; similarity with respect to others and, the frequency that they stopped and talk with people. Responses were scored on a five point scale ranging from (1= strongly agree to 5 = strongly disagree). Together the correlation between the items (ranged from r = .27 to r = 0.65) and the relatively high Cronbach's alpha for internal consistency (α=0.86) implied that there was a single underlying latent factor that could be termed social cohesion. All the items were reverse coded and an overall score was then calculated for each MSOA, the sum of which ranged -0.38 to 0.44 (mean = 0, *SD* = 0.07) with higher scores indicating greater average neighbourhood social cohesion.

Trust and cooperative norms: was measured using the responses to four items asking respondents to indicate the degree to which they agree with several statements about their neighbourhoods. These were, if they thought that they resided: (a) in a close-knit neighbourhood; (b) in a neighbourhood where people were willing to help each other; (c) in a neighbourhood where people can be trusted and; (d) in a neighbourhood where people don't get along with each other. Responses were scored on a five point scale ranging from (1 = strongly disagree to 5 = strongly agree). All items were recoded to indicate positive relationships. The four items ranged from -0.71 to 0.73 (mean = -0.01, *SD* = 0.14) with a Cronbach's alpha for internal consistency (α = 0.78). Higher scores in this measure reflected higher neighbourhood trust and cooperative norms.

Homogenous friendship network: was captured using a measure of the similarity of the respondent's networks with respect to age, ethnicity, occupation, education, income, proportion of friends residing locally, and the proportion who were family members. The measure ranged from -1.48 to 1.36 (mean = -0.03, *SD* = 0.24) and an assessment of the reliability and internal consistency of the items indicated a moderately low

Cronbach's alpha of (α=0.43), with higher scores indicating neighbourhoods with higher levels of perceived homogeneity in friendship networks.

Civic engagement: was measured by a question asking respondents about their membership or lack thereof in 16 types of organizations, including political, voluntary, professional, and recreational clubs. Responses were coded as a binary measure where 1 was equal to participation in at least one organisation. Average civic participation ranged from 0 to 1 (mean = 0.46, *SD* = 0.23), with higher scores indicating neighbourhoods with higher levels of perceived civic engagement.

Both worry about crime and the quality of the neighbourhood facilities and amenities are often used in the literature and have been shown to be important mediators of social trust (Sturgis et al. 2011; Putnam 2007) and social cohesion respectively (Drukker et al. 2005).

Socioeconomic deprivation

This was measured using two indicators, (a) the *Townsend deprivation index* and (b) the *proportion of economically active individuals in a neighbourhood*. The Townsend deprivation index was created using census data aggregated at the middle super output area level and consists of four measures aimed at capturing the material conditions of a given area. These measures were: the percentage of households without access to a car or van, percentage of households with more than one person per room (overcrowding), percentage of households not owner-occupied (tenure) and the percentage of economically active residents who are unemployed, excluding students (Townsend, Phillimore, and Beattie 1988). Higher scores indicate higher levels of deprivation. The proportion of economically active participants in the labour market (aged 16-74) is an indicator of respondents' availability for employment, whether

employed, actively looking for work, waiting to start a new job, availability to start a new job, not employed or not seeking employment. It is calculated by dividing the number of economically active individuals in an area by the total number of residents (ONS Census 2011b).

Whilst the Townsend index, provides an overall measure of the socioeconomic conditions of the neighbourhood, the proportion of unemployed individuals within a given neighbourhood is a reflection of a single economic status, and one, which may be temporary. Further, earlier studies have found that parental unemployment is significantly related to the psychological well-being of young people (Powdthavee and Vernoit 2012).

An examination of the correlation between the Townsend deprivation index and the proportion of economically active individuals showed that these measures were moderately correlated r=-0.53 (p-value 0.000). As such, it seems that the positive association found between mental health and the proportion of economically active individuals appears to be explained by the fact that, within deprived neighbourhoods, there is a high proportion of job seekers and underemployed individuals.

Statistical analysis

In order to account for the hierarchical nature of the data, and to avoid an underestimation of the standard errors while improving precision in the estimates, three-level multilevel linear regression models were fitted. In its simplest form, the models are represented by the equation below:

$$y_{ijk} = \beta_0 + \beta_1 X_{1ijk} + \beta_2 X_{2j} + \beta_3 X_{3k} + v_k + u_{jk} + e_{ijk} \qquad (1)$$

where youth-waves *ijk* are nested youth *jk* who are in turn nested in neighbourhoods *k*. v_k and u_{jk} are neighbourhood and individual random intercepts which like the

individual-wave error term e_{ijk} is normally distributed with the mean 0 and standard deviation σ_v^2, σ_u^2, and σ_e^2 respectively. These models were however extended to allow for the fixed slope to vary across neighborhoods and among youths.

The multilevel models used in this study accounted for the fact that the data consisted of repeated measures (from waves 1, 3 and 5) of reported mental health and life satisfaction (level 1) for young people (level 2) clustered within neighbourhoods (level 3). Applying this type of multilevel model meant that one is able to partition and explain the variation within-individuals over time, between-individuals and between neighbourhoods. Moreover, by using a multilevel model, we can account for the fact that the *UKHLS* sampled young people from the same MSOAs, and thus control for the similarities in these neighbourhoods while increasing the precision of the estimates. An additional benefit is controlling for the correlation between the repeated responses among the same individual. The models outlined in Table 1 were analysed sequentially and separately for mental health and life satisfaction.

Table 1: Summary of main models tested.

Model	Specification
Model 1	Wave [b]
Model 2	Model 1 + covariates [c]
Model 3	Model 2 + socioeconomic deprivation (per MSOA) [d] + proportion economically active (per MSOA)
Model 4	Model 3 + social capital [e]
Model 5	Model 4 + social capital interacted with neighbourhood deprivation

[a] For all models, random intercepts and slopes are specified at both the neighbourhood and youth levels with covariance so that the intercept and slopes can be correlated.
[b] Wave indicates the data collection period (wave 1=2009, wave 3=2011, wave 5=2013).
[c] Youth age, gender, ethnicity; lone parent households; household income in tertiles; parents' nativity; at least one parent in the household working; length of residency in the neighbourhood; parents' highest education; parental mental health.
[d] Measured using the Townsend deprivation index.
[e] Measures of social capital: Worried about crime ; social cohesion ; neighbourhood facilities & amenities ;Friendship networks ; trust & cooperative norms ; civic engagement

Model 1: assesses the within and between associations related to mental health and life satisfaction over time.

Model 2: is the same as above, and it assessed whether the individual/family predictors was associated with mental health and life satisfaction.

Model 3: was the same as model 2 and assesses whether over and above the individual/family predictors, neighbourhood deprivation was associated with mental health and life satisfaction.

Model 4: was the same as model 3, except that its fixed part includes the effect of parental perception of neighbourhood social capital. This model estimates whether social capital is significantly associated with the mental health and life satisfaction of young people. In addition, one is able to determine whether the inclusion of social capital mediates the impact of deprivation on mental health and life satisfaction.

Model 5: was the same as model 4, except that its fixed part includes an interaction between parental perception of neighbourhood social capital and deprivation. This model estimates therefore the extent to which neighbourhood-level social capital moderates the effect of deprivation on the mental health and life satisfaction of young people.

Marginal means

In addition to the above analysis, the estimated marginal mean effects at representative values was investigated to determine the impact of average parental perceptions of neighbourhood social capital on deprivation, and whether this explained the variations in mental health and life satisfaction. These models examined the effect of deprivation on mental health and life satisfaction when a given measure of social capital was

approximately 20%, 40%, 60% and 80% respectively of the responses in a neighbourhood. The results of these models are presented graphically.

Marginal means provide a measure of the change in a given outcome as a function of a change in a given predictor(s), when the other covariates are held at their means (Cameron and Trivedi 2005). It is suggested that this provides a more substantive and practical explanation of the relationship between various measures (Williams 2012). Instead of simply presenting an indication of whether the relationship between measures are significant or non-significant marginal means offers a broader explanation of the observed relationships.

Sensitivity analyses

The hierarchical multilevel model used in this analysis was the more parsimonious of two models. Because some the sample members moved to new neighbourhoods between the data collection periods, the data structure could be considered cross-classified. Sensitivity analyses indicated that approximately 3% (160) of sample had moved between waves. However, an examination of the impact of these moves indicated that they had a negligible effect on the magnitude and strength of the results obtained using the three-level hierarchical model. Therefore, results obtained with the more parsimonious model are shown.

Beyond the models described above, additional models were tested to evaluate if the model outcomes differed significantly when, each of the six social capital measures were modelled separately (models not shown here but available upon request). These results did not differ significantly from those shown.

Results

Descriptive results

Descriptive statistics for the individual, family and neighbourhood predictors are presented in Table 3. The majority of sample participants were White (63%), Asian (11%) or did not include their ethnicity (16%), were on average 12.5 (SD=1.7) years old, and were almost equally spread across the three cohorts studied. The social, economic and demographic profile of the majority of parents was a GCSE-level education, at least one of them employed, residents in their given neighbourhood for 10 years or more, born in the UK and generally had good mental health. The average neighbourhood deprivation and proportion economically active values were relatively low at 0.57 and 0.69, respectively, but with wide variation across neighbourhoods.

Table 2: Individual, family and neighbourhood characteristics for the total sample and the sample at each wave

Unweighted n(%)	Total sample (n=10,559)		Wave 1 (n=4,171)		Wave 3 (n=3,509)		Wave 5 (n=2,879)	
Individual level measures								
Youth is a girl	5,268	49.9	2,102	50.4	1,758	50.1	1,410	48.91
Youth cohorts								
1999	1,688	15.9	667	15.9	564	16.1	457	15.9
1998	1,707	16.2	692	16.6	541	15.4	474	16.5
1997	1,833	17.4	688	16.6	618	17.6	527	18.3
1996	1,788	16.9	720	17.3	590	16.8	478	16.6
1995	1,803	17.1	697	16.7	617	17.6	489	16.9
1994	1,740	16.5	707	16.9	579	16.5	454	15.8
Youth ethnicity								
White	6,636	62.9	2,643	63.4	2,217	63.2	1,776	61.7
Mixed	466	4.4	193	4.6	149	4.3	124	4.3
Asian	1,203	11.4	541	12.9	360	10.3	302	10.5
Black	599	5.7	292	7.0	175	4.9	132	4.6
All other ethnicity	55	0.5	19	0.5	26	0.7	10	0.4
Missing	1,600	15.6	483	11.6	582	16.6	535	18.6
Single parent household	2,680	25.4	1,133	27.2	859	24.5	688	23.9
Parent's nativity								
Both parents UK born	8,019	77.6	3,142	77.5	2,696	78.3	2,181	77.0
1 parent non-UK born	1,193	11.6	428	10.6	419	12.2	346	12.2
Both parents non-UK born	1,118	10.8	486	11.9	328	9.5	304	10.7
Parent's highest education								
No qualification	689	6.5	374	8.9	197	5.6	118	4.1
Other qualification	644	6.1	312	7.5	194	5.5	138	4.8
GCSE etc	2,144	20.3	878	21.1	711	20.3	555	19.3
A-level etc	2,085	19.8	775	18.6	728	20.8	582	20.2
Other high degre	1,592	15.1	658	15.8	506	14.4	428	14.9
Degree	3,145	29.8	1,053	25.3	1,093	31.2	999	34.7
Missing	260	2.5	121	2.9	80	2.3	59	2.1
Length of residency								
1 year or less	326	3.5	302	7.5	18	0.6	6	0.3
2 - 3 years	720	7.7	474	11.8	222	7.7	24	1.0
4-10 years	3,996	42.9	1,672	41.6	1,292	44.7	1,032	43.1
10 years or more	4,264	45.8	1,57	39.1	1,361	47.0	1,333	55.7

Parents' mental well-being M(SD) [range]	9,909	48.5(9.1) [0/71.6]	4,029	48.9(9.5) [3.0/69.7]	3,221	48.1(8.9) [0/71.6]	2,659	48.1(8.8) [9.0/69.3]
At least one parent works	8,500	82.3	3,175	78.2	2,857	83.0	2,468	87.2
Household income								
Tertile 1	3,520	33.3	1,759	42.2	1,005	28.6	756	26.3
Tertile 2	3,521	33.4	1,336	32.0	1,212	34.5	973	33.8
Tertile 3	3,518	33.3	1,076	25.8	1,292	36.8	1,15	39.9
Neighbourhood level measure								
Economically active M(SD) [range]	10,559	0.69(0.06) [0.32/.88]	4,171	0.69(.06) [.32/.87]	3,509	0.69(.06) [.32/.86]	2,879	0.69(0.57) [0.44/0.86]
Townsend Deprivation M(SD) [range]	9,815	0.57(2.31) [-2.59/9.22]	3,899	0.72(2.39) [-2.59/9.22]	3,247	0.46(2.25) [-2.59/9.22]	2,669	0.46(2.26) [-2.59/9.22]

Source: UK Household Longitudinal Survey (2015) [waves 1, 3, and 5]. Linked adult and youth questionnaire with aggregated MSOA-level data from the 2011 census.

Mental health

Table 3 presents the regression coefficients (standard errors) for the association between socioeconomic deprivation, social capital and the reporting of mental health difficulties among young people. Based on the intra-class correlation (ICC) - a measure of dependency in clustered data - the results from Model 1 showed that most of the variation in mental health was at the youth level. The ICC indicated that 62% of the stable variation could be attributed to the individual while 11% could be attributed to the neighbourhood. This indicated further that a substantial proportion of the variation (approximately 27%) had not been accounted for in this model. Logically it can be assumed that this was a combination of inter- and intra-individual changes in mental health among young people over time, and that it might be the result of normal fluctuations, measurement error and/or random noise. This variation remained unexplained because in later models, even after full adjustment for the individual and family-level predictors and neighbourhood deprivation, most of the within-individual (61%) and between-neighbourhood (10%) variation remained.

An examination of the fixed effects (Models 2) showed that in comparison to White youths, Asian and Black youths had significantly better mental health. Young people who have at least one parent who is non-UK born, parents who reported a high mental functioning, residing in a neighbourhood for 10 years or more were associated with better mental health. The results indicated further that the average reports of mental health difficulty was not significantly different at each data collection point. However, significant increases in the reporting of mental health difficulties by cohorts over time were seen, with older cohorts more likely to report greater mental health difficulties. In addition, a negative correlation was found between the intercept and slope at both the youth and neighbourhood levels, suggesting that both young people and

neighbourhoods with better mental health at the baseline tended to show the most deterioration over time.

With regards to the neighbourhood effects, the results indicated that the conceptual models (Figure 1a and Figure 1b) and the proposed hypotheses that social capital at the neighbourhood level would mediate or moderate the negative effect of area level deprivation on mental health were partially confirmed by the results. This was because only two of the six measures significantly related to mental health.

The results of the mediation model, which assesses if social capital buffers young people residing in deprived areas from mental health difficulties (Hypothesis 1, Model 4), demonstrated that some indicators of social capital matter for the mental health of young people. In particular, the results indicated that neighbourhood civic engagement and homogenous friendship networks attenuated the effects of deprivation. All other social capital measures were non-significant.

The hypothesis that parental social capital was a moderator for deprivation was also partially borne out by the current results (Hypothesis 2, Model 5). The results from this model indicated an inverse relationship between civic engagement and deprivation. Showing that, at low levels of deprivation, civic engagement and homogenous friendship networks were associated with increased mental health difficulties. Although at high levels of deprivation these measures of social capital were associated with better mental health, they did not fully compensate for residing in areas of greater deprivation.

Table 3: Multilevel linear models investigating the mediating and moderating role of neighbourhood social capital on mental health difficulties among young people aged 10-15 years old living in England and Wales.

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	b	**se**	**b**	**se**	**b**	**se**	**b**	**se**	**b**	**se**
Fixed Effects										
Constant	10.83***	(0.11)	15.49***	(0.54)	13.30***	(1.17)	14.16***	(1.23)	14.47***	(1.24)
Wave	-0.05	(0.03)	-0.02	(0.04)	-0.02	(0.04)	-0.03	(0.04)	-0.03	(0.04)
youth is a girl			-0.13	(0.13)	-0.10	(0.14)	-0.10	(0.14)	-0.10	(0.14)
Youth Cohorts (ref:1999)										
1998			-0.51**	(0.19)	-0.55**	(0.20)	-0.53**	(0.20)	-0.53**	(0.20)
1997			-0.46**	(0.17)	-0.46**	(0.17)	-0.41*	(0.17)	-0.42*	(0.17)
1996			-0.47*	(0.19)	-0.39*	(0.20)	-0.39+	(0.20)	-0.38+	(0.20)
1995			-0.19	(0.19)	-0.19	(0.19)	-0.19	(0.20)	-0.19	(0.20)
1994			-0.04	(0.20)	0.06	(0.21)	0.06	(0.21)	0.07	(0.21)
Youth ethnicity (ref: white)										
Mixed			-0.42	(0.29)	-0.44	(0.30)	-0.46	(0.31)	-0.47	(0.31)
Asians			-0.74**	(0.25)	-0.75**	(0.26)	-0.74**	(0.27)	-0.70**	(0.27)
Blacks			-1.32***	(0.30)	-1.43***	(0.31)	-1.48***	(0.32)	-1.47***	(0.32)
All other ethnicity			-0.38	(0.81)	-0.42	(0.81)	-0.53	(0.82)	-0.54	(0.83)
Missing			0.07	(0.17)	0.08	(0.18)	0.06	(0.18)	0.06	(0.18)
Single parent household			0.17	(0.18)	0.08	(0.19)	0.09	(0.19)	0.07	(0.19)
Parents nativity (ref:UK born)										
1 parent non-UK born			-0.53*	(0.23)	-0.63*	(0.25)	-0.65**	(0.25)	-0.67**	(0.25)
Both parents non-UK born			-0.84**	(0.27)	-0.94***	(0.28)	-0.97***	(0.28)	-0.97***	(0.28)
Parents' highest education (ref:No qualification)										
Other qualification			1.10**	(0.36)	1.18**	(0.37)	1.09**	(0.38)	1.04**	(0.38)
GCSE etc			0.39	(0.30)	0.43	(0.31)	0.40	(0.31)	0.36	(0.31)

A-level etc	0.22	(0.31)	0.35	(0.32)	0.33	(0.32)	0.32	(0.32)
Other high degre	0.11	(0.32)	0.16	(0.33)	0.13	(0.33)	0.11	(0.33)
Degree	-0.44	(0.31)	-0.35	(0.32)	-0.36	(0.32)	-0.36	(0.32)
Missing	2.38	(1.50)	2.46+	(1.50)	2.38	(1.50)	2.25	(1.50)
Length of residency (ref:a year or less)								
2 - 3 years	-0.41	(0.33)	-0.47	(0.35)	-0.52	(0.35)	-0.52	(0.35)
4-10 years	-0.51	(0.31)	-0.52	(0.33)	-0.57+	(0.33)	-0.58+	(0.33)
10 years or more	-1.18***	(0.32)	-1.19***	(0.33)	-1.25***	(0.34)	-1.24***	(0.34)
Parents' mental well-being	-0.07***	(0.01)	-0.06***	(0.01)	-0.06***	(0.01)	-0.06***	(0.01)
At least one parent works	-0.25	(0.18)	-0.32+	(0.19)	-0.25	(0.19)	-0.27	(0.19)
Household income (ref:tertile 1)								
Tertile 2	0.27+	(0.15)	0.32*	(0.15)	0.32*	(0.16)	0.32*	(0.16)
Tertile 3	0.05	(0.17)	0.06	(0.18)	0.08	(0.18)	0.10	(0.18)
Neighbourhood Effects								
Economically active			2.71+	(1.52)	2.25	(1.54)	2.00	(1.55)
Townsend Index Deprivation			0.09*	(0.05)	0.06	(0.05)	0.00	(0.13)
Not Worry of crime					-0.57	(0.36)	-0.55	(0.37)
Worry about crime*deprivation							0.03	(0.17)
Quality of facilities & amenities					0.52	(0.59)	0.70	(0.60)
Quality of facilities*deprivation							0.35	(0.31)
Civic engagement					-0.78*	(0.38)	-0.82*	(0.39)
Civic engagement*deprivation							0.33+	(0.18)
Friendship networks					-0.83*	(0.34)	-1.01**	(0.35)
Friendship networks*deprivation							0.37*	(0.15)
Trust and cooperative norms					-0.30	(0.58)	-0.19	(0.60)
Trust & cooperative norms*deprivation							-0.29	(0.25)
Social Cohesion					-0.78	(1.09)	-0.66	(1.15)

Social cohesion*deprivation									0.18	(0.49)
Variance components neighbourhoods										
Slope	0.18***	(0.08)	0.15***	(0.08)	0.19***	(0.09)	0.19***	(0.09)	0.19***	(0.09)
Between neighbourhoods	3.57***	(0.85)	3.09***	(0.87)	3.17***	(0.91)	3.14***	(0.92)	3.03***	(0.92)
Intercept/slope covariance	-0.35*	(0.23)	-0.36*	(0.24)	-0.39*	(0.25)	-0.42*	(0.25)	-0.42*	(0.25)
Variance components youth										
Slope	0.46*	(0.14)	0.50*	(0.15)	0.52*	(0.15)	0.53*	(0.16)	0.53*	(0.16)
within neighbourhood/between youths	17.47***	(1.53)	16.67***	(1.59)	17.32***	(1.66)	17.44***	(1.67)	17.50***	(1.68)
Intercept/slope covariance	-1.15***	(0.43)	-1.17***	(0.46)	-1.37***	(0.48)	-1.39***	(0.48)	-1.39***	(0.48)
within youth/wave	12.71***	(0.47)	12.58***	(0.51)	12.46***	(0.53)	12.41***	(0.54)	12.41***	(0.54)

Notes: Significant at + p<0.01,* p<0.05, ** p<0.01, *** p<0.001. Standard errors in parentheses. [a]Higher coefficients indicate greater mental health difficulties. [b] Higher coefficients indicate better life satisfaction

Source: UK Household Longitudinal Survey (2015) [waves 1, 3, and 5]. Linked adult and youth questionnaire with aggregated MSOA-level data from census 2011.

Marginal effects of deprivation and social capital on mental health

The estimated marginal mean effects at representative values as described above is used to explain and describe the pattern of relationships without consideration for whether these effects are significant or not. This is done by plotting the relationship between predicted mental health difficulties conditioned upon deprivation and each of the social capital indicators in Figure 2a-2f. An investigation of the marginal effects also allow for the examination of hypothesis 3.

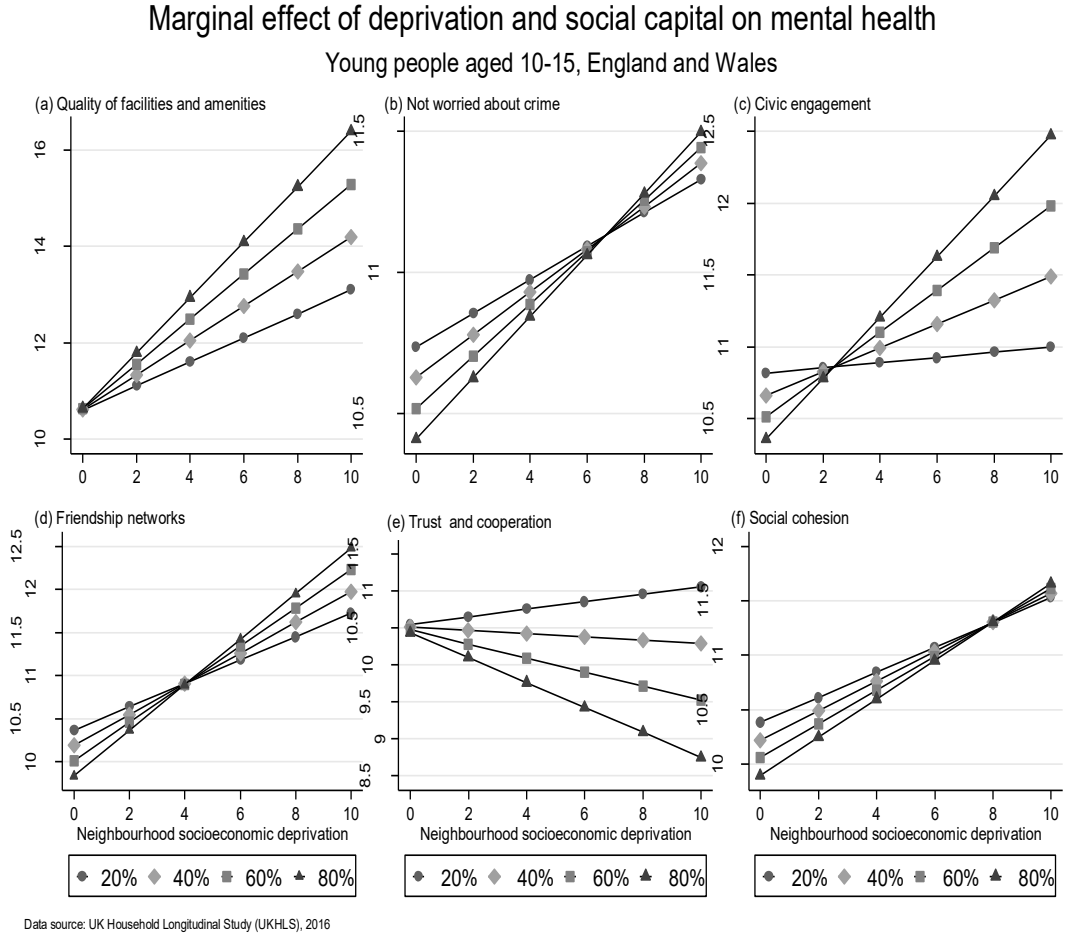

Figure 2a-2f: Estimated marginal mean effects (at representative values) of neighbourhood socioeconomic deprivation and neighbourhood social capital on mental health among young people aged 10-15. *Notes: The model adjusts for cohort, wave, youth gender and ethnicity, lone parent households, household income, parents' nativity, at least one parent in the household working, length of residency in the neighbourhood, parents' highest education and parental mental health, and takes into account neighbourhood-level clustering. On the x-axis higher numbers indicate greater socioeconomic deprivation, on the y-axis higher numbers indicate more mental health difficulties, and the lines represent the marginal effects at various levels of social capital (i.e. 20%, 40%, 60% and 80%) within a given neighbourhood.*

The results of the models examining the marginal effects of deprivation on mental health as assessed by parental perception of the average level of social capital in a neighbourhood, largely suggested that social capital was not enough to compensate for residing in a neighbourhood high in deprivation. This is demonstrated by the fact that higher average social capital, as measured by the quality of the neighbourhood facilities and amenities, no worry about crime, civic engagement and homogenous friendship networks indicated that mental health difficulties were more pronounced within deprived neighbourhoods.

There was also some indication that parental perceptions of neighbourhood social cohesion reduced the gap in mental health difficulties among young people residing in deprived areas, and that trust and neighbourhood cooperation protects young people from mental health difficulties by moderating these effects. This moderation effect is indicated by the fact that young people residing in neighbourhoods with high parental trust and cooperation are shown to have better mental health. In contrast, low parental perception of trust and cooperation within deprived neighbourhoods was associated with increased mental health difficulties.

Beyond the fact that some measures of social capital does not buffer and/or protect young people residing in high deprivation neighbourhoods from mental health difficulties, it appears that the gap in mental health difficulties were wider in neighbourhoods of high deprivation when compared to young people living in less deprived areas. These effects are observed for all the social capital measures with the exception of not worried about crime and social cohesion. In addition, the results also indicated that young people residing in less deprived neighbourhoods does not appear to be affected by neighbourhood trust and cooperation and the quality of neighbourhood facilities and amenities.

Life satisfaction

A similar sequential modelling strategy as outlined in Table 1 was adopted to investigate whether social capital mediated and/or moderated the effects of deprivation on life satisfaction among young people. The results are presented in Table 4.

The results of the ICC from Model 1 (Table 4) indicated that 8% and 49% of the variation in reported life satisfaction is attributed to neighbourhoods and youths respectively. These results indicated that the intra-individual variation over time was substantial. Although, as discussed above, some of this variation might be the result of normal fluctuations over time, measurement error or random noise.

The fixed effects estimates indicated that there was a significant decline in the average reported life satisfaction over time. The results from the random part of the model indicated a negative covariance estimate at the youth level, signalling that among young people who initially had higher than average life satisfaction that their mean rate of change was slower.

Estimates for the adjustment of individual and family predictors (Model 2) indicated that as young people got older, girls, residing in a single-parent household and having parents with A-level qualifications or lower were associated with significantly lower life satisfaction. In contrast, having parents with high mental health functioning was associated with higher life satisfaction. After the inclusion of these covariates in the model, the between-neighbourhood variation increased to 9% but the youth-level variation remained at 49%. The results of later models examined, indicated further that the total proportion of the variation in life satisfaction attributable to between-neighbourhood differences remained at 9%.

Model 3 added the two neighbourhood-level measures of deprivation. The relationship between these measures and life satisfaction was negative (i.e. indicated

Table 4 Multivariate linear models investigating the mediating and moderating role of social capital on life satisfaction among young people aged 10-15 living in England and Wales.

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	b	se	b	se	b	se	b	se	b	se
Fixed Effects										
Constant	5.95***	(0.02)	5.62***	(0.11)	6.17***	(0.23)	6.01***	(0.24)	6.02***	(0.25)
Wave	-0.02**	(0.01)	-0.01	(0.01)	-0.00	(0.01)	-0.00	(0.01)	-0.00	(0.01)
youth is a girl			-0.11***	(0.03)	-0.10***	(0.03)	-0.10***	(0.03)	-0.10***	(0.03)
Youth Cohorts (ref:1999)										
1998			-0.00	(0.04)	0.01	(0.04)	0.00	(0.04)	0.00	(0.04)
1997			-0.10**	(0.04)	-0.09*	(0.04)	-0.10*	(0.04)	-0.10*	(0.04)
1996			-0.22***	(0.04)	-0.21***	(0.04)	-0.20***	(0.04)	-0.20***	(0.04)
1995			-0.33***	(0.04)	-0.32***	(0.04)	-0.33***	(0.04)	-0.33***	(0.04)
1994			-0.36***	(0.04)	-0.37***	(0.04)	-0.37***	(0.04)	-0.37***	(0.04)
Youth ethnicity (ref: white)										
Mixed			-0.00	(0.06)	0.00	(0.06)	0.00	(0.06)	0.00	(0.06)
Asians			0.04	(0.05)	0.04	(0.05)	0.03	(0.05)	0.03	(0.05)
Blacks			0.05	(0.06)	0.08	(0.06)	0.09	(0.07)	0.08	(0.07)
All other ethnicity			0.18	(0.17)	0.18	(0.17)	0.18	(0.17)	0.18	(0.17)
Missing			-0.01	(0.04)	-0.03	(0.04)	-0.03	(0.04)	-0.03	(0.04)
Single parent household			-0.15***	(0.04)	-0.13***	(0.04)	-0.12**	(0.04)	-0.12**	(0.04)
Parents nativity (ref:UK born)										
1 parent non-UK born			0.03	(0.05)	0.06	(0.05)	0.06	(0.05)	0.07	(0.05)
Both parents non-UK born			-0.03	(0.05)	-0.01	(0.06)	-0.00	(0.06)	-0.00	(0.06)
Parents' highest education (ref:No qualification)										
Other qualification			-0.16*	(0.07)	-0.16*	(0.08)	-0.13	(0.08)	-0.12	(0.08)
GCSE etc			-0.12*	(0.06)	-0.12+	(0.06)	-0.10	(0.06)	-0.09	(0.06)

A-level etc	-0.11+	(0.06)	-0.14*	(0.06)	-0.11+	(0.06)	-0.11+	(0.06)
Other high degre	-0.09	(0.06)	-0.09	(0.07)	-0.06	(0.07)	-0.06	(0.07)
Degree	-0.06	(0.06)	-0.07	(0.06)	-0.04	(0.06)	-0.04	(0.06)
Missing	0.23	(0.32)	0.23	(0.32)	0.26	(0.32)	0.27	(0.32)
Length of residency (ref:a year or less)								
2 - 3 years	-0.00	(0.07)	0.01	(0.08)	0.02	(0.08)	0.03	(0.08)
4-10 years	-0.01	(0.07)	-0.02	(0.07)	0.00	(0.07)	0.01	(0.07)
10 years or more	0.05	(0.07)	0.04	(0.07)	0.06	(0.07)	0.06	(0.07)
Parents' mental well-being	0.01***	(0.00)	0.01***	(0.00)	0.01***	(0.00)	0.01***	(0.00)
At least one parent works	-0.03	(0.04)	-0.01	(0.04)	-0.02	(0.04)	-0.02	(0.04)
Household income (ref:tertile 1)								
Tertile 2	-0.01	(0.03)	-0.02	(0.03)	-0.02	(0.03)	-0.03	(0.03)
Tertile 3	-0.02	(0.04)	-0.02	(0.04)	-0.02	(0.04)	-0.03	(0.04)
Random Effects								
Economically active			-0.72*	(0.30)	-0.63*	(0.30)	-0.66*	(0.30)
Townsend Index Deprivation			-0.02*	(0.01)	-0.02+	(0.01)	-0.04	(0.03)
Worry of crime					0.15*	(0.07)	0.15*	(0.07)
Worry about crime*deprivation							0.01	(0.03)
Quality of facilities & amenities					-0.12	(0.11)	-0.13	(0.12)
Quality of facilities							0.00	(0.06)
Civic engagement					0.03	(0.07)	0.03	(0.08)
Civic engagement*deprivation							0.01	(0.03)
Friendship networks					0.15*	(0.07)	0.20**	(0.07)
Friendship networks*deprivation							-0.08**	(0.03)
Trust and cooperative norms					0.12	(0.11)	0.07	(0.12)
Trust & cooperative norms*deprivation							0.08	(0.05)
Social Cohesion					-0.09	(0.21)	-0.13	(0.22)

Social cohesion*deprivation									0.02	(0.09)
Variance components neighbourhoods										
Slope	0.01***	(0.00)	0.01***	(0.00)	0.01***	(0.00)	0.01***	(0.00)	0.01***	(0.00)
Between neighbourhoods	0.12***	(0.04)	0.14***	(0.04)	0.15***	(0.04)	0.14***	(0.04)	0.13***	(0.04)
Intercept/slope covariance	-0.02***	(0.01)	-0.03***	(0.01)	-0.03***	(0.01)	-0.03***	(0.01)	-0.03***	(0.01)
Variance components youth										
Slope	0.02***	(0.01)	0.03***	(0.01)	0.02***	(0.01)	0.02***	(0.01)	0.03***	(0.01)
within neighbourhood/between youths	0.62***	(0.07)	0.59***	(0.08)	0.59***	(0.08)	0.60***	(0.08)	0.60***	(0.07)
Intercept/slope covariance	-0.07***	(0.02)	-0.08***	(0.02)	-0.08***	(0.02)	-0.09***	(0.02)	-0.08***	(0.02)
within youth/wave	0.80***	(0.03)	0.76***	(0.03)	0.76***	(0.03)	0.76***	(0.03)	0.76***	(0.03)

Notes: Significant at + p<0.01,* p<0.05, ** p<0.01, *** p<0.001. Standard errors in parentheses. Higher coefficients indicate better life satisfaction. Source: UK Household Longitudinal Survey (2015) [waves 1,3, and 5]. Linked adult and youth questionnaire with aggregated MSOA-level data from census 2011.

lower levels of life satisfaction). When the six measures of parental perceptions of social capital were added in Model 4, deprivation was associated with lower life satisfaction. Although the relationship between the proportion of people economically active in the neighbourhood remained significant, there was an almost 10% decline in the strength of the association with life satisfaction. These results were in line with hypothesis 1 (Figure 1a) that neighbourhood social capital mediates the influence of deprivation on youth life satisfaction. In particular, the results showed that average worry about crime and homogenous friendship networks were significantly associated with higher life satisfaction.

The results of the moderation models partially confirms hypothesis 2 (figure 1b). This asserted that average parental perceptions of social capital at the neighbourhood level protects young people from low life satisfaction When the moderation models are considered (Table 4) the main effects confirmed the earlier findings that some aspects of parental perceptions of social capital mediated the effects of deprivation. The results indicated also that parental perceptions of neighbourhood friendship networks mattered for the life satisfaction of young people. Homogenous friendship exacerbated the negative effect of deprivation on life satisfaction. This finding suggests that this measure of social capital did not have a protective influence on life satisfaction. This is indicated by the fact that residing in neighbourhoods with higher levels of deprivation even when interacted friendship networks was associated with low life satisfaction.

Marginal effects of deprivation and social capital on life satisfaction

To understand fully the relationship between the effects of deprivation and social capital on life satisfaction, the marginal mean effects at representative values were

assessed and plotted after full adjustment of the model. The results for these effects are illustrated in Figure 3a-3f.

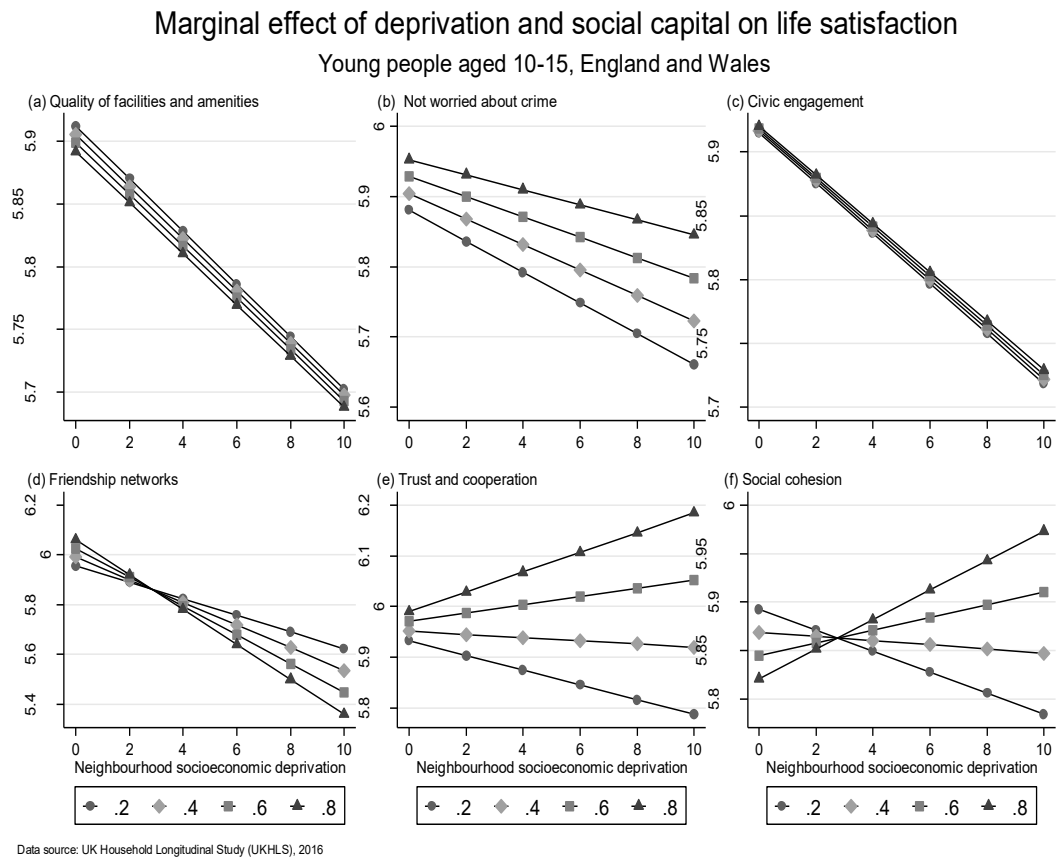

Figure 3a-3f: Estimated marginal mean effects (at representative values) of neighbourhood socioeconomic deprivation and neighbourhood social capital on life satisfaction among young people aged 10-15.

Notes: The model adjusts for cohort, wave, youth gender and ethnicity, lone parent households, household income, parents' nativity, at least one parent in the household working, length of residency in the neighbourhood, parents' highest education and parental mental health, and takes into account neighbourhood-level clustering. On the x-axis higher numbers indicate greater socioeconomic deprivation, on the y-axis higher numbers indicate greater life satisfaction, and the lines represent the marginal effects at various levels of social capital (i.e. 20%, 40%, 60% and 80%) within a given neighbourhood.

Figures 3a and 3c indicated that there is a linear relationship between the average quality of neighbourhood facilities and amenities and civic engagement and socioeconomic deprivation. It showed that young people residing in more deprived neighbourhoods had lower life satisfaction when compared with those living in less

deprived areas. In addition, regardless of neighbourhood deprivation, average parental perceptions of the quality of neighbourhood facilities and amenities, and civic engagement, does not influence life satisfaction. This suggested that neither of these components of social capital buffered or protected young people from having low life satisfaction.

Among young people residing in more deprived neighbourhoods life satisfaction was higher in areas where a higher proportion of residents are not worried about crime, where average social cohesion, and trust and cooperation was high. In contrast, neighbourhoods with a greater proportion of homogenous friendship networks was associated with lower life satisfaction among youths residing in more deprived areas. The results regarding friendship network suggested that parents with more diverse friendship networks (i.e. increased bridging capital) was more beneficial for the life satisfaction of young people.

When the effect of parental social capital on life satisfaction was considered for young people residing in less deprived neighbourhoods, the results indicated that neighbourhood social capital generally had only a marginal impact on their life satisfaction. However, it is worth noting that high social cohesion appeared to have a negative impact on the life satisfaction of young people residing in these neighbourhoods.

Discussion

This study reports the findings from analyses examining the association between the psychosocial and material context of the neighbourhood in explaining the psychological well-being of young people 10-15 year sold residing in England and Wales. The focus was the relationship between neighbourhood deprivation, social

capital, as well as, their independent and combined effect on mental health and life satisfaction. The results add to our current knowledge base, and are consistent with findings that have reported direct and indirect associations between socioeconomic deprivation, social capital and mental health for young people (Aminzadeh et al. 2013; Drukker et al. 2005; Fagg et al. 2006; Flouri, Mavroveli, and Midouhas 2013; Flouri et al. 2015; De Clercq et al. 2012) and adults (De Silva et al. 2005b; Stafford et al. 2008; Mitchell and LaGory 2002; Kim, Subramanian, and Kawachi 2006; McKenzie 2000) across multiple settings. In addition, this study contributes new findings to the literature through its inclusion of life satisfaction as an outcome, given that to the author's knowledge, no earlier studies in the UK have explored the relationships examined here among young people.

Taken together, the results of the current study suggested that the social context of the neighbourhood play a role in the transmission of neighbourhood socioeconomic deprivation on mental health and life satisfaction among young people. This is despite the fact the findings only partially supported the hypotheses and theoretical models proposed in Figure 1. The empirical results indicated a clear difference in the effect of social capital when looking at it from a mediation or a moderation point of view. Additionally, differential effects of social capital was found by the health outcome tested, that is, whether we examined mental health or life satisfaction. These findings remained even after the models were fully adjusted for individual and family predictors.

When the results from the mediation models are considered, we find that civic engagement (i.e. bridging capital) and having more homogenous friendship networks (i.e. bonding capital) attenuated the negative effects of mental health among young people residing in more deprived neighbourhoods. As it relates to life satisfaction, average neighbourhood worry about crime (indicator of general trust) and homogenous

friendship networks were shown to mediate the influence of residing in a neighbourhood characterised by greater deprivation.

These results signal that some components of social capital protect young people from more negative aspects of the neighbourhood in which they reside. Thus supporting the evidence from prior studies that have highlighted the varying roles of bonding and bridging capital within neighbourhoods (Kim, Subramanian, and Kawachi 2006; Kawachi, Subramanian, and Kim 2008). In particular, from a theoretical perspective, the homogeneity of friendship networks may be seen as a proxy for bonding relationships that allow for stability and social support (Kim, Subramanian, and Kawachi 2006) whilst worry about crime is an accepted mediator of social trust (Sturgis et al. 2011; Putnam 2007), and each of these are linked to psychosocial mechanisms which could subsequently influence mental health and life satisfaction.

Within deprived neighbourhoods, a lack of resources (individual and collective) can create a more competitive atmosphere that can lead to additional stress, and thus worse mental health and life satisfaction. Therefore, creating 'bridges' through participation and civic engagement in the neighbourhood might serve to mitigate some of these negative effects because it provides a channel through which information and ideas can flow, within relationships of respect and mutuality (Gilbert 2009; Granovetter 1973). Moreover, in neighbourhoods with high civic engagement it is likely that people might derive other psychosocial and material benefits, such as better facilities and a greater sense of safety through activism and participation, and these factors have been shown to contribute to better health outcomes among young people (Edwards and Bromfield 2010; Aminzadeh et al. 2013; De Clercq et al. 2012).

The results of the moderation models have not fully supported the hypothesis proposed in this study (Figure 1b) but were similar to results from prior studies (Kim,

Subramanian, and Kawachi 2006; Mitchell and LaGory 2002; De Silva et al. 2005a; McKenzie 2000). At first glance, the results appeared to be counter intuitive, showing that high civic engagement in deprived neighbourhoods was related to an increase in young people's mental health difficulties. Meanwhile, people in low civic engagement neighbourhoods appeared to be less affected by deprivation. Similar to the results regarding civic engagement, young people who resided in neighbourhoods with more homogenous friendship networks also predicted more mental health difficulties and lower life satisfaction.

This finding that some components of social capital is positively related to poor mental health and low life satisfaction in high deprivation neighbourhoods is supported by results from the adult literature. Mitchell and LaGory (2002) found an association between bonding capital - relationships between similar others - and mental distress. They attributed this finding to time and resource constraints that individuals might find due to an overload of social obligations. It is important to note that similar to Mitchell and colleague, this measure of civic engagement was not restricted to individuals who shared similar characteristics such as sex, income, education, ethnicity among other factors. In another study, higher social capital was shown to be related to higher readmission rates among patients with psychosis (McKenzie 2000). The authors explained this finding by arguing that residents had less 'tolerance of deviant behaviour'(McKenzie 2000). This might be an indication that there was in fact high levels of bonding social capital which did not allow for the inclusion of individuals perceived as different (see discussion on the negative side of social capital Wang et al. 2009; Mitchell and LaGory 2002; McKenzie 2000; Portes 1998).

Parallels may be drawn between those findings and the marginal effects from this study, which indicated that young people residing in less deprived neighbourhoods with

high social cohesion fare worst with regards to their mental health. It may be that within these tight knit neighbourhoods, young people who are "different" might feel that they are not accepted and this leads to greater mental health difficulties. Further, the results regarding the effect of social capital on mental health and life satisfaction among young people living in less deprived areas was as expected. It has also been suggested in the resilience literature that protective process are more beneficial for individuals living in high risk environments (Ungar 2011). Unlike youths that reside in more socioeconomic advantage, young people, who are less deprived, have less need to draw on protective factors in the wider community.

There may be several factors driving the results found in this study, for instance, there might be differences by ethnic groups. For some groups' diversity, and therefore bridging social capital, may contribute to more positive health outcomes, while for others groups, bonding social capital could offer the most protective factor. In addition, the results may be driven by outliers or may be due to "reverse causation". A greater number of civic organizations and engagement projects may be found in neighbourhoods where there is a greater demand for them, and therefore civic engagement, high deprivation and stronger mental health difficulties and/or life satisfaction cluster together.

One might also consider that while the discussion regarding social capital is often been skewed towards the positive benefits that can be derived, there is a possibility that it also has a negative side. Therefore, an alternative explanation for the current results is that individuals choosing to participate in various civic projects might form strong bonds among themselves and which exclude individuals who do not participate. These relationships may in turn contribute to greater mental health difficulties and low life satisfaction. Portes (1998) among others have argued along similar lines, and other

studies have indeed found a negative relationship between social capital and health (Wang et al. 2009; Mitchell and LaGory 2002; McKenzie 2000), while others have referred to the advantages of creating and maintaining more diverse networks (Kawachi, Subramanian, and Kim 2008; Kim, Subramanian, and Kawachi 2006) and the possible health benefits .

Similarly, the results of this study suggested a positive association between strong homogenous friendship network and greater mental health difficulties, and lower life satisfaction under similar conditions, among young people residing in more socioeconomically deprived neighbourhoods. These findings might seem counterintuitive, because more homogenous networks might be expected to create /offer more supportive and stable relationships due to shared hardships. Yet, a homogenous friendship network, may actually create tensions under conditions where people are competing for scarce resources. Furthermore, a more homogeneous network reduces the possibility of gaining access to information and resources that might be available if one had a more diverse network.

The lack of significant associations between social cohesion, trust and cooperative networks, and the facilities and amenities in the neighbourhood with the mental health and life satisfaction among young people in the current study may be an artefact of the age group that is under examination. Vyncke et al. (2013) suggested that the level of autonomy and mobility of the study group determines how much children are exposed to neighbourhood processes, and subsequent associations with the outcomes under study. Another suggestion is that the inconsistent findings among studies looking at young people could be attributed to the range of health outcomes tested (for example, the measure and/or operationalization of mental health), and the varying definitions and operationalization of social capital (Vyncke et al. 2013). On the other hand, these

effects were consistent with those from other studies suggesting that the variation might be due to the differential effect of bonding and bridging capital (Aminzadeh et al. 2013) or that different types of social networks provide different types of support (Veenstra et al. 2005).

Strengths and limitations

The present study has several strengths and limitations that warrant discussion. One of the reasons that research in this area has remained scant, may be due to a lack of viable data. There are few data sources that have questions measuring social capital among young people. This study is an attempt to address this gap in the literature. Despite this, an acknowledged weakness of this study may be the use of parental perceptions and experiences of neighbourhood social capital rather than those of the young people themselves. While parental perceptions and experiences may differ from those of young people, research does signal that parents' social capital indirectly influences both their children's social capital and health (Leventhal and Brooks-Gunn 2000, 2001). This is because parental networks and parental characteristics influence the types of relationships and resources that their children have at their disposal. In fact, Roosa et al. (2003) suggested that the perceptions that parents hold may stimulate young people's reactions and coping strategies. If this is indeed true, parental perceptions of neighbourhood social capital may also have a more direct impact on their children. Moreover, several studies claim that parental characteristics enhances child well-being. For example, parental social support and parental monitoring have been shown to be highest in less deprived neighbourhoods compared with more deprived neighbourhoods (Leventhal and Brooks-Gunn 2000, 2001; Vyncke et al. 2013).

From a methodological perspective, the use of a parental measure of social capital rather than a measure from the young people themselves offers a more independent evaluation of the neighbourhood. This therefore reduces/removes the problem of endogeneity that might be present in studies where individuals' own assessment of their health might be confounded with their experiences of the neighbourhood.

Another limitation of the current study and one which has plagued neighbourhood research is separating the effects of context (i.e. effects relating to the physical and social characteristics) from composition (i.e. the effects relating to the type of people residing in a given neighbourhood). The multilevel modelling techniques employed in this study, where we adjust for both individual and contextual factors has reduced the potential for model misspecification. Furthermore, the methodological approach used to undertake these analyses allowed the combined effects of time, individual and neighbourhood mechanisms to be investigated at the various levels across which they operate on health outcomes. In particular, by employing a multilevel model technique it was possible to take into account the sources of dependence in the nested structure of the data, and the random variability that might exist. This therefore strengthens the validity of the study's findings.

As indicated previously, the sample changed across the data collection periods due to attrition, missing values or new panel members, and these factors contributed to data becoming an unbalanced panel. However, it was possible to take into account young people who did not contribute to all the data collection periods because the models employed in this analysis has the capacity to handle unbalanced panels (Raudenbush and Bryk 2002). Notwithstanding, the changes in the sample, the sample was drawn from multiple and diverse communities across the England and Wales, and through sampling procedures that was able to capture a wide cross section of British population.

This increases the generalizability of the findings to communities that were not included in this particular assessment.

Young people aged 10-15 years currently make up approximately 7% of the population of England and Wales, and this number is expected to grow over the coming decade (ONS Census 2011a). Therefore, despite the modest health benefits of social capital, research into its possible implications on the health of the next generation is vital given the absolute number of lives that may be influenced by the extent and density of the social capital to be found in their area of residence.

Conclusions and implications for policy and practice

The findings from this study emphasized the importance of considering the impact of both psychosocial and material environments when examining their relationships with psychological well-being among young people. Whilst the empirical evidence only partially supported the hypothesized models, the study has highlighted the importance of cultivating different aspects of social capital because different components appear to offer different benefits. From both a public health and policy perspective, it is therefore important that interventions seeking to enhance the healthy development of young people by contributing to higher good mental health and overall life satisfaction, work to not only eliminate socioeconomic disadvantages, but also to enhance the psychosocial benefits that can be reaped from social capital. This study demonstrates therefore that it is worth considering when and how social capital may positively influence psychological well-being among this group. It however also points to the fact that greater research into the possible negative effects of some aspects of social capital is required, and that the effects of social capital may be non-linear.

SUPPLEMENTARY APPENDIX 1

Table SA1. Pearson correlation coefficient matrix, mean (SD) and range for items measuring social capital.

	[1]	[2]	[3]	[4]	[5]	[6]	Mean (SD)	Range
(1) Not worried about crime	1.00						0.52 (0.22)	0/1
(2) Social cohesion	0.04*	1.00					-0.00 (0.07)	-0.38/0.44
(3) Quality of facilities & amenities	0.21*	-0.03**	1.00				-0.01 0.14)	-0.75/0.53
(4) Homogenous friendship networks	0.15*	0.01	0.15*	1.00			-0.03 (0.24)	-1.48/1.36
(5) Trust & cooperative norms	-0.01	0.03**	-0.10*	0.04*	1.00		0.01 (0.14)	-0.71/0.73
(6) Civic engagement	0.05*	-0.02	0.21*	-0.05*	-0.26*	1.00	0.46 (0.22)	0/1

*Statistically significant at *p<0.05; **p<0.001.*
Cronbach's alpha measures the consistency of items clustered under a given construct.
Source: UK Household Longitudinal Survey (2015). Social capital as measured using items from wave 3 main stage questionnaire-linked youth data (waves 1, 3 and 5) with MSOA-level data from the 2011 census.

Table SA2. Pearson correlation coefficient matrix , mean(SD) and range for items measuring social cohesion

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	Mean (SD)	range
[1] Belong to neighbourhood	1.00								3.71(.87)	1-5
[2] Local friends mean a lot	0.64*	1.00							3.58 (.91)	1-5
[3] Advice obtainable locally	0.53*	0.65*	1.00						3.33 (1.08)	1-5
[4] Can borrow things from neighbours	0.40*	0.47*	0.56*	1.00					3.03 (1.17)	1-5
[5] Willing to improve neighbourhood	0.34*	0.38*	0.35*	0.36*	1.00				3.80 (.81)	1-5
[6] Plan to stay in neighbourhood	0.48*	0.42*	0.37*	0.27*	0.30*	1.00			3.75 (1.07)	1-5
[7] Am similar to others in neighbourhood	0.53*	0.49*	0.44*	0.33*	0.33*	0.54*	1.00		3.57 (.95)	1-5
[8] Talk regularly to neighbours	0.53*	0.55*	0.52*	0.45*	0.39*	0.42*	0.49*	1.00	3.69 (.98)	1-5

*Note 1: Cronbach's alpha=.86; statistically significant *p<.05; **p<.01; ***p<.001.*
Note 2: Items reverse coded and now range from 1 (strongly disagree) to 5 (strongly agree). Higher numbers now signify stronger agreement with more positive perceptions

Source: Understanding Society (2016). Sense of community as measured using items from wave 3 parent's questionnaire linked with MSOA-level data from census 2011.

Table SA3. Pearson correlation coefficient matrix , mean(SD) and range for items measuring neighbourhood facilities & amenities

	[1]	[2]	[3]	[4]	[5]	[6]	Mean (SD)	range
[1] Standard of local services: primary schools	1.00						3.04(.70)	1-4
[2] Standard of local services: secondary schools	0.52*	1.00					2.80 (.78)	1-4
[3] Standard of local services: medical	0.30*	0.30*	1.00				2.88 (.74)	1-4
[4]Standard of local services: shopping	0.15*	0.16*	0.29*	1.00			2.67 (.84)	1-4
[5] Standard of local services: leisure	0.16*	0.18*	0.25*	0.46*	1.00		2.37 (.85)	1-4
[6] Standard of local transport	0.10*	0.10*	0.17*	0.30*	0.24*	1.00	2.60 (.88)	1-4

*Note 1: Cronbach's alpha=.66; statistically significant *p<.05; **p<.01; ***p<.001.*
Note 2: Items reverse coded and now range from 1 (poor facilities) to 4(excellent facilities). Higher numbers now signify stronger agreement with more positive perceptions
Source: Understanding Society (2016). Neighbourhood facilities as measured using items from wave 3 parent's questionnaire linked with MSOA-level data from census 2011.

Table SA4. Pearson correlation coefficient matrix , mean(SD) and range for items measuring homogenous friendship networks

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	Mean (SD)	range
[1] Proportion of friends living in local area[a]	1.00							2.45 (1.25)	1-5
[2] Proportion of friends who are also family members[a]	0.10*	1.00						1.75 (1.19)	1-5
[3] Proportion of friends who have a job	-0.04*	-0.06*	1.00					2.69 (1.16)	1-4
[4] Proportion of friends with same race	0.15*	0.01**	-0.06*	1.00				3.29 (.92)	1-4
[5] Proportion of friends with similar age[a]	0.11*	0.10*	-0.06*	0.17*	1.00			2.99 (.98)	1-5
[6] Proportion of friends with similar income	0.11*	0.06*	0.05*	0.13*	0.18*	1.00		2.40 (1.04)	1-4
[7] Proportion of friends with similar level of education	0.12*	0.03*	0.01**	0.25*	0.27*	0.30*	1.00	3.03 (.95)	1-4

*Note 1: Cronbach's alpha=.43; statistically significant *p<.05; **p<.01; ***p<.001.*
Note 2: Items (3, 4, 6, and 7) reverse coded and now range from 1 (less than half) to 4(all similar). Higher numbers now signify stronger bonding capital
Note 3: Items (1, 2, and 5) reverse coded and now range from 1 (none) to 5(all similar). Higher numbers now signify stronger bonding capital
Source: Understanding Society (2016). Bonding social capital as measured using items from wave 3 parent's questionnaire linked with MSOA-level data from census 2011.

Table SA5. Pearson correlation coefficient matrix , mean(SD) and range for items measuring trust and cooperative norms

	[1]	[2]	[3]	[4]	Mean (SD)	range
(1) Close-knit neighbourhood	1.00				3.72 (.77)	1-5
(2) People willing to help their neighbours	0.31*	1.00			3.36 (.95)	1-5
(3) People in this neighbourhood can be trusted	0.44*	0.56*	1.00		3.72 (.82)	1-5
(4) People in this neighbourhood don t get along with each other	0.47*	0.45*	0.59*	1.00	3.64 (.82)	1-5

*Note 1: Cronbach's alpha=.78; statistically significant *p<.05; **p<.01; ***p<.001.*
Note 2: Items (1, 2 and 3) reverse coded and now range from 1 (strongly disagree) to 5 (strongly agree). Higher numbers now signify stronger agreement with more positive perceptions

Source: Understanding Society (2016). Trust and Social norms as measured using items from wave 3 parents' questionnaire linked with MSOA-level data from census 2011.

Study II

Ethnic variations in mental health among 10–15-year-olds living in England and Wales: The impact of neighbourhood composition and parental behaviour

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Ethnic variations in mental health among 10–15-year-olds living in England and Wales: The impact of neighbourhood composition and parental behaviour

Abstract

Several studies indicate that young people from ethnic minority groups in Britain have a significant mental health advantage over their White counterparts, but the reasons for these differences are poorly understood. This paper analyses the impact of neighbourhood composition as measured by socioeconomic deprivation, crime, living conditions and ethnic density, and parenting behaviour on mental health among young people. Geocoded data from waves 1, 3 and 5 of the UK Household Longitudinal Study (*UKHLS*) are merged to small area statistics from the 2011 census and multilevel linear regression models fit to a sample of 5,513 (7,302 observations) 10–15-year-olds of varying ethnicity residing in England and Wales. We find that mental health is generally lower for White British youths, even after individual/family-level predictors, neighbourhood composition and parental behaviour are taken into account. Similar to results from studies of adult populations, neighbourhoods with high levels of deprivation are associated with worse mental health. Some aspects of parenting behaviour appeared, however, to have a more significant impact on the mental health of young people from ethnic minority backgrounds compared to British Whites. Further research into the stressors that influence the inter-ethnic disparities in mental health among young people is warranted given that clear differences remain after the models in this study were fully adjusted.

Keywords: England and Wales; children and adolescents; youth; ethnic density; socioeconomic deprivation; mental health; parental behaviour; crime; neighbourhood; Strengths and Difficulties Questionnaire (SDQ)

Introduction

It has been estimated that 20% of children and adolescents around the world suffer from some kind of mental disorder (WHO, 2016). The British Child and Adolescent Mental Health Surveys 2004 show that one in ten children aged 5–15 had a diagnosable mental disorder (Green et al. 2005; Meltzer, Gatward, Britain, et al. 2000). In particular, studies from the UK have found that some ethnic minority youths report better mental health and have lower prevalence rates when compared to their counterparts identifying themselves as White/White British (Goodman, Patel, and Leon 2010, 2008; Astell-Burt et al. 2012; Harding et al. 2015; Maynard, Harding, and Minnis 2007; Fagg et al. 2006; Green et al. 2005; Meltzer, Gatward, Goodman, et al. 2000). A reversed relationship is seen among adults, with both an elevated risk (Breslau et al. 2005) and higher prevalence (Rees et al., 2016) of mental health disorders among Black, Asian and ethnic minorities (BAMEs). For instance, first-time contact rates for psychotic disorders is three to five times higher for Blacks when compared with other ethnic groups (Rees et al. 2016). Despite the observed disparities among ethnic groups, the question of the cause of this variation has remained understudied and unexplained. This paper responds to this gap in the scholarship with empirical evidence on the impact of neighbourhood composition and parental behaviour on the mental health of children/adolescents aged 10–15 residing in England and Wales.

Disentangling the factors influencing the mental health of young people may contribute important knowledge by identifying pertinent risk factors, pinpointing relevant areas of focus for future interventions and by informing policy and treatment. Moreover, given that many mental health problems found in later life begin much earlier (Kessler et al. 2005; De Girolamo et al. 2012), providing earlier treatment or other interventions aimed at risk reduction might contribute to reducing the individual

and societal costs associated with long-term and undiagnosed mental health difficulties (Davies et al. 2013; Health 2011).

The neighbourhood and the family may be seen as two of the most influential aspects of a young person's development, and are thus a relevant starting point for explaining factors which may have an impact on the mental health of young people during their formative years. Dating back to the work of Faris and Dunham (1939), both neighbourhood ethnic composition and socioeconomic deprivation, which are intricately linked, have been found to be associated with mental health among adults from minority ethnic groups to varying degrees. In fact, the neighbourhood has been shown to account for between 5 and 10% of the variance in a range of outcomes related to young people (Roosa et al. 2003). With less mobility, young people are more likely to spend more time in and around their area of residence, and as such the neighbourhood context might have a significant role to play in outcomes related to their health and well-being (Allison et al. 1999). Therefore, unless we take into account the varying neighbourhoods in which young people reside as integral we might find a considerable gap in our understanding of the mechanisms contributing to the ethnic disparities in the mental health of young people.

Neighbourhood ethnic composition and socioeconomic deprivation

It has been suggested that minority group members are protected from adversities by ethnic density, defined as the percentage of the population in the respondent's area of residence that share the respondent's ethnicity, after adjusting for area-level socioeconomic deprivation (Faris and Dunham 1939; Pickett and Wilkinson 2008; Bhugra and Arya 2005; Das-Munshi et al. 2010; Bécares, Nazroo, et al. 2012; Aneshensel 2009). In line with this suggestion, there are several studies that used adult

samples to examine ethnically dense neighbourhoods and shown that these residents do indeed enjoy better mental health, at least in the short term (Bécares, Nazroo, et al. 2012; Bécares, Nazroo, and Stafford 2009; Halpern and Nazroo 2000b).

However, there is little evidence supporting the ethnic density hypothesis as it relates to young people, and studies of this issue have yielded mixed results. Some researchers observed beneficial effects of ethnic density on some indicators of mental health such as depressive symptoms, psychological distress, behavioural and cognitive problems (Gieling, Vollebergh, and van Dorsselaer 2010; Wickrama and Bryant 2003). But, at least one study indicated that this effect may be negative when the group is too large (Fagg et al. 2006), while another study recorded a generally negative effect (Abada, Hou, and Ram 2007), and others have found no effect of ethnic density on young people's mental health (Xue et al. 2005; Astell-Burt et al. 2012).

Opponents of the ethnic density hypothesis have argued that ethnic disparities in health are mainly caused by the residential concentration of ethnic minorities in poor socioeconomic circumstances (Williams and Collins 2001; Roland G. Fryer, Pager, and Spenkuch 2013; Wilson 1987). This school of thought suggests that living in 'racially segregated' neighbourhood environments determines access to health-related services and the quality of those services. This is because ethnic concentration correlates strongly with neighbourhood socioeconomic deprivation and adverse neighbourhood conditions such as actual and perceived rates of crime, the number of single parent households, lack of employment opportunities, as well as access to, and the use of social services such as healthcare (Roland G. Fryer, Pager, and Spenkuch 2013; Wilson 1987). All these factors have been shown to be associated with poor health both among adults and young people (Williams and Collins 2001; Leventhal and Brooks-Gunn 2000; Mair et al. 2010).

Parental behaviour

Besides neighbourhood composition, recent research implicates, as we might expect parental behaviour, in particular parenting styles, as a potential mechanism and an influential factor in explaining the healthy development of young people (Maynard and Harding 2010; Lee et al. 2014; Ceballo and McLoyd 2002; Leventhal and Brooks-Gunn 2000; Baumrind 1966, 1971). Parenting behaviour describes the parent-child interaction and relationship, and the factors which distinguish between different types of parenting behaviours according to Baumrind (1970,1966) are: (a) warmth and nurturing; (b) maturity demands; (c) control of a child's behaviour; and (d) communication between parent and child (i.e. the extent to which the child's opinion is sought and listened to) (Baumrind 1971, 1966).

The nature of the neighbourhood has been linked to parental behaviour, with studies pointing to socioeconomic deprivation, crime and disorder, social support and a lack of resources as factors which might undermine effective parenting strategies (Ceballo and McLoyd 2002; Leventhal and Brooks-Gunn 2000; Byrnes and Miller 2012; Wilson 1996; Burton and Jarrett 2000; Furstenberg 1999). Neighbourhoods which suffer high levels of disorder and crime might disrupt both adult and youth behaviours, and as such could act to determine the style of parenting which is adopted. In these areas parents may adopt a more harsh/controlling parenting style in an effort to regulate the interactions of the child/adolescent with their environment (Furstenberg 1999; Burton and Jarrett 2000; Sampson, Morenoff, and Earls 1999). Another explanation offered (Sampson, Morenoff, and Earls 1999) for the harsher, more controlling parenting style, and ineffective parenting strategies that lack warmth and communication, is that parents residing in areas of high deprivation and generally poor living conditions become overwhelmed by these conditions and as a consequence might lack the energy

to engage their children in a non-harsh and warm manner (Byrnes and Miller 2012). The reverse might also be true, where parents that have effective parenting strategies are less likely to reside in more precarious neighbourhoods.

Research aim

Research efforts into exploring ethnic disparities in mental health may have been hampered by small sample sizes and regional data with a focus on specific geographic areas; in fact, data with large representative samples of young people within the age group considered in this paper are rare (Fagg et al. 2006; Astell-Burt et al. 2012; Harding et al. 2015; Maynard and Harding 2010; Maynard, Harding, and Minnis 2007). Using a rich national data source, the UK Household Longitudinal Study (*UKHLS*), linked to aggregated geo-spatial data from the 2011 census, we investigate the impact of neighbourhood composition and parenting behaviour on mental health difficulties among White British, Welsh, other Whites and BAME youths aged 10–15 residing in England and Wales. The specific research questions examined were:

(1) whether and to what extent ethnic variations in mental health among youths might be attributed to individual and family characteristics; and

(2) whether ethnic variations in mental health were associated with the neighbourhood composition (including the ethnic composition, socioeconomic deprivation, the living environment, levels of crime and disorder) and parental behaviour.

Material and methods

Survey

Data for this analysis were drawn from multiple sources. The individual level data were taken from waves 1, 3 and 5 of *Understanding Society*, the *UKHLS* (University of Essex – Institute for Social and Economic Research 2015), while the neighbourhood level data were based on geocoded administrative data collected in the 2011 census (ONS 2017).

Individual data: The *UKHLS* is an annual longitudinal household panel survey that started in 2009 with a nationally representative and stratified clustered sample of around 30,000 households living in the United Kingdom. Within households where adults were interviewed, oral consent was obtained from parents and/or guardians for household members aged 10–15 to complete a pencil-and-paper self-reported questionnaire. The sample for this study was therefore the children of adult members of the panel, for whom consent was granted and who responded to the questionnaire (Buck and McFall 2011).

Neighbourhood data: Derived from geocoded, census-defined small area statistics at the so-called middle super output area (MSOA) level. MSOAs have a minimum residential size of 5,000 individuals and 3,000 households with an average population size of 7,500. By using MSOAs it is possible to link aggregated area level variables taken from the 2011 census to the *UKHLS*.

The use of the *UKHLS* as a secondary data source and linkage to administrative data has been approved by the University of Essex Ethics Committee.

Sample

After listwise deletion of values with missing information, attrition or the inclusion of new survey participants, the final sample used in this analysis was 5,513 (7,302 observations) 10–15-year-olds of varying ethnicity who resided in England and Wales. Attrition may occur due to non-response, a lack of contact with a family who participated in an earlier wave or an individual earlier classified as being a youth (aged 15 or younger) transitioned to the adult survey. There were new entrants to the youth panel because children under the age of ten became eligible participants or became a part of households eligible for the survey. A description of the final sample for each of the three waves has been shown in Figure 1.

Table 1. Sample sizes across data waves

Wave	Sample	Sample after listwise deletion	New participants	Participants from previous wave
1 (2009 – 2011)	4366	3366	3366 (100 %)	
3 (2011– 2013)	3711	2138	1093 (51.1%)	1045 (48.9%)
5 (2013 – 2015)	3113	1798	854 (47.5%)	944 (52.5%)

Source: Understanding Society (2015), *Waves 1, 3 and 5, linked with data from the 2011 UK Census.*

Dependent variable

The dependent variable, *mental health difficulties*, was measured using the responses provided in waves 1, 3 and 5 of the self-reported version of the Strengths and Difficulties Questionnaire (SDQ) (Appendix 1). A copy of this questionnaire is given in appendix SA2. This widely-used and cross-nationally validated (Kersten et al. 2016;

Goodman et al. 2011; Hoosen et al. 2018)screening instrument includes 25 items and five subscales that are suggested to capture four areas of potential difficulty (emotional symptoms, conduct problems, hyperactivity-inattention, peer relationship problems) and one area of strength (prosocial behaviour) (Goodman 1997; Goodman, Meltzer, and Bailey 1998). Responses are based on a three-point scale, ranging from 1 [Not true] to 3 [Certainly true]. A total difficulties score (TDS) ranging from 0 to 40, representing increasing mental health difficulties, is derived by summing scores on the first four of these subscales. According to Goodman (1997), the absence of prosocial behaviour cannot be equated with the presence of mental health problems.

Individual and family predictors

The key explanatory variable, *self-identified ethnicity*, was measured using the responses to a list of 18 ethnic identities categorised according to the UK census, and which remained unchanged throughout the study period. These remained unchanged throughout the study period. Due to small subsample sizes, we collapsed responses regarding ethnicity into four ethnic categories: White British, Welsh, other Whites (including Scottish and Northern Irish participants residing in England), and BAMEs. In general, the literature has suggested that based on culture, eating and general living habits, and health varies even among minority group members. As such, the consequence of this larger categorization may be that some of the heterogeneity in mental health difficulties will be lost. However, the results from several of the models tested were inconsistent due to the small sample sizes. A more in-depth discussion of the consequences of combining ethnicities into larger groups in this way are addressed in the Discussion section of this study.

Parental behaviour was measured by a series of questions regarding the frequency of certain activities/behaviours undertaken between parents and their children. These were the frequency of time spent doing leisure activities; eating dinner together; talking about important matters; giving praise; cuddling the child; involving the child in setting rules; shouting at the child; and spanking or slapping the child. The correlation between the items ranged from r = 0.11 to a maximum r = 0.38 (between cuddling and praising). The weak correlation between the items implied that there was no underlying latent factor which could be termed parenting behaviours, as such average parental behaviour for each item was examined separately in the model, with the exception of quarrelling which correlated too strongly with shouting (r = 0.53) and thus was omitted from the analysis.

Prior studies have pointed to the importance of accounting for the individual and family level predictors used in this study when assessing neighbourhood variation in young persons' mental health (Fagg et al. 2006; Meltzer, Gatward, Goodman, et al. 2000). The individual variables used in this study were youth age and gender. The models also included *socioeconomic and demographic characteristics of the parents that* may predispose families to live in particular neighbourhoods and influence the parent-child relationship. These are lone parent household; household income (log); parents' age; indicators for if one or both parents were born abroad; at least one parent in the household working; length of residency in the neighbourhood (entered as a categorical variable); parents' highest level of education; and parental physical and mental health (measured by 12-item Short Form Health Survey, Appendix 2). All parental variables are averaged between the two parents with the exception of education; in this case information for the parent with the highest level of educational attainment is used. If a child resides in a single parent household, then the information

for that parent is used. Across all the waves, 92% of this information came from households headed by a single mother.

Neighbourhood level predictors

Neighbourhood own group *ethnic density* was defined as the percentage of all the individuals living in the respondent's MSOA of his/her ethnic group (Halpern and Nazroo 2000; Pickett and Wilkinson 2008). This calculation was carried out separately for each ethnic group White British, Welsh, other Whites, Indian, Pakistani, Black Caribbean, and Black African people for each MSOA.

Furthermore, and consistent with previous work on the effect of neighbourhood characteristics on children, several measures (socioeconomic status, crime and disorder, and indicators of the indoor and outdoor living environment) found to influence the health and well-being of young people have been included in the models (Leventhal and Brooks-Gunn 2000; Astell-Burt et al. 2012; Wilson 1996, 1987). These are as follows: 1) *Neighbourhood living environment* as an indicator of both the indoor and outdoor quality of the local environment. This has been created using a combination of four indicators (an assessment of social and private housing in poor condition, houses without central heating, air quality, road traffic accidents involving injury to pedestrians and cyclists). This domain is coded so that higher scores indicate higher levels of deprivation, i.e. the probability that there are, for example, a higher proportion of houses without central heating (McLennan et al. 2011; Noble et al. 2000). 2) The *crime domain* of the indices of deprivation has been used as a proxy for the risk of personal and material victimisation at the small area level. This domain consists of the recorded crime rate for four major types of crime (burglary, theft, criminal damage and violence). This was also coded so that higher scores indicated higher levels of crime

(McLennan et al. 2011; Noble et al. 2007; Noble et al. 2000). Models were also adjusted for area level deprivation using 3) the *Townsend Material Deprivation Score*. This is a measure of socioeconomic disadvantage consisting of four aggregate level variables gathered in the census: the percentage of households without access to a car or van; percentage of households with more than one person per room (overcrowding); percentage of households not owner-occupied (tenure); and the percentage of economically active residents who are unemployed, excluding students (Townsend, Phillimore, and Beattie 1988). The Pearson correlation matrix, mean (SD) and range of the items measuring parental behaviours and neighbourhood compositional variables are provided in supplementary appendix SA1 and SA2 respectively.

Finally, wave - date of data collection - was included in all the models to control for, and assess changes in the outcome over the calendar period under study.

Statistical analysis

Three-level multilevel linear regression models capturing the nested relationship between the neighbourhood (level 3), individual (level 2) and the three waves of data collection (level 1), were fitted using the lmer package of the R programming language. The models have the form:

$$y_{ijk} = \beta_0 + \beta_1 X_{1ijk} + \beta_2 X_{2jk} + \beta_3 X_{3k} + v_k + u_{jk} + e_{ijk} \qquad (1)$$

where person-waves *ijk* are nested in persons *jk*, which in turn are nested in neighbourhoods *k*. v_k and u_{jk} are neighbourhood and person random intercepts, which (like the person-wave error term e_{ijk}) are normally distributed with mean 0 and standard deviations σ_v^2, σ_u^2, and σ_e^2, respectively. Multilevel models of this sort make it possible to partition and explain variation in mental health over time, across

individuals and at the neighbourhood level. Moreover, by using a multilevel model, we can account for the fact that the *UKHLS* sampled young people from the same MSOAs, and thus control for the similarities in these neighbourhoods while increasing the precision of the estimates. Modelling was carried out sequentially using a series of nested models. The initial models were pooled in which the factors impacting the mental health of all ethnic groups were examined simultaneously. This was followed by separate sequential analyses for each of the studied ethnic groups using the following five models of young people's mental health.

Model 1. A three-level model with individual-level predictor variables for young people in the fixed part of the model. This model was adjusted for gender, age and wave, and was used to identify potential differences in the reporting of mental health among BAMEs, Welsh, or other Whites relative to White British youths.

Model 2. Identical to Model 1 except that the fixed part includes all family-level predictors as well as all individual predictors. This model assesses whether and the extent to which family-level predictors explain the difference in mental health among BAMEs, Welsh, or other Whites relative to White British youths.

Model 3. Identical to Model 2 except that its fixed part also includes parental behaviour. As such, this model estimates the extent to which parental behaviour explains differences in mental health among the studied groups.

Model 4. Identical to Model 2 but in addition to the individual and family–level predictors, this model considers the fixed effect of neighbourhood-level ethnic density and socioeconomic deprivation. As such this model estimates the extent to which these effects explain area-level variation in the mental health of youths from various ethnic groups.

Model 5. Identical to Model 2 except that its fixed part includes the effect of neighbourhood-level crime and the living environment. This model thus estimates the extent to which neighbourhood-level ethnic density, crime, and the living environment explain area-level variation in the mental health of youths from various ethnic groups.

Sensitivity analyses

Sensitivity analyses were carried out to investigate possible cross-level effects given that 3% (160) of young people had moved between waves and were therefore cross-classified between different MSOAs. The assessment of this model indicated that there were no significant or substantive changes to the results found in the hierarchical models, we therefore rejected the cross-classified models for the more parsimonious three-level models shown here. Beyond the models described above, additional interaction models were tested to evaluate ethnic differences in parental behaviour, to determine whether there was any relationship between neighbourhood ethnic density and parental behaviour, and to see if neighbourhood deprivation had any effect on this relationship.

Results

Sample description

A breakdown of the total sample across all three waves indicated that as we would expect White British youths formed the largest group with 67%, followed by BAMEs 27%; youths categorised as Welsh and White others were 3% and 2% of the sample respectively. Table 2 provides estimates for the individual and neighbourhood characteristics by ethnic group. It shows that the factors we expect to be associated with mental health differ by ethnic group, for example, the proportion of single parent

households, parental physical and mental health, parents' highest education and length of residence in the neighbourhood.

Variations also existed with regard to parental behaviour, whereby White British and other Whites on average spent more leisure time and more often ate dinner with their children. With regard to punishment, when compared to BAME parents from other ethnic groups were less likely to spank/slap their children but exhibited similar behaviour when it comes to shouting, involving their children in rule setting, cuddling or providing praise for their children. Beyond that, inter-ethnic variations also exist with respect to neighbourhood characteristics, with a noticeable gradient in neighbourhood composition among the ethnic groups. White British were least likely to reside in areas with a high level of crime or that were economically and/or environmentally deprived when compared to BAMEs.

Figure 1 presents the distribution of the proportion of co-ethnic young people across different neighbourhoods: it will be seen that the proportion of co-ethnic respondents is widely distributed for White British, while this distribution is very different for Welsh and all other ethnic groups. The Welsh sample was, however, too small for the effects to dominate in a pooled model. We see that BAMEs and other Whites are more likely to reside in diverse neighbourhoods with lower shares of own-group members at the neighbourhood level.

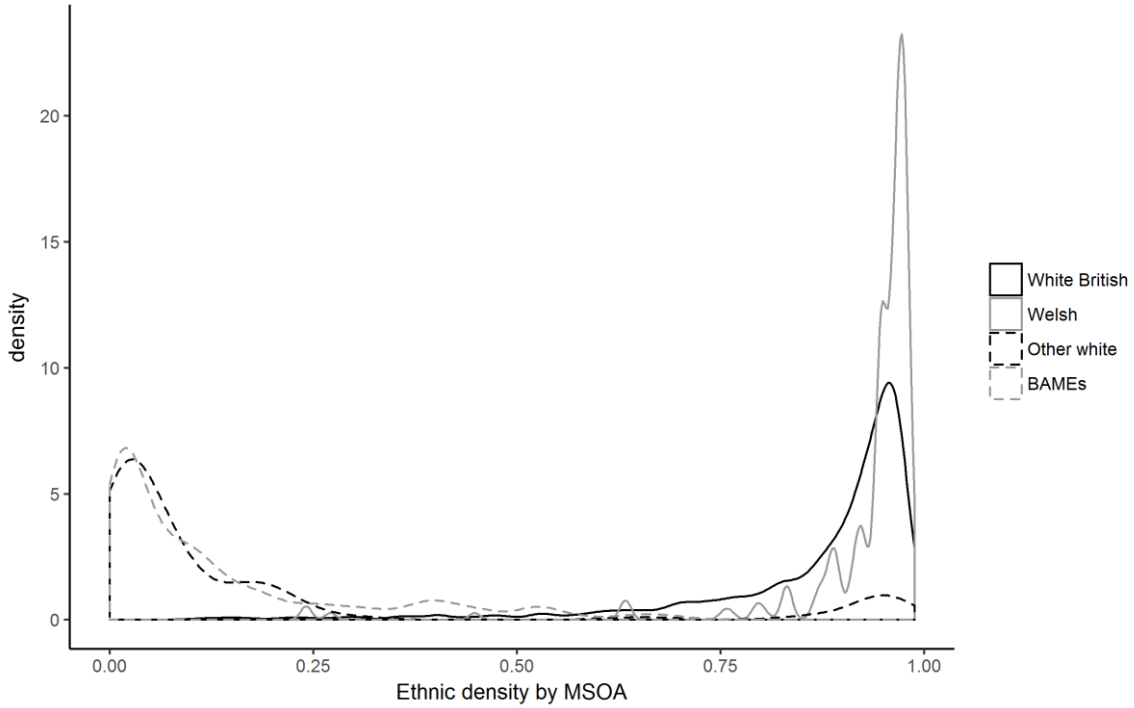

Figure 1. The proportion of young people aged 10–15 categorised by ethnicity across neighbourhoods (Kernel-Density plot). Source: Understanding Society (2015), Waves 1, 3 and 5, linked with data from UK Census 2011.

Table 2. Description of individual and MSOA level variables used in the models to examine the relationship between mental health, ethnicity, parental behaviour and neighbourhood composition.

	(White British, n = 4, 918)			*(Welsh, n = 224)*			*(White other, n = 174)*			*(BAMEs, n = 1,986)*		
	Mean	*Std. Dev.*	*range*	*Mean*	*Std. Dev.*	*range*	*Mean*	*Std. Dev.*	*range*	*Mean*	*Std. Dev.*	*range*
Individual level												
Youth a girl	0.50	0.50	0/1	0.54	0.50	0/1	0.47	0.50	0/1	0.51	0.50	0/1
Youth age	12.53	1.69	10/15	12.83	1.56	10/15	12.57	1.77	10/15	12.55	1.71	10/15
Wave	2.59	1.63	1/5	2.53	1.54	1/5	2.77	1.66	1/5	2.50	1.63	1/5
Household income (log)	8.00	0.53	4.93/9.9	7.82	0.52	6.5/9.14	7.93	0.55	6.17/9.66	7.88	0.56	4.97/9.9
At least one parent works	0.86	0.35	0/1	0.79	0.41	0/1	0.80	0.40	0/1	0.74	0.44	0/1
Single parent	0.25	0.43	0/1	0.35	0.48	0/1	0.34	0.48	0/1	0.28	0.45	0/1
Parent's mental health	48.63	8.87	5.69/69.73	48.58	9.45	8.9/67.36	49.03	9.73	9.03/65.09	48.19	9.83	3.04/70.96
Parent's physical health	52.22	8.28	11.14/70.49	50.82	9.79	14.21/68.18	52.95	7.13	24.01/68.54	49.67	9.16	12.4/68.77
Parent's age	42.65	6.10	25/75	41.74	6.52	27/71	41.95	6.20	27/60	41.99	5.86	21/73
Parent's education												
Degree	0.30	0.46	0/1	0.26	0.44	0/1	0.47	0.50	0/1	0.35	0.48	0/1
Other higher degree	0.17	0.38	0/1	0.18	0.39	0/1	0.11	0.32	0/1	0.13	0.33	0/1
A-level etc	0.21	0.41	0/1	0.21	0.41	0/1	0.12	0.33	0/1	0.18	0.38	0/1
GCSE etc	0.22	0.41	0/1	0.27	0.44	0/1	0.09	0.28	0/1	0.16	0.37	0/1
Other qualification	0.06	0.23	0/1	0.03	0.16	0/1	0.14	0.35	0/1	0.07	0.26	0/1
No qualification	0.04	0.19	0/1	0.05	0.23	0/1	0.07	0.25	0/1	0.11	0.32	0/1
Parent's Nativity												
Both parents UK born	0.84	0.37	0/1	0.84	0.36	0/1	0.28	0.45	0/1	0.23	0.42	0/1
One parent non-UK born	0.15	0.35	0/1	0.15	0.36	0/1	0.36	0.48	0/1	0.36	0.48	0/1
Both parents non-UK born	0.01	0.12	0/1	0.01	0.09	0/1	0.36	0.48	0/1	0.41	0.49	0/1
Length of residence												
1 year or less	0.03	0.18	0/1	0.04	0.19	0/1	0.07	0.25	0/1	0.05	0.22	0/1
2–3 years	0.08	0.26	0/1	0.05	0.22	0/1	0.20	0.40	0/1	0.09	0.28	0/1
4–10 years	0.43	0.49	0/1	0.39	0.49	0/1	0.46	0.50	0/1	0.46	0.50	0/1
10 years or longer	0.46	0.50	0/1	0.53	0.50	0/1	0.28	0.45	0/1	0.40	0.49	0/1

Parental behaviour												
Leisure time	3.50	1.18	1/6	3.35	1.31	1/6	3.57	1.28	1/6	3.18	1.25	1/6
Eat dinner	3.38	0.79	1/4	3.20	0.97	1/4	3.43	0.74	1/4	3.50	0.77	1/4
Talk about important matters	3.31	0.77	1/4	3.35	0.78	1/4	3.42	0.74	1/4	3.39	0.77	1/4
Praise	3.76	0.41	1/4	3.71	0.45	2/4	3.68	0.51	1/4	3.69	0.47	1/4
Cuddle	3.71	0.53	1/4	3.60	0.67	1/4	3.78	0.40	2/4	3.67	0.58	1/4
Involve youth in rule setting	2.50	0.86	1/4	2.34	0.94	1/4	2.55	0.89	1/4	2.57	0.93	1/4
Shouting	2.99	0.71	1/4	2.90	0.73	1/4	2.89	0.65	1/4	2.89	0.78	1/4
Spanking or slapping	1.25	0.50	1/4	1.18	0.44	1/3	1.24	0.45	1/3	1.40	0.63	1/4
Neighbourhood level												
Ethnic density	0.87	0.15	0.09/0.99	0.93	0.10	0.24/0.99	0.16	0.28	0/0.97	0.13	0.16	0/0.77
Deprivation												
Q1-least deprived	0.23	0.42	0/1	0.12	0.32	0/1	0.11	0.31	0/1	0.05	0.22	0/1
Q2	0.22	0.42	0/1	0.31	0.46	0/1	0.16	0.37	0/1	0.06	0.24	0/1
Q3	0.23	0.42	0/1	0.22	0.41	0/1	0.21	0.41	0/1	0.08	0.27	0/1
Q4	0.18	0.38	0/1	0.27	0.45	0/1	0.21	0.41	0/1	0.14	0.35	0/1
Q5-most deprived	0.13	0.34	0/1	0.08	0.27	0/1	0.32	0.47	0/1	0.66	0.47	0/1
Crime												
Q1-least deprived	0.24	0.43	0/1	0.23	0.42	0/1	0.20	0.40	0/1	0.03	0.16	0/1
Q2	0.22	0.42	0/1	0.21	0.41	0/1	0.18	0.39	0/1	0.07	0.25	0/1
Q3	0.20	0.40	0/1	0.23	0.42	0/1	0.16	0.36	0/1	0.15	0.36	0/1
Q4	0.19	0.39	0/1	0.13	0.34	0/1	0.21	0.41	0/1	0.35	0.48	0/1
Q5-most deprived	0.15	0.36	0/1	0.19	0.39	0/1	0.25	0.44	0/1	0.41	0.49	0/1
Living environment												
Q1-least deprived	0.26	0.44	0/1	0.17	0.37	0/1	0.20	0.40	0/1	0.06	0.23	0/1
Q2	0.22	0.42	0/1	0.28	0.45	0/1	0.13	0.34	0/1	0.08	0.27	0/1
Q3	0.21	0.41	0/1	0.14	0.35	0/1	0.22	0.42	0/1	0.13	0.33	0/1
Q4	0.19	0.39	0/1	0.22	0.42	0/1	0.24	0.43	0/1	0.26	0.44	0/1
Q5-most deprived	0.12	0.33	0/1	0.19	0.39	0/1	0.21	0.41	0/1	0.48	0.50	0/1

Note: Deprivation refers to Townsend Deprivation Index, Q1–Q5 refers to neighbourhood quintiles.

Results for individual/family characteristics

Separate inspection of the coefficients for the covariates in the fixed part of the model examining the individual and family characteristics associated with young people's mental health (Table SA6) revealed that having at least one parent in employment, and living in a single parent household are all likely to result in poor mental health. In contrast, older parents, whether having at least one parent born outside of the UK, residing in an area for ten years or more, having a parent without mental health issues, and having a parent with higher education were associated with better mental health among young people. Interestingly, these analyses revealed no significant differences in mental health by youth age or gender, and there were no significant changes in mental health over time.

Results from models examining mental health difficulties for the total sample

Table 3 presents the results from the pooled model whereby the total sample (n = 7,302) is assessed. A negative coefficient for the various ethnic groups would indicate better mental health among these groups relative to White British youths, which would further substantiate the findings from prior studies. The extent to which the coefficient in Model 1 is attenuated or increases is an indication of the effect of parental/familial characteristics and parental behaviour or neighbourhood composition.

Model 1 indicates that relative to young people identifying themselves as White British all other ethnic groups report lower total difficulties (i.e. better mental health). There is, however, some variation by ethnicity. For example, among BAMEs and other Whites these differences are significant, while the differences are small and non-significant for young people with a Welsh background.

These findings for BAMEs persist across all the models tested, with some indication that family characteristics have the strongest impact on their mental health (Model 2). We see that because the coefficients are almost halved when family predictors are included in the models. When models are adjusted for parental behaviour (Model 3) the relationship between mental health among BAMEs remains strong, which we interpret to mean that parental behaviour – like the families' economic and social conditions – is vital for the mental health of this group. For the categories of other Whites and Welsh there is a negligible decline in the mental health of young people, which remained non-significant. Specific aspects of parental behaviours were related to better mental health of youths from these groups. In particular, the frequency of leisure time spent with children predicted better mental health, while worse mental health was found among young people whose parents reported discussing important matters, shouted or slapped them.

The results from Models 4 and 5 indicate clearly that neighbourhood composition is integral to the mental health of BAMEs, whereby the inclusion of these factors reduces the strength of the difference in the mental health of BAMEs relative to British Whites. This could be an indication that own-group ethnic density to a certain extent protects this group from deprivation, higher rates of crime and poor living conditions. In contrast, living in areas of high own-group ethnicity and deprivation appeared to have no impact on the mental health of young people from other White and Welsh backgrounds relative to White British youths. A combined assessment of the five models tested suggested that neighbourhood composition had a significant impact on the health of minorities, while it is individual characteristics that have the most significant impact on other Whites.

Table 3 Ethnicity related coefficients [ab] derived from multilevel linear regression of mental health with respect to ethnicity, individual/family characteristics, parental behaviour and neighbourhood characteristics among young people.

	Ethnicity (comparison group: White British)					
	Other Whites	Welsh	BAMEs	Neighbourhood variance	Individual variance	Variance of Time
	Coeff (SE)	*Coeff (SE)*	*Coeff (SE)*			
Model 1 (Individual characteristics)	-0.93* (0.44)	-0.53 (0.41)	-1.13*** (0.17)	1.81	3.77	3.73
Model 2 (+ family/parental characteristics)	-0.56 (0.45)	-0.57 (0.41)	-0.75*** (0.21)	1.66	3.65	3.74
Model 3 (+ parental behaviour)	-0.57 (0.45)	-0.56 (0.41)	-0.83*** (0.21)	1.53	3.56	3.77
Model 4 (mode1 2 + deprivation and ethnic density)	-0.71 (0.55)	-0.61(0.41)	-0.97* (0.40)	1.65	3.65	3.74
Model 5 (model 2 + crime and living environment)[c]	-0.77 (0.55)	-0.54 (0.41)	-1.01* (0.40)	1.66	3.65	3.74

*Notes: *p<0.05;** p<0.01;*** p<0.001. Models are sequentially adjusted.*

[a] Individual/parental characteristics included: sex, age, parents' age, single parent household, parents' highest educational qualification, parents' mental health, parents' physical health, nativity, household income (log), length of neighbourhood residency and waves.
[b] For complete set of results, see Appendix SA3.
[c] The effect of crime and the living environment alongside ethnic density was assessed in this model without deprivation because of the strong correlation between these variables.
Source: *Understanding Society (2015),* Waves 1, 3 and 5, linked with MSOA-level data from Census 2011.

To further investigate the impact of neighbourhood composition and parental behaviour, separate models examining the mental health of young people from each ethnic group were analysed. The results provided in Figure 2, indicate a strong significant association between deprivation and the mental health of White British youths and a weak but significant relationship for Welsh youths. The results were however not significantly related to the mental health of young people from any other ethnic group.

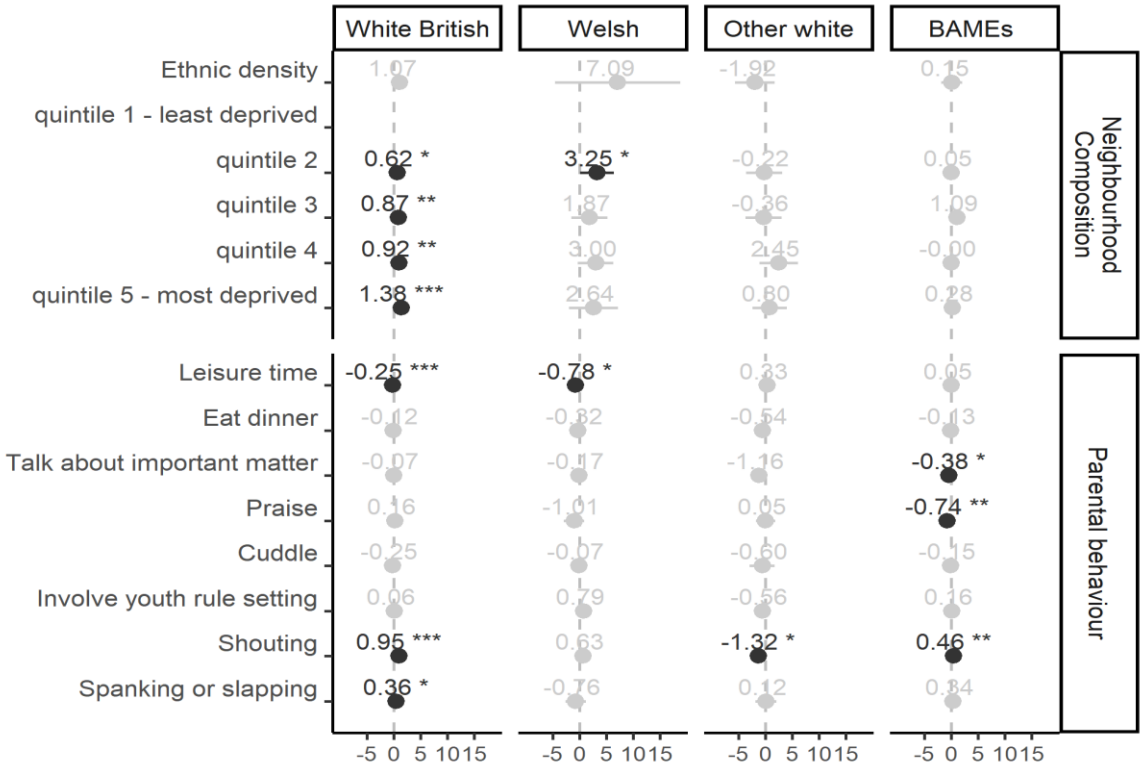

Figure 2. Shows the coefficients from models examining the association between ethnic density, socioeconomic deprivation and parenting behaviour on the mental health of young people aged 10–15. Models were analysed for each ethnic group separately. Negative coefficients indicate lower TDS score (i.e. better mental health). *Notes: *p<0.05;** p<0.01;*** p<0.001*

The effect of parenting varied by ethnicity. Both Welsh and White British youths had significantly better mental health with a greater frequency of social interaction, i.e. leisure time spent with parents. Shouting and spanking appeared to have the most negative impact on the mental health of young people, and was associated with poor mental health for all groups. This effect was, however, particularly strong for White British and BAMEs. BAMEs had better mental health when they discussed important matters with parents and received praise. It seems

that the parental behaviour that had the most significant impact on the mental health of Welsh youths was involvement in rule setting.

The results from the models shown in figure 2 disentangled the results of Welsh and other White youths from that of White British youths. The initial results from the pooled models indicated that the factors that impacted there mental health were the same. However, separate analyses, suggests that young people self-identifying as White British, generally fare worse when compared to other Whites and Welsh youths when parental behaviour and socioeconomic deprivation is considered.

In other analyses (not shown here) we also tested if certain parental behaviours were stronger in more ethnically dense neighbourhoods, and to assess if the level of deprivation was an influential factor (results provided upon request from the authors). The findings from these models did not support either of these hypotheses.

Results of the other subscales

The results of the four subscales included in the TDS are driving the results observed for the mental health of young people (results provided in appendix SA4.1–A4.4). An examination of the subscales indicated that relative to White British youths, all other ethnic groups had lower mean emotional, hyperactivity-inattention and peer problems. Specifically, BAMEs had lower mean scores on all three subscales described above; Welsh youths on average reported having good peer relationships; and other Whites reported having lower mean scores on the hyperactivity-inattention subscale relative to British Whites. There were no differences found in the association between conduct problems among White British youths and all other ethnic groups.

Discussion

The findings reported here support the results of prior research on the inter-ethnic disparities in mental health found among young people at the individual and neighbourhood levels. Specifically, earlier studies have shown that a relatively small but significant proportion of the variation in mental health as measured by SDQ is associated with socioeconomic deprivation (Harding et al. 2015; Fagg et al. 2006), while other work has found that parenting behaviour might be a contributing factor (Maynard and Harding 2010).

In the current study, the neighbourhood compositional factors examined were weakly related to the mental health of BAMEs relative to British Whites. In fact, there was no indication from our data that these factors strongly influence the mental health of any young people, including Welsh and White others. These results were somewhat surprising, given that the descriptive statistics indicate that the composition of the neighbourhood varies greatly by ethnicity. As predictors of inter-ethnic differences of mental health, however, the results were largely non-significant. The fact that inter-ethnic disparities in mental health have not been fully explained by the neighbourhood compositional factors used in the models may be an indication that the relationship between the neighbourhood influences and mental health outcomes among young people is based on a complex set of interactions that has not been captured by the models and the data.

Fagg et al. (2006) speculated that the neighbourhoods included in their study might have lacked variation, and that this lack of heterogeneity may have contributed to the results indicating that socioeconomic disadvantages were not related to psychological distress among young people. Unlike that study, data for this study was taken from a national sample with the necessary heterogeneity in measures of neighbourhood composition. So how then do we explain these differences? We suggest that the results may be due to the age of the participants in the sample used for this study. At a young age it might be that the influence of friends and parents

together with family circumstances, have a more important role to play in determining whether or not young people have mental health problems. Earlier studies have also provided that younger people might lack the mobility and social autonomy necessary for the types of interactions with the neighbourhood which might truly have an impact on their health (De Clercq et al. 2012)

The results also indicate that whereas deprivation by itself does not seem to matter for the mental health of BAMEs, it is an important driver of the effects witnessed for White British youths. For instance, in the stratified models where the mental health of each ethnic group was examined separately, mental health problems were more common among White British youths residing in deprived neighbourhoods, and it is these effects, which usually increase the gap between the mental health of British Whites compared to BAMEs. A similar result has been found among adult populations, where the detrimental association between deprivation at the neighbourhood level and health perceptions was greater in magnitude and stronger for White British people than ethnic minority group members (Bécares, Nazroo, et al. 2012).

One might also argue, since deprivation is strongly associated with minority neighbourhoods, that White British youths residing in these areas might be affected negatively by being ‘outsiders’, which could lead to discrimination that could, in turn, worsen mental health. Moreover, as minorities in deprived neighbourhoods, White British youths may lack the social support and networks to cope with their life situation, which could adversely affect their mental health. It may be that deprivation does not affect the mental health of young people from minority ethnic groups because they are protected from the adverse effects of residing in a deprived neighbourhood by stronger social support and services tailored to their specific ethnic groups (Bécares, Nazroo, et al. 2012; Bécares, Shaw, et al. 2012).

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Another plausible explanation, therefore, for the lack of a significant relationship between deprivation and mental health among BAMEs may be due to the within-group heterogeneity within this group. It is a recognised drawback that creating large ethnic categories may be problematic, as these groups could potentially conceal significant differences (Aspinall 1998; Bhopal 1997; Bhopal 2002). Prior studies have shown a mental health advantage for Black Africans (Maynard, Harding, and Minnis 2007), Indians (Green et al. 2005; Meltzer, Gatward, Goodman, et al. 2000) and Bangladeshis (Stansfeld et al. 2004) when compared to White British youths; no differences were found between Black Caribbean youths and Whites (Green et al. 2005). Unfortunately, due to small samples it was not possible in this current study to examine the neighbourhood compositional factors influencing these groups separately. This factor may have masked some of the effects, as such the heterogeneous make-up of the BAMEs might also explain the weak association between mental health and minorities residing in ethnically dense neighbourhood environments.

The findings from this current study also indicated that parental behaviour may have an important influence on the mental health of young people, especially BAMEs, for whom parenting style seemed to produce small but incremental improvements in mental health when adjusting models testing individual and parental characteristics. Parental behaviour, however, needs to be balanced between supportive and authoritative styles of parentin. We see that the frequency of leisure time with parents and discussing matters deemed to be important predicts better mental health, whilst shouting and spanking predicts poorer mental health. These findings are supported by previous research suggesting that the parent-child relationship buffers young people from the adverse effects of the wider society (Maynard and Harding 2010; Xue et al. 2005) such as deprivation (Fagg et al. 2006). In particular, studies from the US have shown that there may also be a protective component to parenting behaviours, and the subsequent parent-child relationship. Families that live in deprived areas may restrict the level of interaction of

their children with the residents (Sampson, Morenoff, and Earls 1999; Furstenberg 1999; Lee et al. 2014) and from other perceived ills which may negatively impact their well-being using a more authoritative parenting style.

In sum, it appears that although neighbourhood composition has some influence on the mental health of young people, the findings support previous research indicating that most of the variability in mental health is due to individual level variations. There was also some indication that parental behaviour accounted for some of the variation in mental health among young people. The question as to why minority group members would be more resilient to deprivation and why majority group members less so remains unclear, and further studies are required to examine these differences.

Strengths and limitations

The results from this study should also be interpreted bearing in mind some limitations related to the data used and to neighbourhood studies in general. One limitation may be the fact that neighbourhoods are administratively defined, and as such it may not fully reflect young peoples lived experience of their local area of residence. Middle Superout Area (MSOAs) were used to define neighbourhood boundaries in this study; as stated above this is an aggregated census measure which consists 3,000 households with an average population size of 7,500. Using this level of aggregation might bring us closer to the definition of the neighbourhood given the smaller geographic area which the measure captures.

In addition, studies seeking to disentangle area level variances have an acknowledged weakness, and that is separating compositional effects from contextual effects. However, we have sought to overcome this by employing multilevel models which are able to model simultaneously the variances on both the individual and neighbourhood level, and as such

increase the precision in the estimates (Lupton 2003; Van Ham et al. 2012; Pickett and Pearl 2001).

Conclusions and implications

This study has provided compelling evidence that there is a pressing need to undertake additional work to explain the variation in mental health among young people by ethnicity. Such studies are necessary in light of the disturbing prevalence of young people who suffer from emotional and/or behavioural problems, and the fact that childhood/adolescence is the stage where most mental disorders (which are often detected for the first time in later life) have their origins. In general, greater knowledge would contribute both to policy-making and academia. Providing a better understanding of the complex mechanisms that contribute to inter-ethnic disparities in mental health may lead to significant improvements in the delivery of more targeted and effective interventions for detecting and treating mental ill-health. Future studies may also contribute to our understanding of the differential trajectory of mental health among ethnic minority groups, and thereby assist in the earlier diagnosis and treatment of individuals who are later diagnosed with more severe mental disorders.

SUPPLEMENTARY APPENDIX 2

Table SA1. Mean (sd), range and correlation matrix for variables measuring parental style for wave 1,3 and 5, youth data UKHLS

	Mean	SD	Range	Leisure Time	Eating dinner	Talking about important matters	Praise	Involving youth in setting rules	Spanking or slapping	Shouting	Cuddling
Leisure Time	3,41	1,21	1-6	1							
Eating dinner	3,41	0,79	1-4	0.12*	1						
Talking about important matters	3,33	0,77	1-4	0.18*	0.11*	1					
Praise	3,74	0,43	1-4	0.21*	0.09*	0.25*	1				
Involving youth in setting rules	2,52	0,88	1-4	0.08*	0.07*	0.09*	0.09*	1			
Spanking or slapping	2,96	0,73	1-4	-0.06*	-0.07*	0,03	-0.05*	-0.06*	1		
Shouting	1,29	0,54	1-4	-0,04	0,02	0,03	-0.08*	-0,02	0.23*	1	
Cuddling	3,70	0,55	1-4	0.19*	0.11*	0.31*	0.38*	0.06*	0.06*	0,03	1

Note: Significance at .001. The above describes the frequency of a given parent-child interaction
Source: Understanding Society (2016), Waves 1, 3 and 5

Table SA2. Correlation between the neighbourhood characteristics variables for Wave 1,3 and 5, youth data UKHLS

	Mean	SD	Range	*Ethnic Density*	*Deprivation*	*Crime*	*Living Environment*
Ethnic Density	0,65	0,37	0-0.99	1			
Deprivation	3,20	1,46	1-5	-0.50*	1		
Crime	3,15	1,42	1-5	-0.45*	0.73*	1	
Living Environment	3,07	1,45	1-5	-0.42*	0.56*	0.56*	1

Note: Significance at .001.
Source: Understanding Society (2016), Waves 1, 3 and 5

Table SA3. Multilevel linear regression of **mental health** on ethnicity, individual/family characteristics, parental style and neighbourhood characteristics among young people aged 10-15 in England and Wales.

	Model 1 Coeff (S.E.)	Model 2 Coeff (S.E.)	Model 3 Coeff (S.E.)	Model 4 Coeff (S.E.)	Model 5 Coeff (S.E.)
Individual Level Predictors					
Other white	-0.93* (0.44)	-0.56 (0.45)	-0.57 (0.45)	-0.71 (0.55)	-0.77 (0.55)
Welsh	-0.53 (0.41)	-0.57 (0.41)	-0.56 (0.40)	-0.61 (0.41)	-0.54 (0.41)
BAMEs	-1.13*** (0.17)	-0.75*** (0.21)	-0.83*** (0.21)	-0.97* (0.40)	-1.01* (0.40)
Youth a girl	-0.09 (0.14)	-0.08 (0.14)	0.03 (0.14)	-0.07 (0.14)	-0.08 (0.14)
Youth age	0.02 (0.04)	0.06 (0.04)	0.05 (0.04)	0.06 (0.04)	0.06 (0.04)
Wave	-0.06 (0.04)	-0.03 (0.04)	-0.03 (0.04)	-0.03 (0.04)	-0.03 (0.04)
Parent's Education					
Degree					
Other higher degree		0.37 (0.22)	0.30 (0.22)	0.36 (0.22)	0.37 (0.22)
A-level or Similar		0.58** (0.21)	0.48* (0.21)	0.55** (0.21)	0.56** (0.21)
GCSE or Similar		0.61** (0.22)	0.45* (0.21)	0.54* (0.22)	0.59** (0.22)
Other qualification		1.39*** (0.32)	1.33*** (0.32)	1.32*** (0.32)	1.36*** (0.32)
No qualification		0.46 (0.34)	0.33 (0.33)	0.38 (0.34)	0.44 (0.34)
One parent non-UK born		-0.94*** (0.19)	-0.85*** (0.19)	-0.97*** (0.19)	-0.95*** (0.19)
Both parents non-UK born		-0.97*** (0.29)	-0.77** (0.28)	-1.06*** (0.29)	-1.00*** (0.29)
HH income (log)		0.17 (0.14)	0.17 (0.14)	0.19 (0.14)	0.18 (0.14)
At least one parent works		-0.57** (0.20)	-0.54** (0.20)	-0.53** (0.20)	-0.57** (0.20)
Single parent		0.07 (0.19)	0.09 (0.19)	0.04 (0.19)	0.05 (0.19)
Parent's mental health		-0.06*** (0.01)	-0.05*** (0.01)	-0.06*** (0.01)	-0.06*** (0.01)
Parent's physical health		-0.03*** (0.01)	-0.03*** (0.01)	-0.03*** (0.01)	-0.03*** (0.01)
Parent's age		-0.06*** (0.01)	-0.05*** (0.01)	-0.06*** (0.01)	-0.06*** (0.01)
Length of residence					
1 year or less					
2 - 3 years		-0.37 (0.35)	-0.38 (0.35)	-0.37 (0.35)	-0.37 (0.36)
4 - 10 years		-0.39 (0.33)	-0.39 (0.33)	-0.39 (0.33)	-0.38 (0.33)
10 years or longer		-0.88** (0.34)	-0.90** (0.34)	-0.88** (0.34)	-0.88** (0.34)
Length of residence					
Leisure time			-0.16** (0.05)		
Eat dinner			-0.15 (0.08)		
Talk about important matter			-0.18* (0.09)		
Praise			-0.13 (0.16)		
Cuddle			-0.22 (0.13)		
Involve youth rule setting			0.09 (0.07)		
Shouting			0.78*** (0.09)		
Spanking or slapping			0.33** (0.12)		
Ethnic density				-0.12 (0.49)	-0.31 (0.49)
Townsend Deprivation Index					

quintile 1 -least deprived					
quintile 2				0.67* (0.26)	
quintile 3				0.88*** (0.26)	
quintile 4				0.87** (0.27)	
quintile 5 - most deprived				0.91** (0.28)	
Crime					
quintile 1 -least deprived					
quintile 2					0.10 (0.26)
quintile 3					0.56* (0.27)
quintile 4					0.26 (0.28)
quintile 5 - most deprived					0.37 (0.30)
Living Environment					
quintile 1 -least deprived					
quintile 2					-0.38 (0.25)
quintile 3					-0.23 (0.26)
quintile 4					-0.37 (0.26)
quintile 5 - most deprived					-0.19 (0.29)
Constant	10.93*** (0.44)	16.75*** (1.37)	16.12*** (1.63)	15.80*** (1.49)	16.85*** (1.51)
Groups: n, n neigborhoods	5425, 2422	5425, 2422	5425, 2422	5425, 2422	5425, 2422
Neighborhood	1.814	1.658	1.53	1.645	1.66
Neighborhood/Young people	3.763	3.651	3.564	3.649	3.65
Residual	3.73	3.738	3.774	3.738	3.739
AIC	45092.3	44876.4	44766.5	44870.1	44885.7
BIC	45161.2	45055.7	45001	45083.9	45127.1
Observations	7,302	7,302	7,302	7,302	7,302

Note:*p<0.05; **p<0.01; ***p<0.001. *Deprivation refers to Townsend Deprivation Index, Q1–Q5 refers to neighbourhood quintiles. Education variables categorised: A- level or similar includes Welsh baccalaureate; international baccalaureate; higher grade/advanced higher; certificate of sixth year studies. GCSE or similar includes CSE; standard/ordinary (o) grade / lower.* BAMEs- Blacks, Asians and other ethnic minorities. Pooled model. Mental health difficulties measured by Total difficulties score on SDQ scale

Table SA4.1 Multilevel linear regression of **emotional symptoms** on ethnicity, individual/family characteristics, parental style and neighbourhood characteristics among young people aged 10-15 in England and Wales.

	Model 1 Coeff (S.E.)	Model 2 Coeff (S.E.)	Model 3 Coeff (S.E.)	Model 4 Coeff (S.E.)	Model 5 Coeff (S.E.)
Individual Level Predictors					
Other white	-0.25 (0.17)	-0.13 (0.18)	-0.13 (0.18)	-0.16 (0.21)	-0.19 (0.21)
Welsh	-0.23 (0.16)	-0.23 (0.16)	-0.22 (0.16)	-0.23 (0.16)	-0.21 (0.16)
BAMEs	-0.26*** (0.06)	-0.15 (0.08)	-0.16* (0.08)	-0.19 (0.15)	-0.20 (0.15)
Youth a girl	0.89*** (0.05)	0.89*** (0.05)	0.90*** (0.05)	0.89*** (0.05)	0.89*** (0.05)
Youth age	0.03* (0.01)	0.04* (0.01)	0.04* (0.02)	0.04* (0.01)	0.04* (0.01)
Wave	0.01 (0.01)	0.01 (0.02)	0.01 (0.02)	0.01 (0.02)	0.01 (0.02)
Parent's Education					
Degree					
Other higher degree		0.04 (0.09)	0.03 (0.09)	0.04 (0.09)	0.03 (0.09)
A-level or Similar		0.05 (0.08)	0.04 (0.08)	0.04 (0.08)	0.05 (0.08)
GCSE or Similar		0.13 (0.08)	0.11 (0.08)	0.11 (0.08)	0.12 (0.08)
Other qualification		0.17 (0.12)	0.16 (0.12)	0.15 (0.12)	0.16 (0.12)
No qualification		-0.10 (0.13)	-0.10 (0.13)	-0.11 (0.13)	-0.10 (0.13)
One parent non-UK born		-0.23** (0.07)	-0.23** (0.07)	-0.24** (0.07)	-0.23** (0.07)
Both parents non-UK born		-0.23* (0.11)	-0.21 (0.11)	-0.25* (0.11)	-0.23* (0.11)
HH income (log)		0.13* (0.05)	0.13* (0.05)	0.13* (0.05)	0.13* (0.05)
At least one parent works		-0.13 (0.08)	-0.12 (0.08)	-0.12 (0.08)	-0.13 (0.08)
Single parent		-0.04 (0.07)	-0.04 (0.07)	-0.04 (0.07)	-0.04 (0.07)
Parent's mental health		-0.02*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)
Parent's physical health		-0.01** (0.00)	-0.01** (0.00)	-0.01* (0.00)	-0.01** (0.00)
Parent's age		-0.01 (0.005)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.005)
Length of residence					
1 year or less					
2 - 3 years		-0.26 (0.14)	-0.26 (0.14)	-0.26 (0.14)	-0.26 (0.14)
4 - 10 years		-0.24 (0.13)	-0.24 (0.13)	-0.24 (0.13)	-0.24 (0.13)
10 years or longer		-0.33* (0.13)	-0.33* (0.13)	-0.33* (0.13)	-0.33* (0.13)
Leisure time					
Eat dinner			-0.04 (0.02)		
Length of residence			-0.003 (0.03)		
Talk about important matter			-0.02 (0.03)		
Praise			0.06 (0.06)		
Cuddle			0.01 (0.05)		
Involve youth rule setting			0.01 (0.03)		
Shouting			0.06 (0.04)		
Spanking or slapping			0.01 (0.05)		
Ethnic density				-0.02 (0.19)	-0.09 (0.19)
Townsend Deprivation Index					
quintile 1 -least deprived					
quintile 2				0.11 (0.10)	
quintile 3				0.25** (0.10)	
quintile 4				0.21* (0.10)	

quintile 5 - most deprived				0.17 (0.10)	
Crime					
quintile 1 -least deprived					
quintile 2					0.04 (0.10)
quintile 3					0.11 (0.10)
quintile 4					0.03 (0.10)
quintile 5 - most deprived					0.12 (0.11)
Living Environment					
quintile 1 -least deprived					
quintile 2					-0.07 (0.09)
quintile 3					-0.04 (0.10)
quintile 4					-0.15 (0.10)
quintile 5 - most deprived					-0.12 (0.11)
Constant	1.98*** (0.18)	3.28*** (0.54)	2.98*** (0.65)	3.07*** (0.58)	3.37*** (0.59)
Groups: n, n neigborhoods	5425, 2422	5425, 2422	5425, 2422	5425, 2422	5425, 2422
Neighborhood	0.525	0.492	0.486	0.495	0.492
Neighborhood/Young people	1.283	1.252	1.252	1.251	1.253
Residual	1.625	1.63	1.631	1.63	1.63
AIC	31398.6	31298.1	31306.6	31299.8	31311.1
BIC	31467.5	31477.4	31541	31513.6	31552.4
Observations	7,302	7,302	7,302	7,302	7,302

Note:*p<0.05; **p<0.01; ***p<0.001. *Deprivation refers to Townsend Deprivation Index, Q1–Q5 refers to neighbourhood quintiles. Education variables categorised: A- level or similar includes Welsh baccalaureate; international baccalaureate; higher grade/advanced higher; certificate of sixth year studies. GCSE or similar includes CSE; standard/ordinary (o) grade / lower.* BAMEs- Blacks, Asians and other ethnic minorities

Table SA4.2 Multilevel linear regression of **conduct problems** on ethnicity, individual/family characteristics, parental style and neighbourhood characteristics among young people aged 10-15 in England and Wales.

	Model 1 Coeff (S.E.)	Model 2 Coeff (S.E.)	Model 3 Coeff (S.E.)	Model 4 Coeff (S.E.)	Model 5 Coeff (S.E.)
Individual Level Predictors					
Other white	-0.14 (0.14)	-0.08 (0.15)	-0.08 (0.14)	-0.15 (0.18)	-0.16 (0.18)
Welsh	-0.07 (0.13)	-0.08 (0.13)	-0.07 (0.13)	-0.09 (0.13)	-0.07 (0.13)
BAMEs	-0.09 (0.05)	-0.04 (0.07)	-0.08 (0.07)	-0.15 (0.13)	-0.16 (0.13)
Youth a girl	-0.42*** (0.05)	-0.41*** (0.05)	-0.36*** (0.04)	-0.41*** (0.05)	-0.41*** (0.05)
Youth age	-0.01 (0.01)	0.003 (0.01)	0.003 (0.01)	0.002 (0.01)	0.002 (0.01)
Wave	-0.06*** (0.01)	-0.04*** (0.01)	-0.04*** (0.01)	-0.04*** (0.01)	-0.04*** (0.01)
Parent's Education					
Degree					
Other higher degree		0.12 (0.07)	0.09 (0.07)	0.12 (0.07)	0.13 (0.07)
A-level or Similar		0.19** (0.07)	0.15* (0.07)	0.18** (0.07)	0.18** (0.07)
GCSE or Similar		0.19** (0.07)	0.11 (0.07)	0.16* (0.07)	0.18* (0.07)
Other qualification		0.40*** (0.10)	0.37*** (0.10)	0.37*** (0.10)	0.38*** (0.10)
No qualification		0.19 (0.11)	0.13 (0.11)	0.16 (0.11)	0.18 (0.11)
One parent non-UK born		-0.24*** (0.06)	-0.21*** (0.06)	-0.26*** (0.06)	-0.26*** (0.06)
Both parents non-UK born		-0.13 (0.09)	-0.05 (0.09)	-0.17 (0.09)	-0.16 (0.09)
HH income (log)		0.03 (0.05)	0.03 (0.04)	0.04 (0.05)	0.04 (0.05)
At least one parent works		-0.20** (0.07)	-0.18** (0.06)	-0.18** (0.07)	-0.19** (0.07)
Single parent		0.02 (0.06)	0.03 (0.06)	-0.0001 (0.06)	0.004 (0.06)
Parent's mental health		-0.01*** (0.002)	-0.01*** (0.002)	-0.01*** (0.002)	-0.01*** (0.002)
Parent's physical health		-0.01* (0.003)	-0.005 (0.002)	-0.01* (0.003)	-0.01* (0.003)
Parent's age		-0.02*** (0.004)	-0.02*** (0.004)	-0.02*** (0.004)	-0.02*** (0.004)
Length of residence					
1 year or less					
2 - 3 years		0.02 (0.12)	0.01 (0.11)	0.02 (0.12)	0.01 (0.12)
4 - 10 years		-0.03 (0.11)	-0.03 (0.11)	-0.03 (0.11)	-0.03 (0.11)
10 years or longer		-0.16 (0.11)	-0.18 (0.11)	-0.17 (0.11)	-0.17 (0.11)
Leisure time					
Eat dinner			-0.05** (0.02)		
Length of residence			-0.04 (0.03)		
Talk about important matter			-0.06 (0.03)		
Praise			-0.14** (0.05)		
Cuddle			-0.12** (0.04)		
Involve youth rule setting			0.02 (0.02)		
Shouting			0.38*** (0.03)		
Spanking or slapping			0.20*** (0.04)		
Ethnic density				-0.07 (0.16)	-0.11 (0.16)
Townsend Deprivation Index					
quintile 1 -least deprived					
quintile 2				0.18* (0.08)	
quintile 3				0.20* (0.08)	
quintile 4				0.28** (0.09)	

quintile 5 - most deprived				0.32*** (0.09)	
Crime					
quintile 1 -least deprived					
quintile 2					0.11 (0.08)
quintile 3					0.22** (0.09)
quintile 4					0.18* (0.09)
quintile 5 - most deprived					0.17 (0.09)
Living Environment					
quintile 1 -least deprived					
quintile 2					-0.21** (0.08)
quintile 3					-0.13 (0.08)
quintile 4					-0.12 (0.08)
quintile 5 - most deprived					-0.02 (0.09)
Constant	2.75*** (0.14)	4.29*** (0.45)	3.91*** (0.52)	4.00*** (0.48)	4.24*** (0.49)
Groups: n, n neigborhoods	5425, 2422	5425, 2422	5425, 2422	5425, 2422	5425, 2422
Neighborhood	0.502	0.458	0.39	0.454	0.458
Neighborhood/Young people	1.202	1.182	1.113	1.182	1.181
Residual	1.242	1.242	1.262	1.241	1.241
AIC	28642	28498.2	28231	28491.7	28497.4
BIC	28711	28677.4	28465.5	28705.5	28738.8
Observations	7,302	7,302	7,302	7,302	7,302

Note:*p<0.05; **p<0.01; ***p<0.001. *Deprivation refers to Townsend Deprivation Index, Q1–Q5 refers to neighbourhood quintiles. Education variables categorised: A- level or similar includes Welsh baccalaureate; international baccalaureate; higher grade/advanced higher; certificate of sixth year studies. GCSE or similar includes CSE; standard/ordinary (o) grade / lower.* BAMEs- Blacks, Asians and other ethnic minorities

Table SA4.3 Multilevel linear regression of **Peer Relationship Problems** on ethnicity, individual/family characteristics, parental style and neighbourhood characteristics among young people aged 10-15 in England and Wales.

	Model 1 Coeff (S.E.)	Model 2 Coeff (S.E.)	Model 3 Coeff (S.E.)	Model 4 Coeff (S.E.)	Model 5 Coeff (S.E.)
Individual Level Predictors					
Other white	-0.004 (0.13)	-0.04 (0.13)	-0.04 (0.13)	0.05 (0.16)	0.03 (0.16)
Welsh	-0.27* (0.12)	-0.30* (0.12)	-0.30* (0.12)	-0.30* (0.12)	-0.30* (0.12)
BAMEs	-0.15** (0.05)	-0.20** (0.06)	-0.22*** (0.06)	-0.15 (0.12)	-0.13 (0.12)
Youth a girl	-0.14*** (0.04)	-0.14*** (0.04)	-0.12** (0.04)	-0.14*** (0.04)	-0.14*** (0.04)
Youth age	-0.03** (0.01)	-0.03* (0.01)	-0.03* (0.01)	-0.03* (0.01)	-0.03* (0.01)
Wave	0.03* (0.01)	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)
Parent's Education					
Degree					
Other higher degree		-0.05 (0.07)	-0.06 (0.07)	-0.06 (0.07)	-0.06 (0.07)
A-level or Similar		0.03 (0.06)	0.02 (0.06)	0.01 (0.06)	0.02 (0.06)
GCSE or Similar		0.07 (0.06)	0.05 (0.06)	0.04 (0.06)	0.06 (0.06)
Other qualification		0.24* (0.09)	0.23* (0.09)	0.21* (0.09)	0.23* (0.09)
No qualification		0.11 (0.10)	0.10 (0.10)	0.07 (0.10)	0.09 (0.10)
One parent non-UK born		-0.10 (0.06)	-0.09 (0.06)	-0.10 (0.06)	-0.10 (0.06)
Both parents non-UK born		0.02 (0.08)	0.03 (0.08)	-0.01 (0.08)	0.02 (0.08)
HH income (log)		-0.09* (0.04)	-0.09* (0.04)	-0.09* (0.04)	-0.09* (0.04)
At least one parent works		-0.13* (0.06)	-0.12* (0.06)	-0.11 (0.06)	-0.12* (0.06)
Single parent		0.05 (0.06)	0.05 (0.06)	0.05 (0.06)	0.05 (0.06)
Parent's mental health		-0.01*** (0.002)	-0.01*** (0.002)	-0.01*** (0.002)	-0.01*** (0.002)
Parent's physical health		-0.01** (0.002)	-0.01** (0.002)	-0.01** (0.002)	-0.01** (0.002)
Parent's age		-0.01* (0.004)	-0.01* (0.004)	-0.01 (0.004)	-0.01 (0.004)
Length of residence					
1 year or less					
2 - 3 years		-0.10 (0.11)	-0.10 (0.11)	-0.10 (0.11)	-0.10 (0.11)
4 - 10 years		-0.16 (0.10)	-0.16 (0.10)	-0.16 (0.10)	-0.16 (0.10)
10 years or longer		-0.24* (0.10)	-0.24* (0.10)	-0.25* (0.10)	-0.24* (0.10)
Leisure time					
Eat dinner			-0.02 (0.02)		
Length of residence			-0.02 (0.02)		
Talk about important matter			-0.01 (0.03)		
Praise			0.02 (0.05)		
Cuddle			-0.05 (0.04)		
Involve youth rule setting			0.01 (0.02)		
Shouting			0.05 (0.03)		
Spanking or slapping			0.11** (0.04)		
Ethnic density				0.16 (0.14)	0.12 (0.14)
Townsend Deprivation Index					
quintile 1 -least deprived					
quintile 2				0.05 (0.07)	
quintile 3				0.12 (0.07)	
quintile 4				0.13 (0.08)	
quintile 5 - most deprived				0.23** (0.08)	

Crime					
quintile 1 -least deprived					
quintile 2					-0.02 (0.07)
quintile 3					0.10 (0.08)
quintile 4					0.04 (0.08)
quintile 5 - most deprived					0.14 (0.08)
Living Environment					
quintile 1 -least deprived					
quintile 2					-0.06 (0.07)
quintile 3					-0.07 (0.07)
quintile 4					-0.09 (0.08)
quintile 5 - most deprived					-0.07 (0.08)
Constant	2.20*** (0.13)	4.46*** (0.41)	4.33*** (0.49)	4.07*** (0.44)	4.30*** (0.45)
Groups: n, n neigborhoods	5425, 2422	5425, 2422	5425, 2422	5425, 2422	5425, 2422
Neighborhood	0.45	0.411	0.407	0.403	0.409
Neighborhood/Young people	0.988	0.968	0.967	0.969	0.968
Residual	1.213	1.217	1.217	1.217	1.217
AIC	27365.9	27256.4	27252.6	27256.6	27267.3
BIC	27434.8	27435.7	27487.1	27470.4	27508.6
Observations	7,302	7,302	7,302	7,302	7,302

Note:*p<0.05; **p<0.01; ***p<0.001. *Deprivation refers to Townsend Deprivation Index, Q1–Q5 refers to neighbourhood quintiles. Education variables categorised: A- level or similar includes Welsh baccalaureate; international baccalaureate; higher grade/advanced higher; certificate of sixth year studies. GCSE or similar includes CSE; standard/ordinary (o) grade / lower.* BAMEs- Blacks, Asians and other ethnic minorities

Table SA4.4 Multilevel linear regression of **hyperactivity-inattention** on ethnicity, individual/family characteristics, parental style and neighbourhood characteristics among young people aged 10-15 in England and Wales.

	Model 1 Coeff (S.E.)	Model 2 Coeff (S.E.)	Model 3 Coeff (S.E.)	Model 4 Coeff (S.E.)	Model 5 Coeff (S.E.)
Individual Level Predictors					
Other white	-0.57** (0.18)	-0.33 (0.19)	-0.34 (0.18)	-0.46* (0.23)	-0.48* (0.23)
Welsh	-0.01 (0.17)	-0.02 (0.17)	-0.01 (0.16)	-0.04 (0.17)	-0.01 (0.17)
BAMEs	-0.63*** (0.07)	-0.37*** (0.09)	-0.39*** (0.09)	-0.49** (0.16)	-0.53** (0.16)
Youth a girl	-0.41*** (0.06)	-0.41*** (0.06)	-0.37*** (0.06)	-0.40*** (0.06)	-0.40*** (0.06)
Youth age	0.03* (0.01)	0.05** (0.02)	0.04* (0.02)	0.05** (0.02)	0.05** (0.02)
Wave	-0.05** (0.02)	-0.04* (0.02)	-0.05** (0.02)	-0.04** (0.02)	-0.04* (0.02)
Parent's Education					
Degree					
Other higher degree		0.25** (0.09)	0.23* (0.09)	0.25** (0.09)	0.25** (0.09)
A-level or Similar		0.29*** (0.09)	0.25** (0.09)	0.29*** (0.09)	0.30*** (0.09)
GCSE or Similar		0.24** (0.09)	0.17 (0.09)	0.23** (0.09)	0.24** (0.09)
Other qualification		0.60*** (0.13)	0.57*** (0.13)	0.59*** (0.13)	0.60*** (0.13)
No qualification		0.22 (0.14)	0.17 (0.14)	0.23 (0.14)	0.24 (0.14)
One parent non-UK born		-0.35*** (0.08)	-0.32*** (0.08)	-0.36*** (0.08)	-0.36*** (0.08)
Both parents non-UK born		-0.60*** (0.12)	-0.51*** (0.12)	-0.61*** (0.12)	-0.61*** (0.12)
HH income (log)		0.12* (0.06)	0.11* (0.06)	0.11* (0.06)	0.12* (0.06)
At least one parent works		-0.10 (0.08)	-0.10 (0.08)	-0.09 (0.08)	-0.11 (0.08)
Single parent		0.05 (0.08)	0.06 (0.08)	0.04 (0.08)	0.04 (0.08)
Parent's mental health		-0.01*** (0.003)	-0.01** (0.003)	-0.01*** (0.003)	-0.01*** (0.003)
Parent's physical health		-0.01** (0.003)	-0.01* (0.003)	-0.01** (0.003)	-0.01** (0.003)
Parent's age		-0.02*** (0.01)	-0.02*** (0.01)	-0.02*** (0.01)	-0.02*** (0.01)
Length of residence					
1 year or less					
2 - 3 years		-0.09 (0.15)	-0.10 (0.15)	-0.08 (0.15)	-0.08 (0.15)
4 - 10 years		-0.02 (0.14)	-0.02 (0.14)	-0.01 (0.14)	-0.01 (0.14)
10 years or longer		-0.19 (0.14)	-0.20 (0.14)	-0.18 (0.14)	-0.18 (0.14)
Leisure time					
Eat dinner			-0.07** (0.02)		
Length of residence			-0.09** (0.03)		
Talk about important matter			-0.11** (0.04)		
Praise			-0.09 (0.07)		
Cuddle			-0.05 (0.05)		
Involve youth rule setting			0.05 (0.03)		
Shouting			0.32*** (0.04)		
Spanking or slapping			0.02 (0.05)		
Ethnic density				-0.19 (0.20)	-0.23 (0.20)
Townsend Deprivation Index					
quintile 1 -least deprived					
quintile 2				0.33** (0.10)	

quintile 3				0.28** (0.10)	
quintile 4				0.25* (0.11)	
quintile 5 - most deprived				0.19 (0.11)	
Crime					
quintile 1 -least deprived					
quintile 2					-0.03 (0.11)
quintile 3					0.12 (0.11)
quintile 4					-0.004 (0.11)
quintile 5 - most deprived					-0.05 (0.12)
Living Environment					
quintile 1 -least deprived					
quintile 2					-0.02 (0.10)
quintile 3					0.01 (0.10)
quintile 4					0.01 (0.11)
quintile 5 - most deprived					0.03 (0.12)
Constant	4.02*** (0.19)	4.89*** (0.57)	5.11*** (0.68)	4.83*** (0.62)	5.09*** (0.62)
Groups: n, n neigborhoods	5425, 2422	5425, 2422	5425, 2422	5425, 2422	5425, 2422
Neighborhood	0.58	0.554	0.498	0.549	0.559
Neighborhood/Young people	1.498	1.47	1.426	1.468	1.468
Residual	1.617	1.615	1.634	1.616	1.616
AIC	32169.8	32048.1	31944.7	32044.9	32061.2
BIC	32238.8	32227.4	32179.1	32258.6	32302.6
Observations	7,302	7,302	7,302	7,302	7,302

Note:*p<0.05; **p<0.01; ***p<0.001. *Deprivation refers to Townsend Deprivation Index, Q1–Q5 refers to neighbourhood quintiles. Education variables categorised: A- level or similar includes Welsh baccalaureate; international baccalaureate; higher grade/advanced higher; certificate of sixth year studies. GCSE or similar includes CSE; standard/ordinary (o) grade / lower.* BAMEs- Blacks, Asians and other ethnic minorities.

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Study III

Neighbourhood composition: exploring the determinants and stability of reported life satisfaction among ethnic minority youths in England and Wales

Neighbourhood composition: exploring the determinants and stability of reported life satisfaction among ethnic minority youths in England and Wales

Abstract

This paper explores the determinants and stability of reported life satisfaction among ethnic minority youths aged 10-15 years residing in England and Wales, and compares these findings with those for majority White youths. The research draws on the literature which implicates the high spatial concentration of ethnic minorities in a given area – 'ethnic density' effects and neighbourhood socioeconomic status on health. Three-level multilevel growth models were fitted to a sample of n=5700 individuals (12,468 observations) using data drawn from two sources: *Understanding Society*: *The UK Household Longitudinal Study* (UKHLS) and *administrative data* based on the 2011 UK census. In general, life satisfaction was found to decrease with age. A strong association was also found between life satisfaction and ethnicity, in particular Asian and Black youths were shown to report better life satisfaction compared with their White counterparts. This differential association was attenuated by ethnic density and neighbourhood socioeconomic status measured by deprivation, proportion of residents proficient in English but English was not their main language, proportion of residents who had arrived in the UK in the past 5 years, and the proportion of residents with a routine/semi-routine occupation. Policies and public health initiatives aimed at improving the mental health and well-being of young people should take into account the inter-relationship between ethnic density and socioeconomic deprivation.

Keywords: life satisfaction, young people, children/adolescents, socioeconomic status, England and Wales, family, ethnic density, neighbourhood.

Introduction

Global assessments of life satisfaction provide an overall evaluation of an individual's quality of life and are associated with both morbidity and mortality (Lewinsohn, Redner, and Seeley 1991; Kahneman and Krueger 2006). Adult members of ethnic minority groups are more likely to report lower life satisfaction compared with the White adult majority (Knies, Nandi, and Platt 2014; Shields and Wailoo 2002; Burton and Phipps 2008), and the evidence strongly suggests that this is linked to various dimensions of individual and neighbourhood socioeconomic inequalities (e.g. unemployment, income, deprivation, neighbourhood quality and resources, health, health care provision and services, among other factors).

There is a wealth of evidence indicating that ethnic minority groups are over-represented in socioeconomically disadvantaged neighbourhoods and, according to several studies, the residential/spatial clustering segregation of these groups is a key determinant of the observed differences in health and well-being compared with the white majority (Wilson 1987; Williams and Collins 2001). On the other hand, some studies have reported better mental health, life satisfaction and in some instances physical health, in neighbourhoods where adult members of ethnic minority groups constitute a greater proportion of the population (Halpern and Nazroo 2000; Bécares, Shaw, et al. 2012). Similarly, prior studies investigating the health of young people across multiple contexts have found that the so-called ethnic density, which is measured as proportion ethnic minority or the proportion of co-ethnics was associated with health (Fagg et al. 2006; Harding et al. 2015; Abada, Hou, and Ram 2007; Gieling, Vollebergh, and van Dorsselaer 2010; Wickrama and Bryant 2003). The results of these studies have been inconsistent. Whereas some studies have found that ethnic density is associated with salutary health effects (Wickrama and Bryant 2003; Gieling,

Vollebergh, and van Dorsselaer 2010; Fagg et al. 2006; Zhang et al. 2017), others have reported that it contributes (Abada, Hou, and Ram 2007) to poor health or that there was no association (Xue et al. 2005). In order, to disentangle the true effect of ethnic density on the health of young people, more research into its impact is warranted.

Research into whether the effect of neighbourhood 'ethnic density' on life satisfaction also applies to ethnic minority youths has yet to be examined in the British context. This is despite the fact that young people may be more susceptible to neighbourhood effects because of their early developmental stage, relative immobility and autonomy with regards to where they live and the amount of time spent in their area of residence (Allison et al. 1999; Jackson and Mare 2007). Improving our knowledge of the determinants of life satisfaction, specifically the positive aspects, could provide a springboard for creating targeted and effective interventions to buffer and protect socially and economic disadvantaged at-risk groups.

This is crucial because life satisfaction has been shown to predict mental ill-health at least two years before actual diagnosis (Lewinsohn, Redner, and Seeley 1991), and mental ill-health among young people in the UK has been estimated at 10% (Green et al. 2005; Meltzer, Gatward, Goodman, et al. 2000). These estimates indicate however that ethnicity matters. Estimates indicate that the prevalence of mental health disorders is unequally distributed among young people, where approximately 12% Black, 10% Whites, 8% Asian (Pakistani & Bangladeshi) and 4% Indian youths have a mental health disorder (Meltzer, Gatward, Goodman, et al. 2000). In light of the diversity of the British population (Jivraj and Simpson 2015a; Simpson 2015) and the fact that young people aged 10-15 years make up 7% of the population (ONS Census 2011a), exploring factors which may improve the life satisfaction across these groups may have

significant public health implications. A pioneering study was therefore conducted of the influence of ethnic density on life satisfaction among ethnic minority youths.

Bearing the above in mind, the central focus of the present study was to explore the determinants and stability of reported life satisfaction among ethnic minority youths aged 10-15 years residing in England and Wales, and compares these findings with those of majority White youths. The research drew on the extensive literature that implicates the neighbourhood in a range of youth health outcomes. Further by using a longitudinal panel it was possible to follow the development of life satisfaction among the various ethnic groups over time. The following questions were addressed (1) What is the effect of ethnic density and neighbourhood socioeconomic status on ethnic-specific age trajectories in life satisfaction among ethnic minority youths? (2) Does ethnic density and neighbourhood socioeconomic status explain the variation in life satisfaction across different ethnic groups? (3) How stable are the effects of life satisfaction across ethnic minority groups over time when compared to majority white youths?

Materials and methods

Data and study population

The research drew upon data from two sources: the individual-level data was taken from waves 1 (2009/2010) to 5 (2013/2014) of *Understanding Society*: *The UK Household Longitudinal Study* (UKHLS) (University of Essex – Institute for Social and Economic Research 2015), while the neighbourhood-level data was based on aggregated *administrative data* collected in the 2011 census (ONS 2017).

Individual-level data

The UKHLS is a household panel study that in 2009/2010 sampled around 50,000 households, resulting in wave 1 of a sample of approximately 70,000 individuals living in 30,000 households across the UK (Knies 2017b), who have since been surveyed annually. Within households where adults were interviewed, oral consent was obtained from parents and/or guardians for household members aged 10-15 years to complete a pencil-and-paper self-reported questionnaire.

Neighbourhood-level data

For the purpose of this analysis, neighbourhood is defined as a Middle Super Output Area (MSOA). MSOAs were created for administrative purposes as a part of the system used to monitor social, economic and general living conditions in the UK. They have a minimum residential size of 5000 individuals and 2000 households, with an average population size of 7500.

Permission was requested and obtained for the data linkage and for secondary analyses to be conducted using UKHLS data. Approval was granted by the University of Essex Ethics Committee.

Sample

The final sample, defined as youth or young people, referred to both children (i.e. 10-12 years old) and adolescents (i.e. aged 13-15) who together formed an unbalanced panel consisting of 5,700 young people aged 10-15 years (12,468 observations) residing in 2,505 neighbourhoods. The final analytical sample size can be attributed to list-wise deletion of variables with missing information. Some attrition across the data collection periods could be explained by the fact that: (a) the survey team lost contact

with families who had participated in an earlier wave, (b) young people decided not to respond to the survey even though their families participated, or (c) individuals initially classified as being a youth (i.e. aged 10-15 years) turned age 16 and were interviewed as a part of the adult sample. New participants also joined the survey at different time points because they gained eligibility (i.e. turned age 10) and/or joined households that were already part of the survey.

Measures

The dependent variable *life satisfaction* was comprised of six items measured at each available wave (i.e. waves 1-5, covering the years 2009/2010-2013/2014) of the questionnaire. This measure was aimed at capturing how satisfied respondents were with several aspects of their lives: schoolwork, appearance, family, friends, school, and life as a whole. Respondents were provided with depictions of more or less smiling faces, representing 1 (very satisfied) to 7 (not very satisfied). The six items had a correlation ranging from r=0.25 to a maximum r=0.51, and which loaded onto a single factor (see supplementary appendix SA1). Moreover, together the items had a relatively high internal consistency and reliability, as measured by the Cronbach's alpha (α=0.77), indicating that it was appropriate to sum the items to create a single summary scale. The measure ranged from 1 to 43 and was coded in a similar way to that of earlier studies (see for e.g. Knies 2017a) where higher scores indicated greater life satisfaction. Although there are no studies that has specifically sought to examine the cross-cultural validity of this particular measure, measures of life satisfaction has been widely used and accepted as an indicator of overall well-being (Van Praag, Frijters, and Ferrer-i-Carbonell 2003; Kahneman and Krueger 2006; Proctor, Linley, and Maltby 2009; Shields and Wailoo 2002).

The key explanatory variable, *self-identified ethnicity* was measured using the responses to a list of 18 ethnic identity categories. The variable was then collapsed into four categories (White, Black, Asian and other Mixed identities) because of the small sample sizes. Throughout the text, the terms White and majority White is used interchangeably. Full groups are given in appendix SA2.

Ethnic density, created from data obtained from the 2011 census, was defined as the proportion of all individuals from any ethnic minority group living in the respondent's MSOA (proportion ethnic minority) and the proportion of all individuals living in the respondent's MSOA who were of the same ethnic group (proportion co-ethnics). These measures were calculated separately for each ethnic group using data from the 2011 UK census. It was then merged to the individual level data using the appropriate geographic codes.

Several measures aimed at capturing residential mobility and the socioeconomic conditions of the neighbourhood. These were (a) *socioeconomic deprivation*, which was measured using the Townsend deprivation index and based on data from the 2011 census, which was aggregated at the MSOA level. It consisted of information pertaining to the percentage of households without access to a car or van; percentage of households with more than one person per room (overcrowding); percentage of households not owner-occupied (tenure); and the percentage of economically active residents who are unemployed, excluding students (Townsend, Phillimore, and Beattie 1988); (b) the *proportion routine/semi-routine workers* per neighbourhood was calculated based on the National Statistics Socio-Economic Classification (NS-SEC)[6], which provides an indication of socioeconomic position based on an individual's

[6] More information regarding this census-aggregated measure is available at http://www.ons.gov.uk/census.

occupation; (c) *English language proficiency* which was an aggregated measure that classified people whose main language was not English (or not English or Welsh in Wales) according to their ability to speak English. The following categories were used: can speak English very well, can speak English well, cannot speak English well, or cannot speak English. Higher scores indicated the proportion of individuals in the neighbourhood proficient in English but for whom English was not their main language and (d) an indicator for *Newly arriving migrants* was measured as the proportion of migrants residing in a given neighbourhood (MSOA) who had moved into the UK in the past 5 years.

Individual/family variables previously shown (Webb et al. 2017; Knies 2017a; Proctor, Linley, and Maltby 2009; Bradshaw and Richardson 2009; Scott and Chaudhary 2003) to be related to young people's life satisfaction were also included in the models as controls, in order to reduce the risk that any relationships observed between youth life satisfaction and neighbourhood characteristics were spurious. These included the young people's age, sex and ethnicity. As well as these measures, socioeconomic and demographic characteristics of the parents were included in the models. These factors predisposes families to live in particular neighbourhoods (parents' highest level of education attained; household income; lone parent household; indicators for parents' nativity; length of residency) (Leventhal, Dupéré, and Brooks-Gunn 2009; Leventhal and Brooks-Gunn 2001), and parents' mental health as Survey (measured by 12-item Short Form Health Survey, Appendix 2) With the exception of parental education, all other parental variables were averaged between the two parents. For youths residing in a lone-parent household, the information for that parent was used.

Statistical analysis

Three-level multilevel growth curve models capturing the nested relationships between the repeated measures (at each wave, 1-5) of life satisfaction (level 1) nested in young people (level 2) nested in MSOAs–neighbourhoods (level 3). The models estimated the mean trajectories (i.e. growth) of young people's life satisfaction from age 10 to 15, by including time as an independent variable. This approach captured the fact that young people may differ in life satisfaction at different ages, while also capturing individual differences in patterns over time and therefore deviations from mean trajectories. The models also accounted for the 'clustering' of repeated measures as youth life satisfaction was correlated across the different data collection periods. Thus both the fixed (i.e. mean life satisfaction at the average age) and random (i.e. change per annum/age) parameters were specified in the growth model. With this, the random parameters captured the variation in life satisfaction between data collection periods for each young person (between-wave variance) and between youths at the average age (between-youth intercept variance), as well as the variation in life satisfaction annually (between-youth slope variance). The covariance between the intercept and the slope indicated whether there was a relationship between life satisfaction of young people around the mean age of 12.5 years, and their growth between the ages of 10 and 15.

Bivariate analyses including Pearson correlation and a general description of the variables used in the models across various ethnic groups and waves were followed with a full random effects model with an indicator for clustering at the neighbourhood level. The analysis of the data proceeded sequentially. Model 1 will allow for random intercepts and slopes, with age as the only predictor. This model assesses therefore the average level and growth in life satisfaction through a multilevel regression where only age was included in the model. It also allowed the

relationship between age and life satisfaction to vary across neighbourhoods and among youths. In another specification, age squared was added to the models to allow for the non-linearity of the trajectories but was later dropped because the effects were non-significant. Model 2 included separate variables for each of the ethnic minority groups (modelled relative to Whites). This model provided a baseline measurement for assessing whether the average differences in life satisfaction across the sample could be explained by ethnicity.

Models 3-6 added the neighbourhood factors of interest. These models examined whether proportion ethnic minority or indicators of deprivation were significantly associated with life satisfaction among young people. This model assess the extent to which these indicators explains area-level variation in life satisfaction among youths from various ethnic groups. In model 6, individual/family characteristics were introduced in order to assess whether and the extent to which the observed effects could be attributed to the type of individuals/families residing in these neighbourhoods.

Results

Distribution of life satisfaction by ethnic group over time.

Figure 1 provides a breakdown of the ethnic distribution of life satisfaction across each of the five waves of data collection. The results indicated that life satisfaction declined over time among Black and Asian youths but fluctuated inconsistently among White and Mixed ethnic youths.

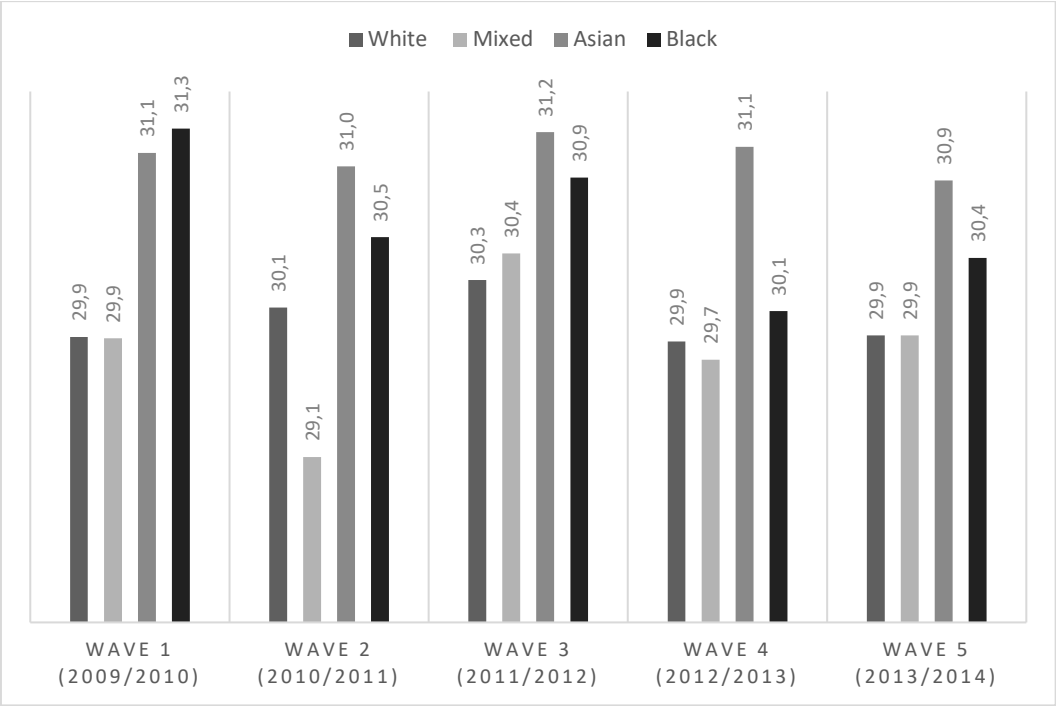

Figure 1. The ethnic distribution of life satisfaction across the five waves of data collection [(Wave 1 (2009/2010) to Wave 5 (2013/2014)].

Distribution of life satisfaction by ethnic group

An examination of the percentage of youths reporting each of the dimensions of life satisfaction by ethnicity (Figure 2A-2D) indicated that, overall, the most common contributors to high life satisfaction were family and friends, while the least common was school work. Asians were the most satisfied of these groups, followed by Blacks and Whites. Youths of Mixed ethnicities were least satisfied with family and friends, by approximately 6 percentage points. Besides the high satisfaction which young people felt for their family and friends, there was some variation between the four ethnic groups in their report certain dimensions of life satisfaction. Examples of these differences are provided with a description of the dimensions with which young people from each ethnic group were most satisfied –i.e. dimensions reported as being 7, based on the response scale of 1-7.

For White youths, appearance (18%) and school work (18%) were the most frequently citied dimensions of life satisfaction, followed by going to school and life as a whole. In contrast, slightly more than double the proportion of Blacks felt satisfied with their appearance (37%), while 28% reported being very satisfied with school work, 35% with going to school and 38% with life as a whole. Patterns of life satisfaction for Asians were largely similar to those of Blacks, with 32% reporting being satisfied with their appearance, 29% being very satisfied with school work, 40% with going to school and 39% with life as a whole. For Mixed youths, 28% reporting being satisfied with their appearance, 22% with school work and 32% with going to school and life as a whole. Full details are provided in Figures 2A-2D in the appendix.

A zero-order correlation among the neighbourhood measures (Table 1) was significantly related with youth life satisfaction ($p<0.05$ or less). There was a significant and high correlation between minority ethnic density and the Townsend deprivation index, providing further evidence of the over-representation of minority ethnic groups in deprived areas. Figure 3 presents the ethnic distribution of overall ethnic density and the Townsend deprivation index. A full description of all the individual/family variables is shown in appendix SA3.

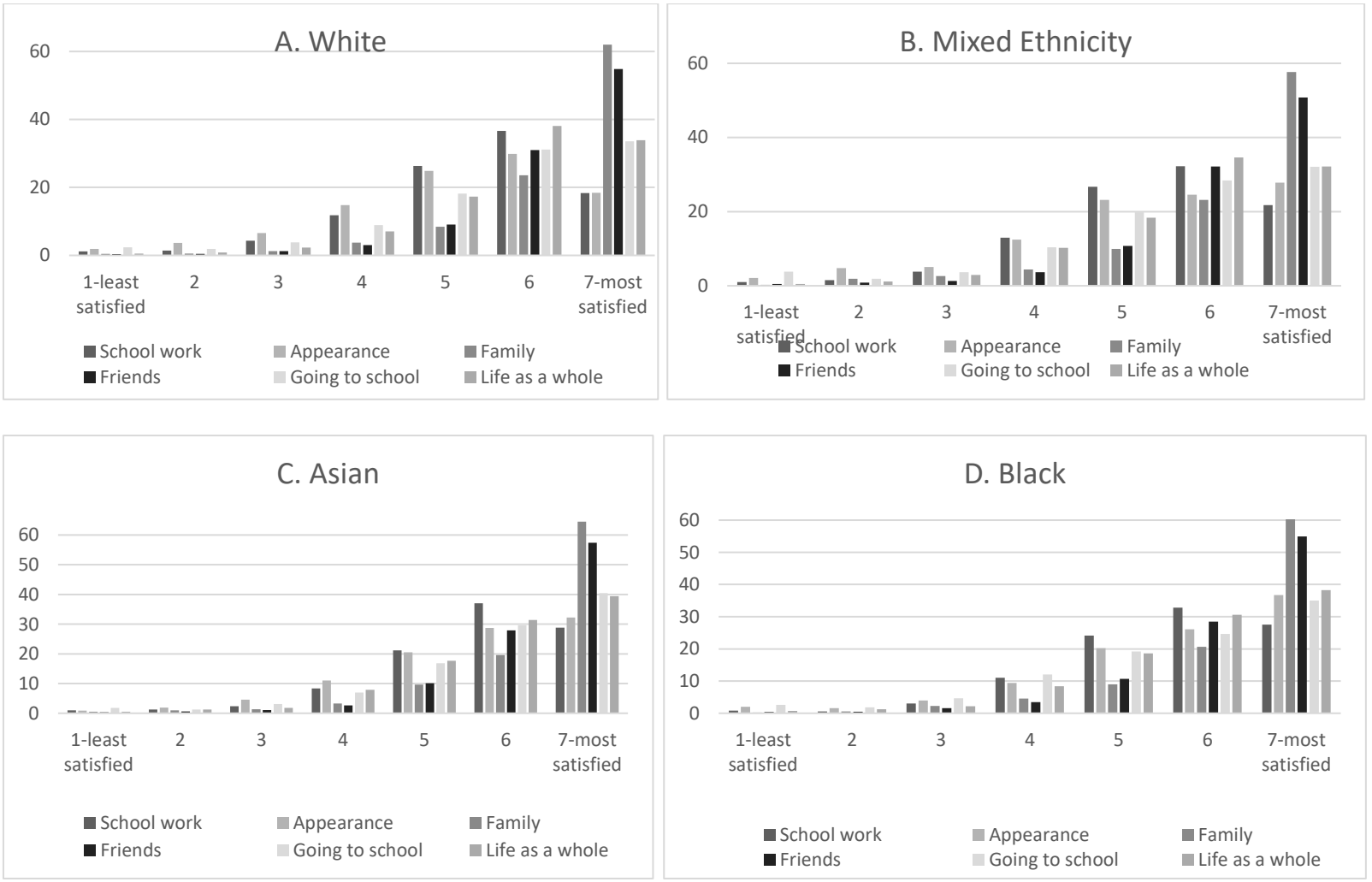

Figure 2A-2D. The distribution of items measuring life satisfaction by ethnicity.

Table 1. Pearson correlation matrix of neighbourhood level variables with life satisfaction

	[1]	[2]	[3]	[4]	[5]	[6]
[1] Life satisfaction	1.00					
[2] Deprivation	0.03**	1.00				
[3] Ethnic density	0.05***	0.83***	1.00			
[4] English Language Proficiency	0.02**	0.48***	-0.20***	1.00		
[5] Proportion migrants arrived last 5 years	-0.03***	0.26***	-0.18***	0.24***	1.00	
[6] Proportion routine/semi routine workers	-0.02**	0.25***	0.13***	0.52***	0.07***	1.00

Notes: *** p<0.001, ** p<0.01, * p<0.05. *Source: UK Household Longitudinal Survey (2015) [Waves 1-5]*

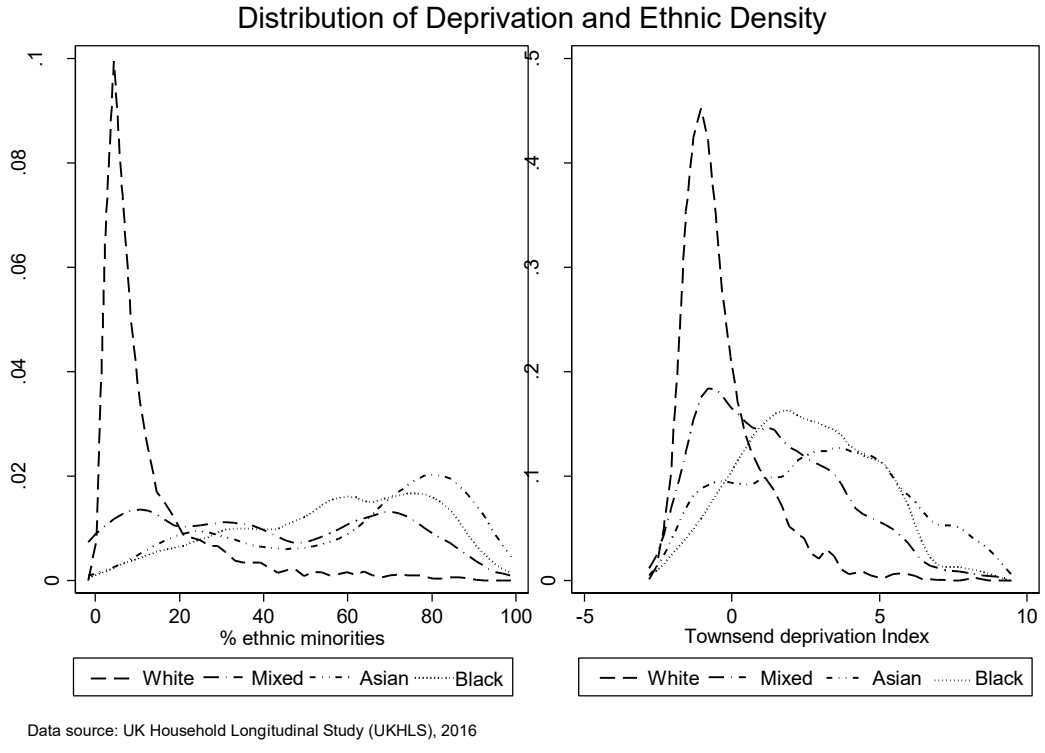

Figure 3. The ethnic distribution of deprivation and ethnic density across neighbourhoods (MSOAs). Lower numbers represent lower levels of deprivation.

As indicated in the model specification, several nested models were then tested as a means of addressing the research questions. The results for coefficients and standard errors (se) are reported in Table 2. For Model 1, the results indicated that life

satisfaction dropped annually by 0.61(0.03) points. These effects were clearly linear, given that age squared, the quadratic term, which was included in another specification (available upon request), did not have a significant influence on life satisfaction, suggesting that the relationship between age and youth life satisfaction was not curvilinear. The random effects were significant, with more between-wave variance and the between-youth intercept variance over time when compared to the between neighbourhood variance. There was also a significant negative covariance between the intercept and the slope. These results, the smaller (more negative) value of the intercept and its association with the larger (more positive) value of the slope, suggested that lower initial life satisfaction scores would lead to a more rapid increase, with more positive changes, in life satisfaction over time.

In Model 2, the trajectory of youth life satisfaction was significantly related to the ethnicity of Asians and Blacks relative to Whites. The mean level of life satisfaction by ethnic group across the five waves of data collection showed that, on average, Black and Asian youths reported significantly higher levels of life satisfaction compared with youths of both White and Mixed ethnicity. This differential was, however, not statistically significant at the 5% level for youths of mixed ethnicity relative to Whites.

Table 2. Fixed and random estimates of life satisfaction trajectories among by ethnicity among youths aged 10-15 years. An examination of the influence of the proportion ethnic minority in a neighbourhood and neighbourhood socioeconomic status

	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**		**Model 6**	
Independent variables	**coef**	**se**	**coef**	**se**	**coef**	**se**	**coef**	**se**	**coef**	**se**	**coef**	**se**
Youth ethnicity (**ref.** white)												
Mixed			0.25	(0.23)	0.22	(0.24)	0.22	(0.24)	0.18	(0.24)	0.22	(0.25)
Asian			1.09***	(0.18)	1.04***	(0.22)	1.03***	(0.21)	0.98***	(0.22)	0.63**	(0.24)
Black			0.81***	(0.23)	0.76**	(0.26)	0.80**	(0.25)	0.75**	(0.26)	0.68*	(0.26)
Neighbourhood variables												
Ethnic density					0.11	(0.33)			0.38	(0.62)	0.33	(0.62)
Townsend deprivation index							-0.02	(0.04)	-0.05	(0.07)	-0.03	(0.07)
English language proficiency							0.52*	(0.24)	0.48+	(0.25)	0.48+	(0.25)
Proportion of newly arriving immigrants							-2.11**	(0.76)	-2.11**	(0.76)	-2.08**	(0.75)
Proportion in routine occupations							-1.70+	(0.89)	-1.26	(1.14)	-0.36	(1.14)
Individual/family variables												
Youth age	-0.61***	(0.03)	-0.61***	(0.03)	-0.61***	(0.03)	-0.61***	(0.03)	-0.61***	(0.03)	-0.60***	(0.03)
Youth is a girl											-0.10	(0.11)
Lone parent households											-0.71***	(0.15)
Parental mental well-being											0.04***	(0.00)
At least one parent employed											0.02	(0.07)
Parents' nativity (ref. UK born)												
1 parent non-UK born											0.25	(0.20)
Both parents non-UK born											0.43+	(0.23)
Parents' highest education (ref. no qualification)												
Other qualification											-0.60+	(0.31)
GCSE, etc.											-0.36	(0.26)
A-level, etc.											-0.49+	(0.26)
Other high degree											-0.35	(0.27)
Degree											-0.16	(0.26)
Length of residency (ref. a year or less)												
2 - 3 years											-0.23	(0.27)
4-10 years											-0.04	(0.26)
10 years or more											-0.04	(0.27)

Household income (ref. tertile 1)												
Tertile 2											-0.02	(0.11)
Tertile 3											-0.01	(0.13)
Constant	37.79***	(0.34)	37.60***	(0.34)	37.58***	(0.34)	38.20***	(0.42)	38.04***	(0.50)	36.43***	(0.66)
Random effects												
Level 3 (Neighbourhood-MSOA)												
Intercept	0.36***	(0.07)	0.32***	(0.08)	0.32***	(0.08)	0.31***	(0.08)	0.31***	(0.08)	0.28***	(0.08)
Level 2 (Youth)												
Intercept	-0.15**	(0.05)	-0.15**	(0.05)	-0.15**	(0.05)	-0.15**	(0.05)	-0.15**	(0.05)	-0.16**	(0.05)
Slope	2.31***	(0.06)	2.31***	(0.06)	2.31***	(0.06)	2.31***	(0.06)	2.31***	(0.06)	2.30***	(0.06)
Covariance	-1.92***	(0.06)	-1.92***	(0.06)	-1.92***	(0.06)	-1.92***	(0.06)	-1.92***	(0.06)	-1.93***	(0.06)
Level 1 (Wave)												
Intercept	1.20***	(0.01)	1.20***	(0.01)	1.20***	(0.01)	1.20***	(0.01)	1.20***	(0.01)	1.20***	(0.01)
AIC	72,738		72,699		72,700		72,700		72,696		72,598	
Observations	12,468		12,468		12,468		12,468		12,468		12,468	
Number of groups	2505		2505		2505		2505		2505		2505	

Notes: *** p<0.001, ** p<0.01, * p<0.05, + p<0.10; standard errors in parentheses; Coeff=coefficient; Wave=repeated measurement occasions

The effect of the proportion ethnic minority was assessed in Model 3; and although proportion ethnic minority itself was not significant, adjusting for this measure reduced the difference in life satisfaction of Asians and Blacks by approximately 5 units in comparison to Whites. The significance of the strength of the relationship between life satisfaction among Blacks was also reduced in comparison to White Majority youths. This indicated that ethnic density was correlated with both life satisfaction and ethnicity. An examination of neighbourhood socioeconomic status (Model 4) indicated that life satisfaction was significantly related to the proportion of individuals in the neighbourhood who were proficient in English but for whom English was not their main language, the proportion of migrants in the neighbourhood who had arrived in the UK in the past 5 years**,** and the proportion of residents in routine occupations. Of these only English language proficiency was shown to be related to better life satisfaction. The difference in life satisfaction between White majority, and Asians and Black youths was further reduced when proportion ethnic minority, indicators of neighbourhood socioeconomic status and the individual/family predictors were included in the models (Models 5-6) simultaneously. The results from models in which proportion co-ethnics were examined were similar to those already presented and therefore not shown in detail. The full results are given in appendix SA4.

Discussion

This study explored the poorly researched determinants of life satisfaction and stability among ethnic minority youths. In particular, it explored the previously unexamined associations between ethnic variation in life satisfaction, socioeconomic status and neighbourhood ethnic density among 10–15-year-olds living in England and Wales. To disentangle these factors, three research questions were addressed. The results from

this study find an association between the individual factors we expect to be associated with life satisfaction among young people, and similar to earlier studies, the relationship between youth life satisfaction and demographic factors such as gender and age is weak (Proctor, Linley, and Maltby 2009). The findings in relation to age across the data collection periods indicate that life satisfaction is largely stable over time.

Previous research has shown that ethnic density is highly correlated with some deprivation, it was therefore important to capture varying aspects of deprivation in this study. The results indicated that, similar to those earlier studies, ethnic density was strongly correlated with deprivation, as measured by the Townsend deprivation index, with a more moderate to weak correlation with English language proficiency, the proportion of migrants who had arrived in the UK in the last 5 years and the proportion of routine/semi-routine workers. No statistically significant relationship was found between ethnic density and life satisfaction. This lack of significance, however, was not evidence of a no effect, given that the inclusion of this measure attenuated the difference across ethnic groups. Research to date on the effects of ethnic density as it relates to health outcomes among young people has been equivocal; whereas some researchers find a beneficial effect of ethnic density (Gieling, Vollebergh, and van Dorsselaer 2010; Wickrama and Bryant 2003), at least one study has indicated that this effect may be negative when the ethnic group in question is too large (Fagg et al. 2006), others find a generally negative effect (Abada, Hou, and Ram 2007), and yet others find no effect of ethnic density as it relates to young people (Xue et al. 2005; Astell-Burt et al. 2012). One explanation for the inconsistencies in the literature examining the effects of ethnic density, is the varying definitions applied to the term ethnic density and the level at which the measure is created. For instance, some studies have defined

ethnic density as the overall proportion of ethnic minorities in an area, while others have defined it as the proportion of co-ethnics. As elsewhere, the current study examined the ethnic variations in life satisfaction using both definitions of ethnic density (see for e.g. Bécares, Nazroo, and Stafford 2009; Bécares, Nazroo, et al. 2012; Halpern and Nazroo 2000), however, the results from both sets of analyses were almost identical.

Numerous studies have demonstrated that socioeconomic inequalities in a neighbourhood account for some of the variation found in the life satisfaction of ethnic minority groups compared with the majority White populations (Roy, Hughes, and Yoshikawa 2012; Shields and Wailoo 2002). The results of this study indicate that neighbourhood socioeconomic status only partially explains the ethnic variations in life satisfaction. The results show that the addition of various indicators reduced ethnic differences in the association between neighbourhood and life satisfaction. Even with this adjustment, both Asian and Black youths were estimated to have better life satisfaction compared with their White counterparts. These findings are also similar to those found in the literature where other health outcomes have been compared for minority and majority group members (Bécares, Nazroo, et al. 2012; Astell-Burt et al. 2012; Goodman, Patel, and Leon 2010, 2008).

This finding might be interpreted as a sort of ‘resilience’ among ethnic minorities. Several studies have alluded to the fact that people who live in more disadvantaged areas are more likely to adapt to their more economically disadvantaged situation, and this may account for the ethnic differences in life satisfaction (Joshi et al. 2000; Bécares, Nazroo, et al. 2012). A possible alternative explanation is that some of these differences are in fact ethnic variations in survey response styles, as they relate to subjective well-being, and this may contribute to the observed disparity in health (Van

Herk, Poortinga, and Verhallen 2004; Marin, Gamba, and Marin 1992; Ross and Mirowsky 1984).

A key strength of the current study is the analytical approach adopted. Given the nested structure of the data, individual error terms might have been correlated across which could lead to imprecise (biased) standard errors. However, this correlation was accounted for with the implementation of multilevel growth models, which allows for the estimation of individual level data while taking into account both the contextual and individual processes simultaneously. Additionally, although the analyses are based on a large nationally representative sample of young people and their parents linked to census data at a relatively small geographic level, because of missing random data, attrition and new entrants into the panel at different time points, the panel is unbalanced. Despite this, it was possible, however, to take advantage of the rich data set with the analytical approach used (Raudenbush and Bryk 2002). For instance, young people who were measured at one time point but did not contribute to the within-individual variability, were counted towards the between-individual variance (Snijders and Bosker 1999). Moreover, given the longitudinal nature of the data, it was possible to examine average inter- and intra-individual changes annually.

The study does, however, have some limitations. Firstly, the use of an administrative measure of neighbourhood based on census data, although at a small geographic area, may not be appropriate for assessing relationships within areas of residence. To ensure we have captured the true 'geographic' relationships, these analyses should be replicated using other definitions of neighbourhood. Secondly, families may have self-selected the neighbourhoods in which they reside, and this may have influenced the results of the study.

Despite the limited empirical support for the research questions assessed here, investigation of the possible influences of ethnic density on life satisfaction was warranted because young people are typically less mobile compared to their adult counterparts, which means that they may spend a disproportionate amount of time within their neighbourhoods. Previous studies have indicated that, during the critical phase of development when young people are experiencing physical, psychological and cognitive changes on their path towards adulthood, (Allison et al. 1999; Jackson and Mare 2007), their experiences and relationships within the neighbourhood have a strong influence on a range of outcomes. The current theoretical discourse indicates that the effects of area of residence persist throughout life (WHO 2016; Leventhal and Brooks-Gunn 2000; Xue et al. 2005; Leventhal, Dupéré, and Brooks-Gunn 2009; Leventhal and Brooks-Gunn 2001). Furthermore, as shown in this study, the factors that impact the life satisfaction of young people differ in several respects from adults, and thus a reliance on adult findings can be misleading.

Conclusion

The present study reports a strong association between life satisfaction and ethnicity, in particular Asian and Black youths appear to have better life satisfaction compared with their White counterparts. This differential association is attenuated by ethnic density and neighbourhood socioeconomic status (deprivation, proportion of residents proficient in English but English is not their main language, proportion of residents who have arrived in the UK in the past 5 years, and the proportion of residents who have a routine/semi-routine occupation). Further exploration of these mediating factors would be of value for policy makers and public health practitioners interested in closing the widening health gaps between more or less disadvantaged groups. More research is

also necessary to disentangle the underlying processes that could explain health differentials generally, as well as the role of ethnicity.

SUPPLEMENTARY APPENDIX 3

Table SA1 Pearson correlation matrix of items measuring life satisfaction

	[1]	[2]	[3]	[4]	[5]	[6]
[1] School work	1.00					
[2] Appearance	0.33*	1.00				
[3] Family	0.29*	0.34*	1.00			
[4] Friends	0.25*	0.31*	0.36*	1.00		
[5] Going to school	0.46*	0.32*	0.32*	0.35*	1.00	
[6] Life as a whole	0.40*	0.51*	0.51*	0.40*	0.42*	1.00

Source: UK Household Longitudinal Survey (2015) [Waves 1-5]

Table SA2. Ethnic grouping for current survey

What is your ethnic group? CODE ONE ONLY

White

British/English/Scottish/Welsh/ Northern Irish

Irish

Gypsy or Irish Traveller

Other

Mixed

White and Black Caribbean

White and Black African

White and Asian

White and Black African

Asian

Indian

Pakistani

Bangladeshi

Chinese

Any other Asian background

Black/ African/ Caribbean/ Black British

Caribbean

African

Any other Black background

Source: UK Household Longitudinal Survey (2015) [Waves 1-5] and UK Census 2011; Notes: Ethnic group as recorded in the interview.

Table SA3 Individual/family and neighbourhood characteristics for the total sample		
unweighted n(%)	**Total Sample (n=12,468)**	
Individual level measures		
Youth is a girl	6,221	49.90
Youth Age **M(SD) [range]**	12,468	12.6(1.6) [10-15]
Youth Ethnicity		
White	9,184	73.66
Mixed	790	6.34
Asians	1,686	13.52
Blacks	808	6.48
Single parent household	3,304	26.50
Parents Nativity		
Both parents UK born	9,861	79.09
1 parent non-UK born	1,363	10.93
Both parents non-UK born	1,244	9.98
Parents highest education		
No qualification	683	5.48
Other qualification	703	5.64
GCSE etc	2,509	20.12
A-level etc	2,520	20.21
Other high degre	1,985	15.92
Degree	4,068	32.63
Length of residency		
1 year or less	325	2.6
2 - 3 years	987	7.9
4-10 years	5,448	43.7
10 years or more	5,708	45.8
At least one parent works	7,279	58.4
Parents' mental well-being M(SD) [range]	12,468	48.5(9.1) [3.0–77.1]
Household income		
Tertile 1 (Lowest)	4,173	33.5
Tertile 2	4,094	32.8
Tertile 3 (highest)	4,201	33.7
Neighbourhood level measures		
Coethnic density M(SD) [range]	12,468	.66 (.36) (0-0,99)
Overall ethnic density M(SD) [range]	12,468	0.24 (0.26)[0.01-0.96]
Townsend Deprivation Index M(SD) [range]	12,468	0.40(2.24) [-2.6–9.2]
English language proficiency M(SD) [range]	12,468	.51(0.34)[0-3.33]
Proportion of newly arriving immigrants M(SD) [range]	12,468	0.20(0.09)[0.4-0.72]
Proportion in routine occupations M(SD) [range]	12,468	0.26 (0.09)[0.04-0.54]

Source: UK Household Longitudinal Survey (2015) [Waves 1-5]

Table SA4. Fixed and random estimates of life satisfaction trajectories among by ethnicity among youths aged 10-15 years. An examination of the proportion co-ethnics and neighbourhood socioeconomic status.

	Model 2		Model 3		Model 4		Model 5		Model 6	
Independent variables	**coef**	**se**	**coef**	**se**	**coef**	**se**	**coef**	**se**	**coef**	**se**
Youth ethnicity (ref: white)										
Mixed	0.25	(0.23)	0.07	(0.34)	0.22	(0.24)	-0.04	(0.34)	0.01	(0.34)
Asian	1.09***	(0.18)	0.95***	(0.26)	1.03***	(0.21)	0.85**	(0.27)	0.52+	(0.28)
Black	0.81***	(0.23)	0.64*	(0.32)	0.80**	(0.25)	0.57+	(0.33)	0.52	(0.33)
Proportion Co-ethnics			-0.22	(0.31)			-0.34	(0.32)	-0.32	(0.33)
Townsend deprivation Index					-0.02	(0.04)	-0.02	(0.04)	-0.01	(0.04)
English language proficiency					0.52*	(0.24)	0.51*	(0.24)	0.51*	(0.24)
Proportion of newly arriving immigrants					-2.11**	(0.76)	-2.22**	(0.77)	-2.18**	(0.76)
Proportion in routine occupations					-1.70+	(0.89)	-1.55+	(0.90)	-0.60	(0.91)
Individual/family control variables										
Youth age	-0.61***	(0.03)	-0.61***	(0.03)	-0.61***	(0.03)	-0.61***	(0.03)	-0.60***	(0.03)
Youth is a girl									-0.09	(0.11)
Lone parent households									-0.72***	(0.15)
Parental mental well-being									0.04***	(0.00)
At least one parent employed									0.02	(0.07)
Parents nativity (ref:UK born)										
1 parent non-UK born									0.23	(0.21)
Both parents non-UK born									0.40+	(0.24)
Parents' highest education (ref:No qualification)										
Other qualification									-0.61+	(0.31)
GCSE etc									-0.36	(0.26)
A-level etc									-0.49+	(0.26)
Other high degre									-0.35	(0.27)
Degree									-0.17	(0.26)

Length of residency (ref:a year or less)										
2 - 3 years									-0.23	(0.27)
4-10 years									-0.04	(0.26)
10 years or more									-0.03	(0.27)
Household income (ref:tertile 1)										
Tertile 2									-0.02	(0.11)
Tertile 3									-0.01	(0.13)
Constant	37.60***	(0.34)	37.78***	(0.42)	38.20***	(0.42)	38.46***	(0.49)	36.82***	(0.66)
Random effects										
Level 3 (Neighbourhood-MSOA)										
Intercept	0.32***	(0.08)	0.32***	(0.08)	0.31***	(0.08)	0.31***	(0.08)	0.28***	(0.08)
Level 2 (Youth)										
Intercept	-0.15**	(0.05)	-0.15**	(0.05)	-0.15**	(0.05)	-0.15**	(0.05)	-0.16**	(0.05)
Slope	2.31***	(0.06)	2.31***	(0.06)	2.31***	(0.06)	2.31***	(0.06)	2.30***	(0.06)
Covariance	-1.92***	(0.06)	-1.92***	(0.06)	-1.92***	(0.06)	-1.92***	(0.06)	-1.93***	(0.06)
Level 1 (Wave)										
Intercept	1.20***	(0.01)	1.20***	(0.01)	1.20***	(0.01)	1.20***	(0.01)	1.20***	(0.01)
AIC	72699.02		72700.52		72694.84		72695.74		72598.3	
Observations	12,468		12,468		12,468		12,468		12,468	
Number of groups	2,505		2,505		2,505		2,505		2,505	

Notes: *** p<0.001, ** p<0.01, * p<0.05, + p<0.10; Standard errors in parentheses; Coeff=coefficient

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Overall Conclusion

Conclusion

This dissertation addresses gaps in the literature regarding the geographic and individual/family-level factors influencing the development of psychopathological problems in young people. As outlined in the introduction, these investigations are warranted for several reasons, not least because several studies have suggested that the population-based prevalence of mental health disorders has increased (Collishaw et al. 2004; Twenge 2011). Although the magnitude of this increase has been questioned (Busfield 2012), further investigations are needed because of the substantial social and economic costs of mental illness. Financially, children's mental health disorders are estimated to cost between £11,000 and £59,000 per child annually (Department of Health 2011; Davies et al. 2013). Moreover, mental health disorders have been shown to cause considerable disability and suffering, and these costs are not only borne by the individual suffering from the disorders but also their families and the wider society (Davies et al. 2013).

Furthermore, there is an extensive and growing body of literature demonstrating the existence of social inequalities in mental health. Although low socioeconomic status does not necessarily translate to higher rates of mental health problems, risk factors related to low socioeconomic status such as unemployment, poor housing and living conditions, and debt are related to increased vulnerability to mental health disorders (Mental Health Foundation 2016). Numerous studies have shown that the elevated risk of mental ill-health among certain subgroups of the population is related to interactions between individual-level characteristics such as gender, age and ethnicity, and greater exposure to unfavourable social, economic and environmental conditions (Mental Health Foundation 2016). Spencer (2013) suggests that the incidence of psychological and behavioural problems in children and adolescents with conduct disorders would be

reduced by 59% if all children faced the same levels of risk as the most socially advantaged.

These findings are important because recently published studies have identified mental health disorders among young people as one of the most significant contributors to the global burden of disease (Lancet 2017; Gore et al. 2011). In addition, it has been shown that most mental health disorders begin in adolescence and early adulthood (De Girolamo et al. 2012; Kessler et al. 2005), and if left untreated will gradually become more severe and less responsive to clinical treatment (Kessler et al. 2005; Kessler et al. 2007; De Girolamo et al. 2012). These studies also suggested that early detection and treatment would reduce both the severity and the persistence of primary disorders (De Girolamo et al. 2012). Early treatment has the additional benefit of reducing the adverse and long lasting negative effects associated with mental health disorders among young people (Department of Health 2011)

Another reason for considering these findings important is that several studies indicate that approximately 10% of British youths suffer from a mental health disorder (Meltzer, Gatward, Goodman, et al. 2000; Green et al. 2005). The results also demonstrate that the prevalence of mental health disorders is unequally distributed across the population and varies with ethnicity: their prevalence among youths aged 5-15 is estimated to be 12%, 10%, 8%, and 4% in the Black, Whites, Asian (Pakistani & Bangladeshi), and Indian populations, respectively (Meltzer, Gatward, Goodman, et al. 2000). These differences may have significant public policy and public health implications given the diversity of the British population (Jivraj and Simpson 2015a) and the fact that young people aged 10-15 years comprise 7% of the total population (ONS Census 2011a). As noted in the introduction, there are several gaps in our current understanding of the factors affecting the mental health and well-being of young people

across various ethnicities. This doctoral dissertation therefore investigated the mechanisms and the factors that contribute to mental health and life satisfaction among young people. This was done by performing three studies that investigated the effect of neighbourhood composition (characterized in terms of social capital, socioeconomic deprivation, and ethnic density) on mental health and life satisfaction among 10-15 year-old children residing in England and Wales. *Study I* investigated the area-level mechanisms affecting both outcomes for all young people residing in a given neighbourhood, while *Study II* and *Study III* delved deeper into potential differences by ethnicity in mental health and life satisfaction respectively. The analyses were performed by multilevel modeling using data from the first five waves of *Understanding Society: The UK household longitudinal study* gathered between 2009/2010 and 2013/2014, matched to area-level aggregated measures collected in the 2011 UK census. This conclusion summarizes the key findings of each study, describes their strengths and limitations, and presents recommendations for future research and an overall conclusion.

Summary of key findings

Study I

This study analysed the association between the psychosocial and material contexts of neighbourhoods and its effects on the psychological well-being of young people. The main focus was on the relationship between neighbourhood socioeconomic deprivation and neighbourhood social capital, and their independent and combined effects on mental health and life satisfaction among young people aged 10-15 residing in England and Wales. The study's main findings were:

(a) Mental health and life satisfaction among young people are negatively associated with residence in a socioeconomically deprived neighbourhood.

(b) The effects of deprivation are attenuated in neighbourhoods with higher average social capital – specifically, strong homogenous friendship networks (bonding), high civic engagement (bridging), and low average worry about crime (mediator of social capital).

(c) Social capital appeared to have no moderating influence on deprivation. And, contrary to expectations, homogenous friendship networks and civic engagement were predicted to *increase* the negative influence of residing in deprived neighbourhoods.

(d) The empirical evidence highlights the importance of cultivating various forms of social capital in neighbourhoods because different components of social capital appear to offer different benefits. The study's results also suggested that future studies should consider the possible negative effects of social capital and that the effects of social capital may be non-linear.

Study II

This study investigated the impact of neighbourhood composition (measured by socioeconomic deprivation, an indicator for crime, the living environment and ethnic density) and parenting behaviour on mental health among young people aged 10-15 years old residing in England and Wales. Its main findings were:

(a) Neighbourhood composition influences the mental health of young people, but most of the variation is due to individual-level differences.

(b) Socioeconomic deprivation appeared to have a stronger detrimental impact on the mental health of White British youths than that of ethnic minority youths.

(c) Pooled models indicated that there were no differences between the mental health difficulties of White British youths and those of Welsh and other Whites. However, in models stratified by ethnic group, adjustment for parental behaviour and socioeconomic deprivation seemed to increase the gap in mental health between White British and all other ethnic minority youths.

(d) British Whites appeared to fare less well in socioeconomically deprived areas than Black, Asian and other ethnic minority (BAMEs) groups because they lack the requisite social support. This is evidenced by the fact that the effect of deprivation appeared to be mitigated among BAMEs residing in more ethnically dense neighbourhoods.

(e) The influence of parental behaviours was independent of neighbourhood ethnic density, and parental behaviours were not influenced by the level of neighbourhood deprivation.

Study III

This study explored the determinants and stability of reported life satisfaction among ethnic minority youths aged 10-15 years residing in England and Wales, and compared these findings to those for majority White youths. It draws on the extensive literature discussing how neighbourhood ethnic density and socioeconomic status influences health. Its main findings were:

(a) Life satisfaction declined with age for all ethnic groups.

(b) There was a strong association between life satisfaction and ethnicity. Specifically, Asian and Black youths reported better life satisfaction than their White counterparts.

(c) Over time, life satisfaction among minority youths fell relative to that of White British youths. In particular, life satisfaction was influenced by ethnic density and neighbourhood socioeconomic status[7].

Taken together, the results of the three studies suggests that similar neighbourhood and individual/family-level factors predicted the mental health and life satisfaction of young people residing in England and Wales. In addition, there appears to be a strong relationship between the social and physical context of the neighbourhood and the assessed outcomes. While most of the variability in these outcomes was due to individual- and family-level predictors, the results suggested that it was the intersection between neighbourhood composition and individual/family-level factors that determined the mental health and life satisfaction of young people. These effects were unequally distributed across the social, economic and demographic groups within the study population, and the mental health of young White British adolescents seemed to be worse than that of their ethnic minority counterparts. This could be because White British youths are more likely to see a greater inequality of outcomes within their own group, whereas ethnic minority youths see a narrower range of outcomes in their groups.

The findings also suggest that the neighbourhood is an important arena for policies and initiatives targeted at improving the mental health and life satisfaction of young people, and that a good starting point for such initiatives would be to invest in the aspects of young people's lives with which they are most satisfied. The studies' findings highlight a need for future research and policy development to account for

[7] Measured by deprivation, proportion of residents proficient in English where English was not their main language, the proportion of residents who arrived in the UK in the past 5 years, and the proportion of residents who have a routine/semi-routine occupation)

both neighbourhood social processes and ethnic composition when creating initiatives to counter the influence of disadvantage among young people.

Strengths and limitations of the studies

Only a few publications (Aminzadeh et al. 2013; Drukker et al. 2005; Odgers et al. 2009; Vyncke et al. 2013; De Clercq et al. 2012; Edwards and Bromfield 2010) have presented empirical evidence regarding the possible moderating influence of neighbourhood socioeconomic status and neighbourhood social capital on youth outcomes; to the author's knowledge, this is the first British study to do so. Moreover, the outcomes examined here have been insufficiently studied among the investigated age group, and only a few studies have attempted to explain the mechanisms involved. Because of the paucity of work in this area, this dissertation significantly expands the body of work relating to the effects of neighbourhood ethnic composition on health outcomes among young people. Specifically, it:

(a) Contributes to the ongoing debate about the effects of ethnic concentration on residents' health. In particular, it adds significant new empirical evidence on the impact (or lack thereof) of ethnic density on health outcomes. It also helps to disentangle previously published equivocal findings relating to the ethnic density hypothesis, which has rarely been tested among the studied age group.

(b) Provides new evidence on an outcome – life satisfaction – that has not previously been explored in the British context, and which is a generally understudied outcome in the field of neighbourhood research.

(c) Moves away from assessments of a single time-point by using longitudinal data and examining time trends;

(d) Provides a more in-depth explanation for the inter-ethnic variation in young people's mental health, complementing earlier studies (see for e.g. Green et al. 2005; Meltzer, Gatward, Goodman, et al. 2000) that were mostly descriptive.

One of the contributions of this dissertation stems from the use of multilevel statistical methods in all three studies. The advantage of such models is their flexibility with respect to the analysis of unbalanced panel data, and the fact that they can be used to analyse individual changes as well as to examine time-variant and -invariant measures. (Raudenbush and Bryk 2002). These properties made it possible to take full advantage of the rich data set used in this work.

Using multilevel models enabled estimation of individual-level data while simultaneously accounting for both contextual and individual processes. This represents an important step towards minimizing a significant limitation in research on neighbourhood effects, namely the difficulty of separating contextual effects (i.e. effects relating to the physical and social characteristics of the neighbourhood) from compositional effects (i.e. effects relating to the type of people residing in the neighbourhood) (Lupton 2003; Van Ham et al. 2012; Pickett and Pearl 2001).

Research on the contextual effects on health is plagued by some fundamental issues, which I believe have contributed to the lack of research on the potential influence of neighbourhood factors on young people's mental health. A major challenge I encountered in conducting research was the small sample sizes of some ethnic groups. This necessitated the use of some relatively broad ethnic categorizations, which might have obscured some of the expected heterogeneity in the assessed outcomes. More in-depth discussions of the limitations of using ethnic categories in general and such broad categorizations in particular can be found in the introduction and the works of Bhopal (Bhopal (2007); Bhopal (2002); Bhopal (1997))

Another limitation in neighbourhood research relates to the operationalization of neighbourhoods. Out of necessity, research in this field has made extensive use of data-driven methods for delineating neighbourhood boundaries, which may have masked important local-level variation and could explain why previous studies have found small or non-existent area-level associations between health and ethnic density (Lupton 2003; Macintyre and Ellaway 2003; Pickett and Pearl 2001). I therefore sought to avoid some of the acknowledged weaknesses of earlier studies that operationalized neighbourhoods using electoral wards and census tracts by defining a neighbourhood as a middle super output area (MSOA). Although MSOAs are also administratively defined units, they cover small geographic areas, which should in principle make it easier to capture true residential effects.

A pertinent but often overlooked limitation of area-level research is selection bias, which may occur when people self-select into particular neighbourhoods. For example, in this work, the ethnic composition of neighbourhoods was used to explain mental health difficulties and life satisfaction. However, it may be that people self-selected to reside in ethnically-concentrated neighbourhoods in the first place because of their ethnicity. Consequently, some of the correlations between the dependent variables and neighbourhood characteristics may be due to this neighbourhood selection mechanism. Therefore, while the work's main aim was to examine the neighbourhood context, it was essential to account for individual and parental/family characteristics to minimize the risk of selection bias. By adjusting for individual and parental/family predictors, one can also 'separate out' some of these effects from that of the neighbourhood. This approach could also be useful in developing more effective and targeted policies that give appropriate weightings to factors in order of importance.

Aside from using control variables, it is not clear how issues of selection bias could be addressed because individuals have not been randomly placed across groups, nor were the studies intended to strictly examine change over time. Nevertheless, the studies presented here do account for changes in factors over time and thus provide a much more complex picture of some of the factors that are relevant to the psychopathological development of young people, than could be obtained by simply studying cross-sectional data covering a single point in time.

Recommendations for future research

The following recommendations are based on the experience gained while conducting the studies presented in this thesis and the results that were obtained.

(a) More longitudinal studies are needed to explore the mechanisms influencing the mental health and well-being of young people. Studies adopting a life course approach to understanding and tackling mental health inequalities would be particularly valuable. Such research should ideally follow groups of people from childhood through to young adulthood and repeatedly examine measures of mental health, subjective well-being (such as life satisfaction), and other relevant outcomes. The investigations should be designed to shed further light on confounding and mediation issues as well as possible moderators.

(b) There is a need to replicate the analyses conducted in this study across multiple contexts and to incorporate additional outcome measures. Special attention is required to disentangle the causes of ethnic inequalities in health.

(c) More attention should be given to investigating the relationships between the social structures relevant to different groups and the structural factors related to the areas in which they live. There are many possibilities for future research on social inequalities in this field. An area of particular importance is the interaction between contextual and individual/family level factors that may facilitate or hinder the social participation of certain groups.

(d) Future research is required to disentangle the underlying mechanisms influencing the mental health and life satisfaction among young people. It is also apparent that special attention needs to be given to the inter-ethnic disparities in mental health and life satisfaction within this group. Such research may be the key to unlocking important knowledge regarding the later-life trajectories in mental health and life satisfaction observed for some of the studied ethnic groups.

(e) Future studies could also contribute by building on the work of De Girolamo et al. (2012) and (Kessler et al. 2007) who suggested that undiagnosed mental disorders become more severe and harder to treat if left undiagnosed. Research efforts could focus on understanding the differential trajectories of mental health among ethnic minority groups, and thereby facilitate earlier diagnosis and treatment of these individuals.

Conclusions and overall study implications

The studies included in this thesis demonstrate that there are indeed inequalities in mental health and life satisfaction among young people, and that these are strongly related to the socio-economic, social and physical characteristics of their neighborhoods. But, individual/family-level characteristics are the strongest predictors of these outcomes.

The empirical evidence from these studies also points to significant ethnic differences in mental health and life satisfaction, especially among Asian and Black youths when compared to their White counterparts. The difference in these measured outcomes is seemingly explained by the fact that Black and Asian youths are less affected (at least at this age) by the socioeconomic conditions in which they reside. Still, adults from ethnic minority groups are generally overrepresented among people with ill health, and are more likely to suffer from mental health disorders and to report lower life satisfaction. This raises a question (which is beyond the scope of this thesis) – namely, at what age do these factors begin to influence these groups?

From a public health perspective, the growing diversification of the British population makes it important to identify the determinants of mental health and well-being among the various ethnicities. This study's findings imply that it may be beneficial to implement targeted services to meet the varying needs of different groups in the population and to thereby create better opportunities for effective treatment and targeted intervention.

Furthermore, prevention work and health policies aimed at reducing inequalities in the development of psychopathological problems

among young people should consider larger structural inequalities such as socioeconomic deprivation and area-level ethnic concentration. Finally, more emphasis

should be placed on factors with the potential to positively enhance the mental health and well-being of vulnerable groups, such as those that improve life satisfaction.

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Appendix A1. Strengths and Difficulties Questionnaire as provided in the UKHLS youth self-completion questionnaire

For each item, please tick the box for Not True, Somewhat True or Certainly True. It would help us if you answered all items as best you can even if you are not absolutely certain. Please give your answers on the basis of how things have been for you over the last six months.

Name…… Male/Female

Date of Birth……

	Not True	Somewhat True	Certainly True
Try to be nice to other people. I care about their feelings			
I am restless, I cannot stay still for long			
I get a lot of headaches, stomach-aches or sickness			
I usually share with others (food, games, pens, etc.)			
I get very angry and often lose my temper			
I am usually on my own. I generally play alone or keep to myself			
I usually do as I am told			
I worry a lot			
I am helpful if someone is hurt, upset or feeling ill			
I am constantly fidgeting or squirming			
I have one good friend or more			
I fight a lot. I can make other people do what I want			
I am often unhappy, down-hearted or tearful			
Other people my age generally like me			
I am easily distracted, I find it difficult to concentrate			
I am nervous in new situations. I easily lose confidence			
I am kind to younger children			
I am often accused of lying or cheating			
Other children or young people pick on me or bully me			
I often volunteer to help others (parents, teachers, children)			
I think before I do things			
I take things that are not mine from home, school or elsewhere			
I get on better with adults than with people my own age			
I have many fears, I am easily scared			
I finish the work I'm doing. My attention is good			

Source: UK Household Longitudinal Survey (2015) [Waves 1-5]

Appendix 2. SF-12 Health Survey provided in the UKHLS main questionnaire	
This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities. Answer each question by choosing just one Visit type (circle one) unsure how to answer a question, please give the best answer you can.answer. If you are	
1. In general, would you say your health is:	□1 Excellent □2 Very good □3 Good □4 Fair □5 Poor
The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?	
2. Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling or playing golf	□1 Yes, limited a lot □2 Yes, limited a little □3No, not limited at all
3. Climbing several flights of stairs.	□1 Yes, limited a lot □2 Yes, limited a little □3 No, not limited at all
During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of your physical health?	
4. Accomplished less than you would like.	□1 All of the time □2 Most of the time □3 Some of the time □4 A little of the time □5 None of the time
5. Were limited in the kind of work or other activities.	□1 All of the time □2 Most of the time □3 Some of the time □4 A little of the time □5 None of the time
During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?	
6. Accomplished less than you would like.	□1 All of the time □2 Most of the time □3 Some of the time □4 A little of the time □5 None of the time
7. Did work or other activities less carefully than usual	□1 All of the time □2 Most of the time □3 Some of the time □4 A little of the time □5 None of the time
8. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?	□1 Not at all A little bit □3 Moderately □4 Quite a bit □5 Extremely

These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks...	
9. Have you felt calm and peaceful?	□1 All of the time □2 Most of the time □3 Some of the time □4 A little of the time □5 None of the time
10. Did you have a lot of energy?	□1 All of the time □2 Most of the time □3 Some of the time □4 A little of the time □5 None of the time
11. Have you felt downhearted and depressed?	□1 All of the time □2 Most of the time □3 Some of the time □4 A little of the time □5 None of the time
12. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)?	□1 All of the time □2 Most of the time □3 Some of the time □4 A little of the time □5 None of the time

Notes: Adapted from https://www.understandingsociety.ac.uk/documentation/mainstage/dataset-documentation/wave/3/questionnaire-module/scasf12_w3.
Source: UK Household Longitudinal Survey (2015) [Waves 1-5]