Keeping Family Close: Intergenerational Geographic Proximity in the United Kingdom

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INTRODUCTION

The spatial configuration of families has received growing scholarly attention because geographic proximity significantly influences intergenerational support and contact (Grundy & Shelton, 2001; Michielin & Mulder, 2007; Mulder & Van Der Meer, 2009; Rogerson et al., 1997). Among the full spectrum of family relationships, parent-child ties are the most significant, leading to substantial research on geographic proximity between parents and adult children (Blaauboer et al., 2011; Thomas & Dommermuth, 2020). In empirical analyses, two perspectives have been adopted: either using adult children (i.e., focusing on distance to parents) or parents (i.e., focusing on distance to children) as the unit of analysis (Rogerson et al., 1993, 1997; Van Den Broek et al., 2014). The patterns and determinants of geographic proximity may vary depending on the perspective taken because the number of children available to a parent often differs from the number of parents available to a child (Chan & Ermisch, 2015; Grundy, 2000). To date, few studies have simultaneously adopted both viewpoints in analysing parent-child proximity, with the exception of Chan and Ermisch (2015) and Malmberg and Pettersson (2007).

Demographic changes in recent decades have significantly reconfigured family structures and functions (Bengtson, 2001; Holmlund et al., 2013; Lundholm & Malmberg, 2009). The increase in life expectancy and declining fertility result in fewer individuals in each generation (horizontal kinships) but a greater number of generations coexisting (vertical

kinships) – a pattern known as the "beanpole" family structure (Bengtson, 2001; Daw et al., 2016). Although families with four or five living generations remain relatively uncommon, three-generational families have become widespread (Grundy & Henretta, 2006). In particular, longer intergenerational spacing has amplified the burden on the "sandwich generation," who raise dependent children while simultaneously caring for ageing parents (Boele et al., 2018; Lundholm & Malmberg, 2009). Therefore, multigenerational relationships are increasingly essential in providing financial, social, and emotional support throughout the life course (Bengtson, 2001; Grundy & Henretta, 2006; Phillipson, 2010). Despite well-established theoretical arguments, there has been little exploration of proximity to extended kin, such as grandparents, and its implications for multigenerational relationships (Daw et al., 2016, 2019; Kolk, 2017; Lundholm & Malmberg, 2009).

Substantial research has examined the determinants of geographic proximity (Lin & Rogerson, 1995; Malmberg & Pettersson, 2007; Rogerson et al., 1993). The findings suggest that family spatial distribution is shaped by a range of structural forces, including sociodemographic and household-level factors (Holmlund et al., 2013; Spring et al., 2023; Van Den Broek et al., 2014). However, the influence of regional characteristics has yet to receive adequate attention, despite the obvious geographic context of this field of study (Shelton & Grundy, 2000). This is unfortunate because individual developmental trajectories are embedded in the socio-spatial environments where people live (Mitchell, 2003). Regional variation in geographic proximity may result from, for example, differences in opportunity structures and cultural values (Van Den Broek et al., 2014; Van Der Pers & Mulder, 2013). Studies that consider spatial structural factors focus on variations in intergenerational proximity between urban and rural areas (e.g., Choi et al., 2021; Hank, 2007; Michielin & Mulder, 2007; Mulder & Van Der Meer, 2009), as well as across broad geographic regions, such as the South and North of the UK (e.g., Shelton and Grundy (2000)), or the Northeast, Midwest, South, and

West in the US (e.g., Choi et al., 2020; Gillespie & Treas, 2017; Lin & Rogerson, 1995; Rogerson et al., 1993). A finer spatial scale of analysis, however, could yield a better understanding of the factors shaping geographic proximity.

This study examines intergenerational geographic proximity by addressing the question: What factors determine whether one lives with, near, or far from another generation? Drawing on data from Understanding Society, the UK Household Longitudinal Study (UKHLS), our research is novel in several ways. First, we conceptualise geographic proximity through adults' dual roles as both children and parents, ensuring that the measures capture upward and downward kinship ties within the family structure. As such, we focus on proximity to parents from the perspective of adult children, proximity to adult children from the perspective of parents, and three-generational living arrangements from the perspective of individuals who have both parents and children. To the best of our knowledge, no previous study has simultaneously analysed these three dimensions of intergenerational ties. Second, we examine spatial variation in geographic proximity at the local authority level – a spatial scale better suited to capturing socioeconomic disparities than broad regions used in previous research. Such analysis will deepen our understanding of how intergenerational relationships interact with socio-spatial contexts. As the costs of formal care continue to rise, informal support from spatially proximate kin is expected to become more important in care provision than it has been thus far (Van Der Pers & Mulder, 2013). Improved knowledge of intergenerational proximity can support policymaking by identifying where support gaps are most likely to emerge.

THEORETICAL AND EMPIRICAL BACKGROUND

Theoretical Background

The concept of "linked lives" posits that individuals' lives are embedded in social relationships with kin and friends throughout their lifespan (Elder, 1994). With the "longer

years of shared lives", intergenerational solidarity and dependence may gain rather than lose importance, despite the post-modernist trend towards individualism and weakening family orientation (Bengtson, 2001; Grundy, 2000; Hank, 2007; Mulder & Van Der Meer, 2009). According to Bengtson's multidimensional model of intergenerational solidarity, geographic proximity among family members defines the "opportunity structure for interaction" and reflects the degree of structural solidarity (Bengtson, 2001; Bengtson & Roberts, 1991). Having family nearby is, for many, a location-specific capital (Mulder, 2007).

The relational family landscape can be conceptualised within the context of migration, the life cycle, and social exchange theories (Choi, 2003; Lin & Rogerson, 1995). Parents and children initially co-reside, but spatial separation begins as children establish independent households (Hank, 2007; Lin & Rogerson, 1995). Nest leaving marks a major milestone in the transition to adulthood, accompanied by financial independence and a decline in instrumental and social support from parents (Gillespie & Lei, 2021). Parent-child proximity tends to decrease over time. This is often followed by a stabilisation or adjustment phase of intergenerational separation, during which intergenerational involvement may increase as adult children begin raising their children (Lin & Rogerson, 1995). As parents' need for support grows with age, geographic closeness may increase in response (Lin & Rogerson, 1995).

Intergenerational proximity is influenced by a range of factors – some may "push" individuals to move far, while others place restrictions on such movement (Gillespie & Van Der Lippe, 2015). In general, people tend to prefer "intimacy at a distance" over "living under the same roof" as a means of balancing the needs of different generations (De Valk & Bordone, 2019; Glaser & Tomassini, 2000; Hank, 2007; Lin & Rogerson, 1995). From the perspective of adult children, distance from parents is associated with life course events during the transition to adulthood, including education, employment, and family formation (Choi, 2003; Glaser & Tomassini, 2000; Van Der Pers & Mulder, 2013). For parents, proximity to children

results from later-life inevitable changes, such as spousal loss, growing needs for instrumental and emotional support, and factors that affect independent living (Choi, 2003; Glaser & Tomassini, 2000).

Fertility and mortality patterns influence intergenerational relationships (Chan & Ermisch, 2015). Over recent decades, industrialised countries have experienced demographic changes that have profoundly reconfigured family structures and functions (Holmlund et al., 2013). Increasing longevity and decreasing fertility have resulted in fewer individuals within each generation (horizontal kinships) but more generations coexisting (vertical kinships), a pattern known as the "beanpole" family structure (Bengtson, 2001; Daw et al., 2016). The notion of "sandwich generation" – adult children who care for ageing parents while raising dependent children – has resonated widely (Grundy & Henretta, 2006). Furthermore, rising marriage ages lead to "squeezing household cycles," where, as parents age and require support, their adult children are occupied with establishing their own family and caring for young children (Boele et al., 2018). These developments have increased the availability of extended kin, with grandparents, in particular, becoming more prominent in family relationships (Bengtson, 2001; Phillipson, 2010).

The life course principle of sociohistorical and geographic location emphasises that individual developmental trajectories are shaped by the socio-spatial contexts where people live (Mitchell, 2003). Spatial variation in intergenerational proximity is anticipated due to differences in opportunity structures related to education, employment, and the housing market (Van Den Broek et al., 2014; Van Der Pers & Mulder, 2013). For instance, adult children whose parents live in economically developed regions or large cities may not need to migrate for employment, enabling them to stay geographically close to their parents (Malmberg & Pettersson, 2007; Van Den Broek et al., 2014). Moreover, location provides a cultural

background that influences individual values regarding family solidarity and, in turn, physical proximity (Van Der Pers & Mulder, 2013).

Previous Research on Factors Associated with Geographic Proximity

The determinants of geographic proximity have garnered considerable scholarly attention since the 1990s (Kolk, 2017; Michielin & Mulder, 2007). Research has demonstrated that intergenerational proximity is stratified by numerous sociodemographic factors. According to migration age schedules, the most notable changes in proximity typically occur as children enter young adulthood and as parents approach retirement (Lin & Rogerson, 1995; Rogerson et al., 1997). Parent-child distance, in general, increases with age for both generations (Chan & Ermisch, 2015; Choi et al., 2021; Compton & Pollak, 2015; Glaser & Tomassini, 2000). There is a gender aspect, although findings on gender's role remain inconclusive. As women often assume kin-keeping roles, daughters tend to have more frequent contact with parents and live closer to them than sons (Blaauboer et al., 2011; Chan & Ermisch, 2015), and mothers are more likely than fathers to co-reside with their children (Hank, 2007). Nevertheless, other studies such as Michielin and Mulder (2007), Leopold et al. (2012), and Compton and Pollak (2015) reported no significant gender differences in geographic proximity. The socioeconomic status of parents and children is another key determinant of proximity, with higher income and educational attainment linked to greater spatial separation (Choi et al., 2020; Lin & Rogerson, 1995; Malmberg & Pettersson, 2007; Shelton & Grundy, 2000). Moreover, distance to parents varies based on individuals' partnership status, with differences observed between those who are single, married or cohabiting, divorced, and widowed (Chan & Ermisch, 2015; Choi et al., 2020; Michielin & Mulder, 2007). Studies have also highlighted the impact of parents' partnership status on proximity, as marital disruption may increase tensions between generations (Chan & Ermisch, 2015; Dommermuth, 2018; Leopold et al., 2012).

Another key individual-level factor is ethnicity, with ethnic minorities more likely to live closer to their families. For example, in the UK, residential proximity is more prevalent among Pakistanis and Bangladeshis compared to White individuals (Chan & Ermisch, 2015). Similar patterns have also been identified between Black and White Americans (Choi et al., 2020, 2021; Compton & Pollak, 2015; Reyes et al., 2020). Migration background also plays a role in shaping parent-child proximity (Leopold et al., 2012). Evidence from the UK indicates that, compared with native-born individuals, foreign-born parents are more likely to co-reside with their children rather than live nearby, whereas foreign-born children tend to live farther from their parents instead of co-residing with them (Chan & Ermisch, 2015).

Extant studies have documented the importance of household-level factors, such as the number of children, on intergenerational proximity. Having a child of one's own increases the likelihood of adult children living close to their parents (Gillespie & Treas, 2017; Malmberg & Pettersson, 2007). From the perspective of parents, a larger number of children raises the probability that at least one will live nearby (Glaser & Tomassini, 2000; Hank, 2007; Lin & Rogerson, 1995; Malmberg & Pettersson, 2007). Sibling characteristics represent a further set of household characteristics that affect parent-child proximity (Leopold et al., 2012). One such factor is sibship size: previous research has found a negative relationship between the number of siblings and proximity to parents, with only children more frequently living nearby (Compton & Pollak, 2015; Van Den Broek & Dykstra, 2017). Birth order is also relevant for proximity. A first-mover advantage has been identified, where first-borns have fewer constraints in making residential decisions, whereas later-born siblings must consider the locations of those who moved out earlier (Boele et al., 2018; Konrad et al., 2002).

The spatial configuration of families is embedded within broader spatial opportunity structures (Thomas et al., 2018). The significance of urbanisation for geographic proximity has been confirmed, though the direction of this relationship depends on the generation considered

(Kalmijn, 2021). For example, adult children are more prone to live near their parents when residing in rural areas (Kalmijn, 2021; Malmberg & Pettersson, 2007; Rogerson et al., 1993; Van Der Pers & Mulder, 2013). In contrast, parents living in urban areas often reside closer to their children, partly due to the wider availability of educational and employment opportunities (Choi et al., 2020; Leopold et al., 2012; Rogerson et al., 1997; Van Der Pers & Mulder, 2013). Moreover, a few studies have explored regional disparities in geographic proximity. Shelton and Grundy (2000) observed that in the UK, individuals in the South typically reside farther from their parents. In the United States, intergenerational residential proximity tends to be closer in the Northeast compared to other regions (Choi et al., 2020; Gillespie & Treas, 2017; Lin & Rogerson, 1995).

The literature suggests that intergenerational geographic proximity is influenced by a range of factors, and importantly, that the effects of some factors vary depending on the generation in question. Empirical studies have adopted two perspectives: using either adult children (i.e., proximity to parents) or parents (i.e., proximity to children) as the unit of analysis (Chan & Ermisch, 2015; Rogerson et al., 1993, 1997). The patterns of geographic proximity from these two perspectives are not necessarily the same (Chan & Ermisch, 2015; Grundy, 2000). Using Swedish data, Malmberg and Pettersson (2007) found that 85% of older parents had adult children residing within 50 km, compared to 72% of adult children whose parents lived within the same distance. In the UK, intergenerational co-residence was less common when examined from the child's perspective than the parent's (Chan & Ermisch, 2015). However, despite the extensive focus on parent-child proximity, few studies (if any) have integrated both perspectives in their analysis.

Parent-child relationships are often regarded as the most significant within the full constellation of kinship ties (Thomas & Dommermuth, 2020). Therefore, prior research has focused narrowly on geographic proximity between parents and children (Daw et al., 2016,

2019; Mulder & Van Der Meer, 2009). However, parent-child distance alone does not capture the complexity of family relationships. Multigenerational ties have gained increasing significance in individuals' life courses, owing to the "longer years of shared lives" between generations and the role of extended kin in supporting family functions (Bengtson, 2001). Despite well-established theoretical arguments for their significance, only a limited number of studies have considered extended family members, such as grandparents (e.g., Lundholm and Malmberg (2009), Kolk (2017), and Daw et al. (2019)). By simultaneously analysing living arrangements across children, parents, and grandparents, a more detailed understanding can be gained of how family relations and structures evolve across generations.

In contrast to the substantial attention given to individual- and household-level factors, regional variation in geographic proximity remains underexplored, despite the inherent spatial context of this topic (Shelton & Grundy, 2000). Although some studies have incorporated locational information, they rely on broad regional classifications. Adopting a finer spatial scale, such as the local authority level used in this study, facilitates much deeper insights into the factors shaping intergenerational proximity.

The British Context

Recent demographic trends in British society have profound implications for intergenerational relationships. As in many countries, rising life expectancy has prolonged intergenerational co-survival: approximately 80% of individuals aged 40-49 and nearly half of those aged 50-59 still have a living parent (Grundy & Shelton, 2001). Equally noteworthy is the declining total fertility rate over the long run, alongside an increase in the mean age at first birth, from 26.5 in 2000 to 29.1 in 2019 (Adler & Lenz, 2023). Leaving the parental home has long been a norm, yet the proportion of individuals under 35 living with their parents has risen since 2000, and the process of leaving home has become more protracted, due in part to economic uncertainty and housing market pressures (Adler & Lenz, 2023; Grundy & Shelton,

2001; Shelton & Grundy, 2000). Furthermore, shifts in population composition may alter the patterns of geographic proximity at the societal level. The share of immigrants and ethnic minorities has increased, especially in large cities such as London and Manchester (Catney et al., 2023; Chan & Ermisch, 2015). The proportion of the UK population born abroad rose from 7.3% in 1991 to 8.8% in 2001, reaching 14.2% by 2018 (Adler & Lenz, 2023). The proportion of ethnic minorities in England and Wales grew from 12.5% in 2001 to 19.5% in 2011 and further to 25.6% in 2021 (Catney et al., 2023).

The UK is considered as a liberal or individualistic welfare regime, marked by limited state intervention and a reliance on market mechanisms for social support (Adler & Lenz, 2023). Social care is means-tested and primarily targeted at "problem families" (Adler & Lenz, 2023; Chan & Ermisch, 2015). Public childcare and eldercare services are insufficient, whereas market-based alternatives are prohibitively expensive for many (Chan & Ermisch, 2015). Informal care from spatially proximate kin has thus become an important component of support in contemporary society (Chan & Ermisch, 2015).

Given these contexts, we consider the UK a valuable setting for analysis. This study provides a comprehensive examination of geographic proximity by focusing on (a) adult children's proximity to their parents, (b) parents' proximity to their adult children, and (c) three-generational co-residence from the perspective of individuals with both parents and children. We hypothesise that these measures will exhibit substantial heterogeneity across sociodemographic and household variables, such as age, education, ethnicity, and migrant background. Shaped by the UK's socioeconomic landscape, we also expect notable regional variation between rural and urban areas, as well as across local authorities.

DATA, MEASURES, AND METHODS

Sample Selection

The data for this research come from Understanding Society: The UK Household Longitudinal Study, conducted by the University of Essex, Institute for Social and Economic Research (2023). The survey includes a Family Networks module, which collects information on respondents' distance from their parents and children. This research uses the odd-numbered waves of Waves 1-13, as the Family Networks module is available only in those waves.

We constructed three datasets based on the kinship structures in Figure 1. Panel (a) presents the datasets used to analyse geographic proximity between adult children and parents. The presence of three generations is not necessary, despite the dual roles of adults as both parents and children. Thus, the parent and child datasets include two scenarios. From the perspective of adult children, the "child sample" comprises 165031 individuals aged 16 or older with at least one living parent (e.g., C1 in Panel (a1) or C1 & P1 in Panel (a2)). From the perspective of parents (the "parent sample"), we focus on samples whose children are all aged 16 or older, resulting in a sample of 107485 individuals (e.g., P1 in Panel (a1) or P1 & G1 in Panel (a2)). Panel (b) shows the "multigenerational sample" used to examine three-generational living arrangements. This sample focuses on the "sandwich" generation (e.g., P1) due to their role as both-end caregivers – those who have at least one living parent (e.g., G1) and one child (e.g., C1), regardless of the child's age – yielding a dataset of 99153 individuals.

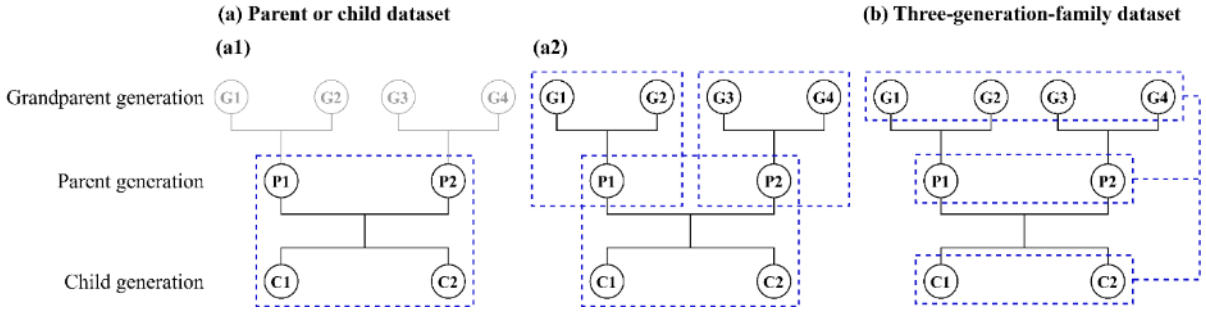


FIGURE 1. KINSHIP STRUCTURES

Panel (a) presents the datasets used to analyse geographic proximity between adult children and parents. Although adults may occupy dual roles as both parents and children, the presence of three generations is not required. Specifically, the "child sample" and "parent sample" capture kin relationships both between P1/2 and C1/2 (Figure (a1) & (a2)) and between G1/2 and P1 (Figure (a2)). Panel (b) presents three-generational families, focusing on the "sandwich" generation (P1/2) with both children and living parents.

Dependent Variables

There is a broad consensus that living in the same household and living nearby are qualitatively distinct, and that the transition from co-residence to the lowest ordinal category of proximity is not comparable to subsequent transitions between categories (Compton & Pollak, 2015; Silverstein, 1995; Van Den Broek et al., 2014). Therefore, this study employs a two-step approach: first, estimating the likelihood of co-residing with another generation; and second, for those without co-resident parents or adult children, assessing their geographic proximity to their parents or adult children.

The UKHLS provides household composition data, which enable the identification of family members with whom respondents live. In the Family Networks module, respondents with non-resident parents or children are asked to report the travel time to their mother's, father's or child's residence. Based on this information, we define two dependent variables. The first is a dichotomous variable, coded as 1 if the respondent co-resides with at least one parent (for the "child sample"), an adult child (for the "parent sample"), or both a parent and child (for the "multigenerational sample"); otherwise, it is coded as 0. In the absence of resident parents or children, we categorise travel time into three groups: "close" (within 30 minutes), "far" (over 30 minutes but within the UK), and "abroad". As in previous analyses, a 30-minute threshold is chosen as a cutoff, beyond which frequent face-to-face contact and exchange of support become less feasible (Artamonova & Gillespie, 2023; Shelton & Grundy, 2000). In

cases where parents live separately and are in different proximity categories, we focus on the parent residing closer to the child. Unfortunately, grandchild-grandparent proximity cannot be studied. As the survey only provides travel time, but no direction or specific location, it is impossible to triangulate the locations of the parents, children, and grandparents, and thus calculate the distance between grandchildren and grandparents. As such, the analysis is limited to the likelihood of three-generational co-residence for the "multigenerational sample".

The temporal measure of distance has both advantages and limitations. One potential issue is that self-reported time may be biased due to subjective distortions in individuals' perception, memory, or knowledge of time duration (Silverstein, 1995). Structural differences may also arise because travel time for the same physical distance can vary across regions, such as urban and rural areas. Additionally, we lack information on travel mode; for instance, 30 minutes by car or public transport is much further away than 30 minutes of walking. Nonetheless, temporal measures can more accurately reflect the real opportunity costs and inconvenience of travel compared to spatial distance (Silverstein, 1995).

Independent Variables

We examine the determinants of intergenerational proximity at the individual, household, and contextual levels. This study focuses on sociodemographic variables, including age, gender, education, migration background, ethnicity, and partnership status. Specifically, (1) age is considered to account for life course effects, with age categories reclassified as necessary in certain datasets. (2) Gender is controlled for in all analyses. (3) For education, we classify individuals with a university degree or higher in the high-education category, those with A-levels or equivalent qualifications in the medium category, and those with GCSEs, other qualifications, or no qualifications in the low category. (4) We include a dummy variable indicating whether the respondent was UK-born to account for migration background. Immigrants are more likely than natives to have families living abroad and differ in their

socioeconomic attributes and residential patterns (Chan & Ermisch, 2015; Malmberg & Pettersson, 2007). (5) Ethnicity is included as a categorical variable, including White; Indian; Pakistani and Bangladeshi; Black, African and Caribbean; mixed ethnicities; and other ethnic backgrounds. (6) Partnership status is classified as single, married, cohabiting, divorced or separated, and widowed.

At the household level, sibship size is considered an important characteristic. We hypothesise that having more siblings may reduce the likelihood of co-residing with or living near one's parents or living in a three-generational household. Note that this variable is excluded from the analysis of parents' proximity to adult children. We also examine how the number of children the respondent has influences intergenerational proximity. In the analyses of the child and multigenerational samples, we consider the number of dependent children in the household, whereas in the parent sample, we use the total number of children parents have.

The final set includes two dummy variables to capture the geographic contexts associated with the respondent's place of residence. One variable indicates whether the respondent lives in a rural or urban area. The other variable identifies the local authority where the respondent resides. With 373 local authorities in the UK (adjusted for boundary changes), this allows us, for the first time, to draw detailed maps illustrating spatial variation in intergenerational proximity.

Statistical Analysis

We first apply binomial logistic regression to examine the factors associated with co-residence with parents or adult children, as well as living in three-generational households. We then focus on adult children and parents who do not live with any parent or adult child. Multinomial logistic regression is used to assess the likelihood of having them nearby, far away, or abroad. All regressions include wave fixed effects to control for context-wide factors that may affect intergenerational living arrangements. Because observations are clustered

within individuals, robust standard errors are used to account for clustering at the individual level. Variance inflation factors (VIF) were conducted and indicated no significant multicollinearity in the models.

In the following analysis, we present average marginal effects of covariates, which reflect the average change in the predicted probability of co-residence or being in a specific proximity category when comparing non-reference to reference groups. The marginal effects for local authority dummies are displayed on a map, and those for other covariates are presented using forest plots. To better understand spatial variation in intergenerational proximity, we compute the global Moran's *I* statistic (Moran, 1950) to measure the degree of spatial autocorrelation and apply hotspot analysis (Getis-Ord Gi*) (Getis & Ord, 1992; Ord & Getis, 1995) to identify areas where co-residence or close proximity is more (hotspots) or less likely (coldspots). A fixed distance band of 181.4 km is applied to define spatial relationships, ensuring that geographically isolated regions are assigned neighbours.

Sensitivity analyses were conducted to assess the robustness of the findings across different proximity specifications: close (within one hour), far (over one hour), and abroad. To evaluate whether spatial variation in intergenerational proximity reflects the influence of urbanisation level, we re-estimated the models without the urban-rural residence variable. Overall, the results showed negligible differences in the magnitude and significance of the parameters (see Figures S1-S3 in the Supplementary File).

EMPIRICAL RESULTS: DETERMINANTS OF INTERGENERATIONAL GEOGRAPHIC PROXIMITY

In our sample, the results showed that 19% of adult children co-resided with their parents. Among those without a resident parent, the share of living close, living far, and having parents abroad were 54%, 35%, and 11%, respectively. From the parents' perspective, co-residence and living in closer proximity were more common. The corresponding figures were

33% for co-residing with an adult child, and among those without any resident child, 63% for living close, 34% for living far, and 3% for having children abroad. For the multigenerational sample, about 2.4% lived with both their parents and children.

The Perspective of Adult Children

From the perspective of adult children, we first estimated the determinants of co-residence with at least one parent, as shown in Figure 2. Daughters were marginally less likely to live with a parent than sons. This was partly attributable to daughters leaving the parental home earlier than sons due to gendered age differences in cohabitation and marriage (Gillespie, 2020; Gillespie & Treas, 2017). An alternative reason may be that daughters faced more constraints from parental rules and traditional expectations, which could reduce their willingness to live with parents (Gillespie, 2020). Co-residence declined with the increasing age of adult children, though a slight increase was observed after age 55, primarily due to their increased caregiving responsibilities for ageing parents. Co-residence was more prevalent among children who were less educated, ethnic minorities, or single. For instance, compared to Whites, Indians, Pakistanis, and Bangladeshis were at least 10 percentage points more likely to live with their parents. People who were married or cohabiting were approximately 20 percentage points less likely than singles to co-reside with parents. Also, foreign-born children were less likely to live with their parents than natives, because most foreign-born immigrants have left-behind parents. At the household level, respondents with dependent children and two or more siblings were less likely to co-reside with their parents.

As expected, the likelihood of co-residing with parents was higher in less urbanised areas, likely due to greater housing capacities, stronger familial ties, and more cohesive local networks (Malmberg & Pettersson, 2007; Mulder & Van Der Meer, 2009; Van Der Pers & Mulder, 2013). Geographically, although no statistically significant spatial autocorrelation was detected, hotspot analysis indicated that co-residence with parents was more common among

adult children in Northern Ireland but less prevalent across much of Scotland and northern England.

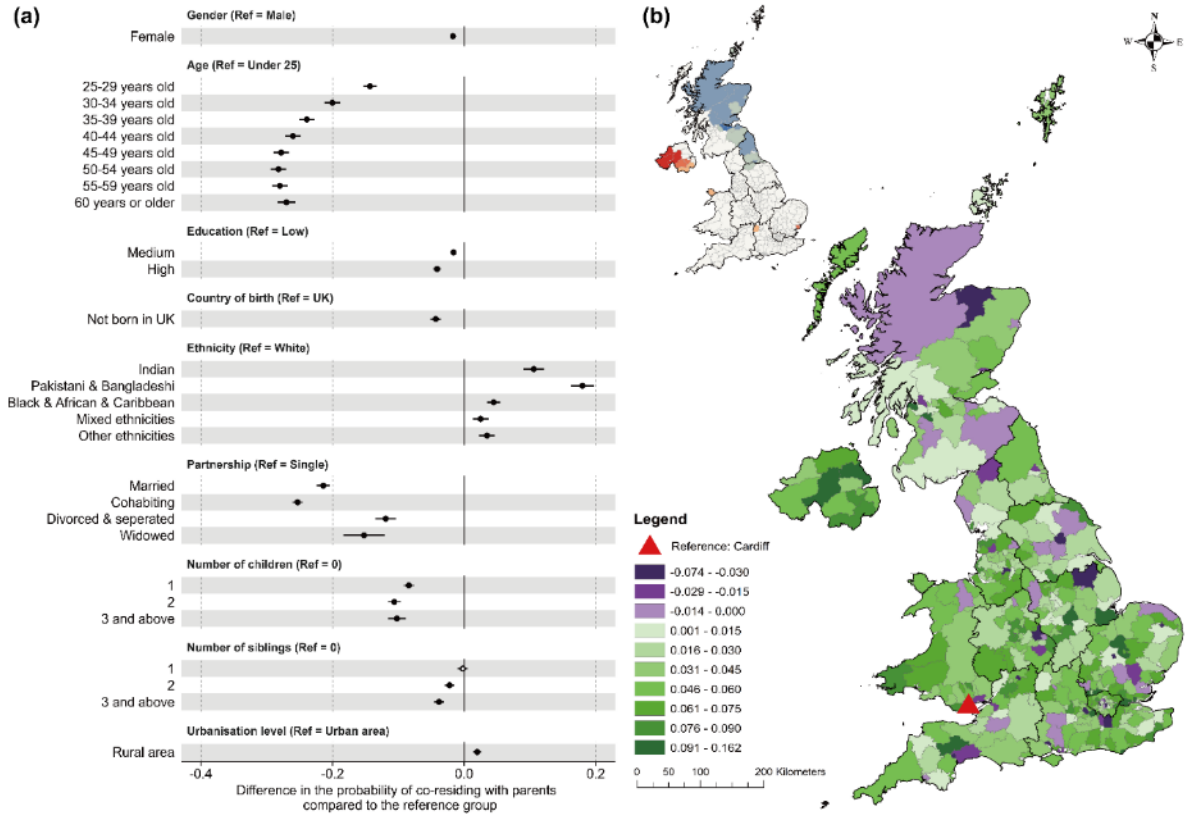


FIGURE 2. AVERAGE MARGINAL EFFECTS FROM THE MODEL OF WHETHER CO-RESIDING WITH PARENTS

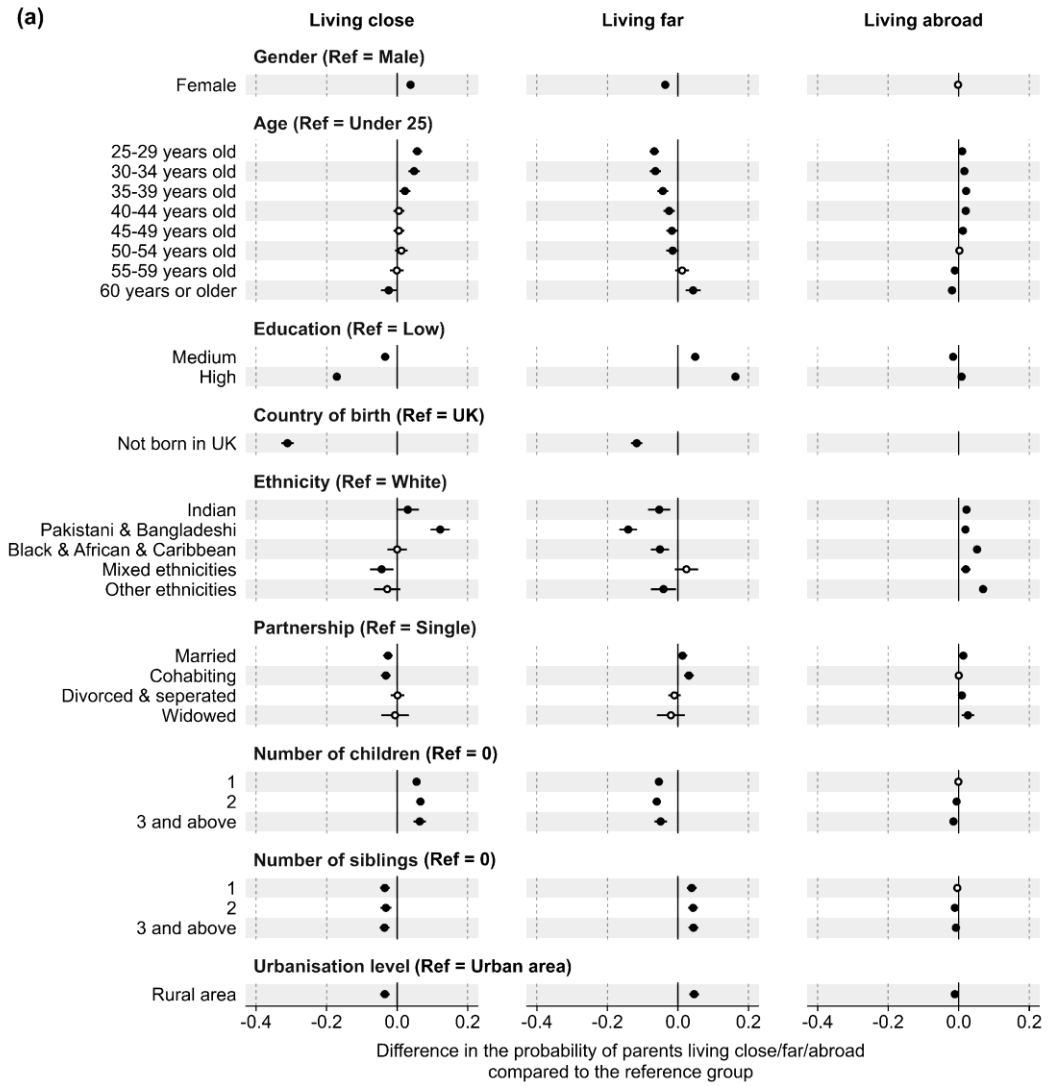
Panel (a) shows the difference in the probability of co-residing with parents compared to the reference group. A solid circle indicates statistical significance at the 10% level, and a hollow circle denotes non-significance, hereinafter referred to for all subsequent figures. The main map in panel (b) shows the difference in the probability of co-residence against the reference local authority, Cardiff, which is selected because its share of adult children living with parents is at the median among all local authorities. The upper-left smaller map presents the results of hotspot analysis, where red indicates clusters of high values (hotspots) and blue indicates clusters of low values (coldspots). This applies to all subsequent figures.

Figure 3 showed the differences in geographic distance across selected covariates for adult children without resident parents. Daughters were slightly more likely than sons to live

in close proximity to their parents rather than farther away, whereas the likelihood of having parents living abroad did not vary by gender. This gender asymmetry results from the "kin-keeper" role often assigned to women within families, which leads to their greater caregiving responsibilities than men (Michielin & Mulder, 2007; Mulder & Van Der Meer, 2009; Shelton & Grundy, 2000). Ageing was linked to a lower likelihood of living near parents and a higher likelihood of residing at a greater distance. Its effect on the likelihood of parents living abroad, however, was relatively modest. Higher educational attainment increases the likelihood of living farther from parents rather than nearby. Individuals with a degree were about 20 percentage points less likely than those with low educational attainment to live close to their parents. Foreign-born adults often had parents residing abroad, which explained their lower likelihood of co-residing with, living near, or even living far from them. Ethnic differences were notable: individuals of South Asian origin (i.e., Indian, Pakistani, and Bangladeshi) were more inclined to live near their parents compared to other ethnic groups, whereas ethnic minorities were more likely than Whites to have parents abroad. Proximity to parents varied slightly by partnership status, with married and cohabiting people less likely than singles to have their parents nearby.

Though having dependent children was negatively associated with co-residence, it increased the probability of living close to parents rather than farther away. The presence of siblings, as opposed to none, led to greater spatial distance from parents. This pattern – along with the negative relationship between co-residence and the number of siblings noted above – may reflect the limited availability of parental resources in larger families, which reduces the potential "gain" of living near the parental home (Gillespie & Treas, 2017; Leopold et al., 2012; Shelton & Grundy, 2000). Also, the presence of siblings allows caregiving responsibilities to be shared among more individuals, decreasing the need to reside close to parents (Gillespie & Van Der Lippe, 2015; Malmberg & Pettersson, 2007; Van Den Broek & Dykstra, 2017).

The results further indicated that adult children in rural areas were less likely to live near their parents and more likely to live at a greater distance. This pattern contrasts with earlier findings, which suggest that adult children in urban areas tend to live farther from their parents because they are more often internal migrants (Malmberg & Pettersson, 2007; Van Den Broek et al., 2014; Van Der Pers & Mulder, 2013). One plausible explanation lies in structural differences associated with the travel-time metric: it may take longer in rural areas despite similar or even shorter spatial distances. Furthermore, the likelihoods of having parents nearby, far away, or abroad exhibited notable spatial clustering patterns (Moran's $I = 0.217$, 0.191, and 0.040, respectively; all significant at the 1% level). Individuals in the South, mainly London, South East, and East of England, tended to live farther from their parents rather than in closer proximity, reflecting a larger share of internal migrants in these areas. In contrast, those residing in Northern Ireland, Wales, northern England, and southern Scotland were more likely to live close to their parents and less likely to live far away. The pattern of having parents abroad generally aligned with the distribution of immigrants, with higher probabilities observed across local authorities in the South (e.g., London, South East, and East of England).


(a)
Living close
Living far
Living abroad
Gender (Ref = Male)
Female
Age (Ref = Under 25)
25-29 years old
30-34 years old
35-39 years old
40-44 years old
45-49 years old
50-54 years old
55-59 years old
60 years or older
Education (Ref = Low)
Medium
High
Country of birth (Ref = UK)
Not born in UK
Ethnicity (Ref = White)
Indian
Pakistani & Bangladeshi
Black & African & Caribbean
Mixed ethnicities
Other ethnicities
Partnership (Ref = Single)
Married
Cohabiting
Divorced & seperated
Widowed
Number of children (Ref = 0)
1
2
3 and above
Number of siblings (Ref = 0)
1
2
3 and above
Urbanisation level (Ref = Urban area)
Rural area
-0.4
-0.2
0.0
0.2
Difference in the probability of parents living close/far/abroad
compared to the reference group

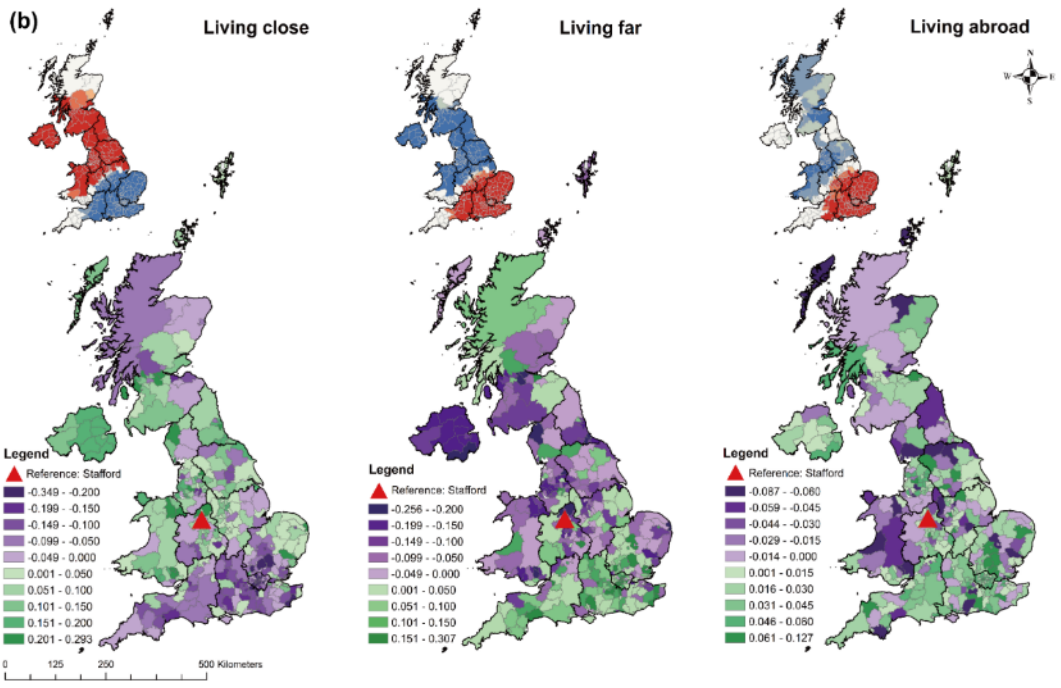

(b)
Living close
Living far
Living abroad
Legend
Reference: Stafford
-0.349 - -0.200
-0.199 - -0.150
-0.149 - -0.100
-0.099 - -0.050
-0.049 - 0.000
0.001 - 0.050
0.051 - 0.100
0.101 - 0.150
0.151 - 0.200
0.201 - 0.293
0
125
250
500 Kilometers
Legend
Reference: Stafford
-0.256 - -0.200
-0.199 - -0.150
-0.149 - -0.100
-0.099 - -0.050
-0.049 - 0.000
0.001 - 0.050
0.051 - 0.100
0.101 - 0.150
0.151 - 0.307
Legend
Reference: Stafford
-0.087 - -0.060
-0.059 - -0.045
-0.044 - -0.030
-0.029 - -0.015
-0.014 - 0.000
0.001 - 0.015
0.016 - 0.030
0.031 - 0.045
0.046 - 0.060
0.061 - 0.127

FIGURE 3. AVERAGE MARGINAL EFFECTS FROM THE MODEL OF DISTANCE TO PARENTS

Panel (a) shows the difference in the probability of having parents living close, far, or abroad compared to the reference group. Note that the average marginal effect for "Country of birth" in the "Living abroad" category is 0.43, which is omitted from the figure due to its substantially larger magnitude than other covariates. The main maps in panel (b) show the difference in the probabilities of having parents nearby, far, or abroad against the reference local authority, Stafford, which is selected because its share of adult children living close to parents is at the median among all local authorities. The smaller maps in the upper-left show the hot- and cold-spots for each type, as identified by the Getis-Ord Gi* statistics – that is, areas with significantly higher or lower values compared to the reference local authority.

The Perspective of Parents

Turning to the perspective of parents (Figure 4), the likelihood of living with adult children declined sharply with age until the 70s, after which it stabilised. The magnitude of these associations was substantial: parents under 50 were almost 70 percentage points more likely to co-reside with an adult child than those aged 70 or older. Indian, Pakistani, and Bangladeshi parents were significantly more likely to live with children compared to their White counterparts. In comparison to married parents, those who were single, cohabiting, or divorced/separated were less likely to live with their adult children, but widowed parents were more likely to do so. Families with more than three children had a slightly higher probability of living with an adult child compared to one-child families. Although variations across gender, country of birth, urbanisation levels were relatively modest, females, foreign-born individuals and those living in rural areas were more likely to co-reside with their adult children. There was little evidence of substantial differences by educational attainment. Similarly, we observed a modest but statistically significant spatial clustering in the probability of parents living with

their children (Moran's $I = 0.046$, $p < 0.01$), where those in the south – including London, South East, and East of England – were more likely to co-reside with an adult child than in other regions such as Wales, northern England, and Scotland.

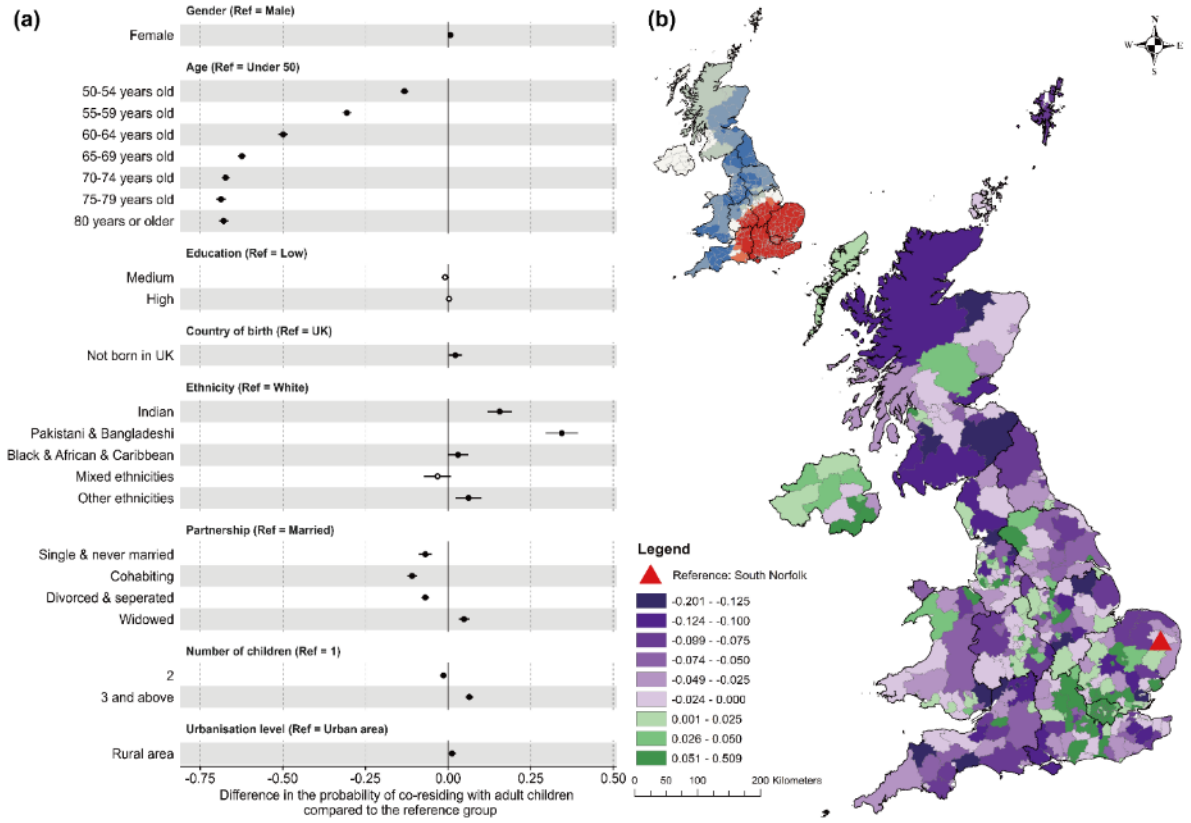


FIGURE 4. AVERAGE MARGINAL EFFECTS FROM THE MODEL OF WHETHER CO-RESIDING WITH ADULT CHILDREN

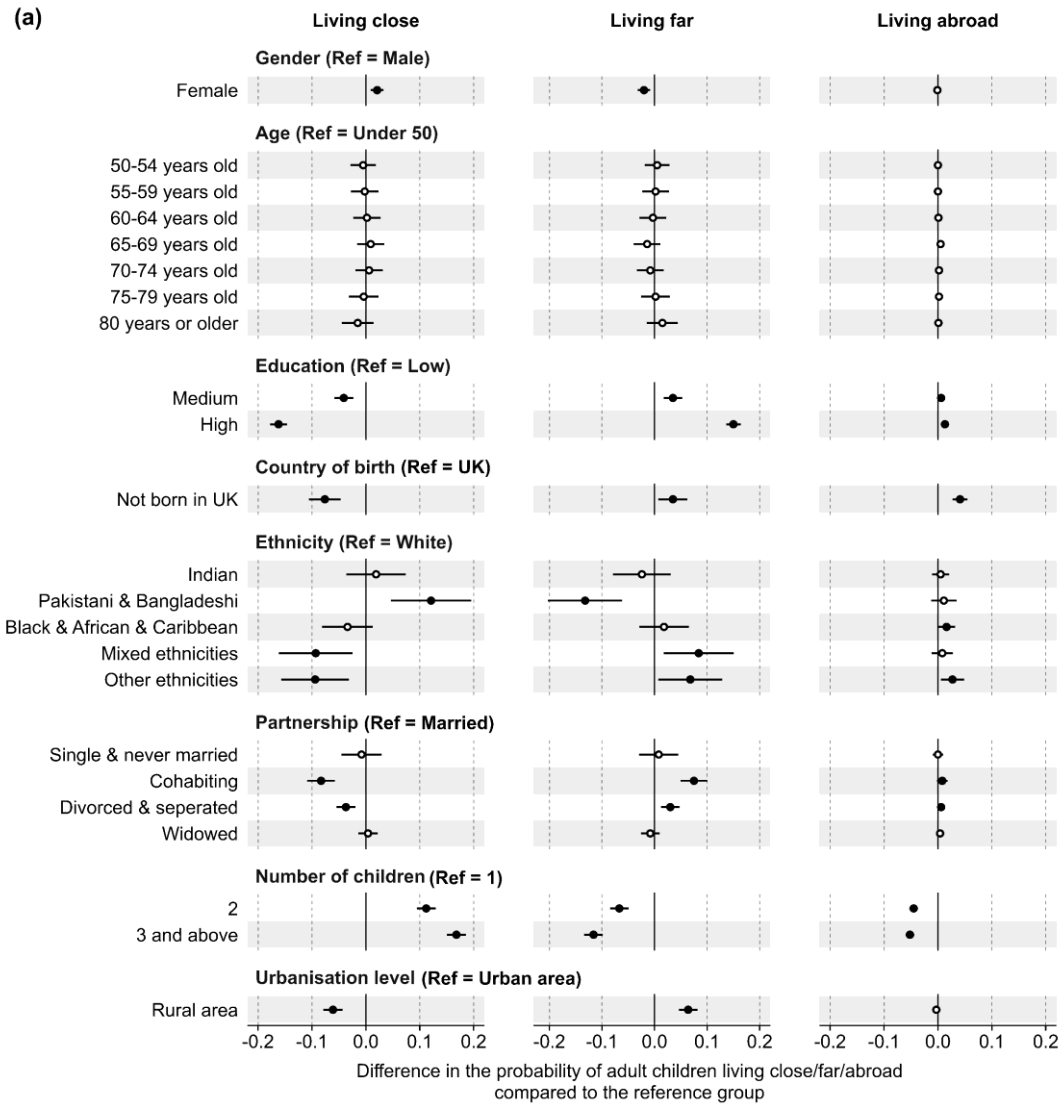
Panel (a) shows the difference in the probability of co-residing with adult children compared to the reference group. The main map in panel (b) shows the difference in the probability of co-residence against the reference local authority, South Norfolk, which is selected because its share of parents living with adult children is at the median among all local authorities. The smaller map shows the hot- and cold-spots where values are significantly higher or lower than the reference local authority.

We next examined parents without resident children to understand how these factors influence the distance to their nearest child (Figure 5). Compared to fathers, mothers tended to live closer to their children rather than at a distance, with no notable difference in the

probability of children living abroad. Age, however, did not significantly impact parent-child proximity. A possible explanation is that the model controlled for the number of children, which is strongly correlated with parental age. To assess this possibility, we estimated an alternative model excluding this variable; the results lend support to this interpretation (see Figure S4 in the Supplementary File). Parents with a low level of education were about 20 percentage points more likely to live near their children than their highly educated counterparts. Foreign-born parents tended to have children living at greater distances or residing abroad than native-born parents. Significant ethnic differences were found: Pakistani and Bangladeshi parents were approximately 15 percentage points more likely to live near their children than White parents, whereas mixed and other ethnic groups were more likely to reside farther away. Parents who were married exhibited a higher likelihood of having adult children close by compared to those who were cohabiting or divorced/separated.

Having more children increased the likelihood that at least one child lived nearby and decreased the likelihood that all children lived far away or abroad. Compared to parents with only one child, those with three or more children were about 20 percentage points more likely to have a child living close by. Parents from densely populated areas tended to reside closer to their children, with a roughly 5 percentage points higher probability than their counterparts in rural areas, because abundant local employment opportunities make it easier for adult children to remain nearby (Malmberg & Pettersson, 2007; Van Den Broek et al., 2014; Van Der Pers & Mulder, 2013). In addition, the positive spatial autocorrelation pattern remained evident. Parents in Northern Ireland, Wales, northern England, and southern Scotland were more likely than those in other regions (e.g., London, South East, South West, and East of England) to live near their adult children (Moran's $I = 0.073$, $p < 0.01$). A contrasting pattern was found for the probability of adult children living farther away (Moran's $I = 0.081, p < 0.01$). The results

also indicated a higher likelihood of having children living abroad in regions such as Northern Ireland and southern Scotland compared to others like Wales (Moran's $I = 0.005$, $p < 0.10$).



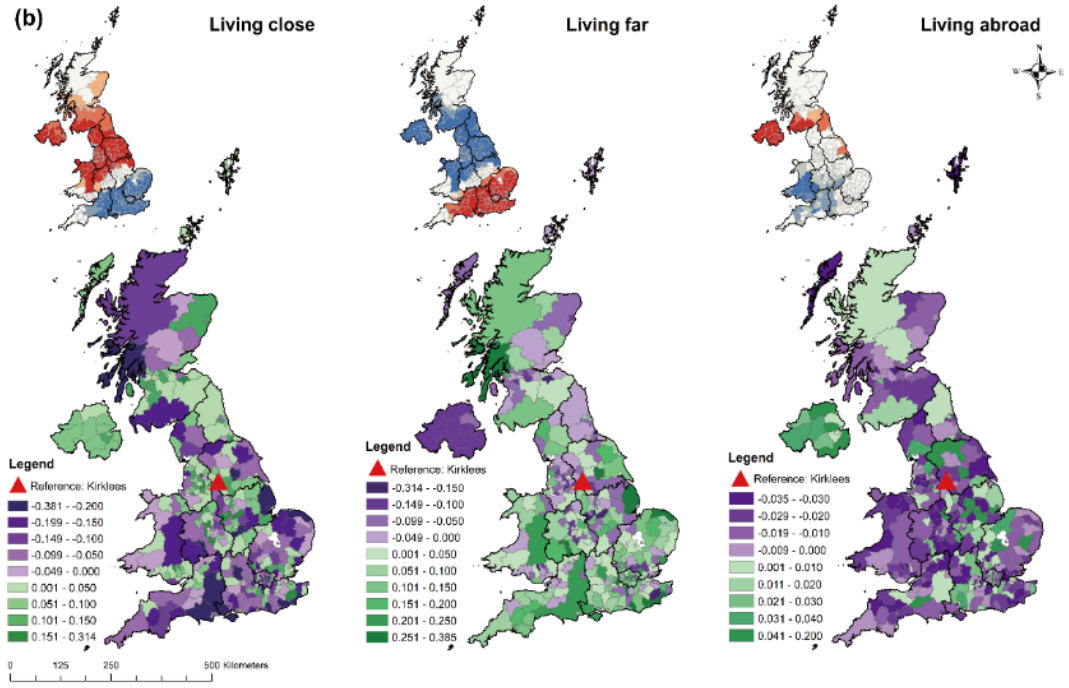


FIGURE 5. AVERAGE MARGINAL EFFECTS FROM THE MODEL OF DISTANCE TO ADULT CHILDREN

Panel (a) shows the difference in the probability of having adult children living close, far, or abroad compared to the reference group. The main maps in panel (b) show the difference in the probabilities of having adult children nearby, far, or abroad against the reference local authority, Kirklees, which is selected because its share of parents living close to adult children is at the median among all local authorities. Smaller maps in the upper-left show hot- and cold-spots, that is, areas where values are significantly higher or lower than the reference local authority.

Multigenerational Co-residence

For the multigenerational sample, we focused on the "sandwich" generation and investigated how parental characteristics impact the living arrangements across three generations (Figure 6). Compared to females (mothers), multigenerational co-residence was slightly more common among males (fathers), partly because females tend to move to their partner's residence rather than vice versa (Blaauboer et al., 2011). The probability of co-residing with at least one parent and one child declined markedly until parents reached

approximately age 35, after which it stabilised. Ethnic minorities, particularly Indian, Pakistani, and Bangladeshi, were more inclined than White people to live in three-generational households. Though parental education did not significantly influence the likelihood of such arrangements, foreign-born parents were slightly less likely than their native-born counterparts to live in multigenerational households. Single and divorced or separated individuals tended to live with both their parents and children compared those who are married. This may be attributed, on one hand, to a greater demand for family care support and the unpartnered adult child's desire for companionship, and on the other, to a lower potential for conflict with a spouse over the inclusion of an extended family member in the household (Rogerson et al., 1997).

Regarding household-level variables, co-residence was more prevalent in households with at least one dependent child than in those without. Having more siblings was associated with a lower probability of three-generational co-residence. Parents residing in rural areas were more likely to live with both their parents and children. Regional variation in this measure was minimal, and spatial clustering was not statistically significant. Nonetheless, multigenerational co-residence appeared to be slightly more prevalent in areas such as London and Wales.

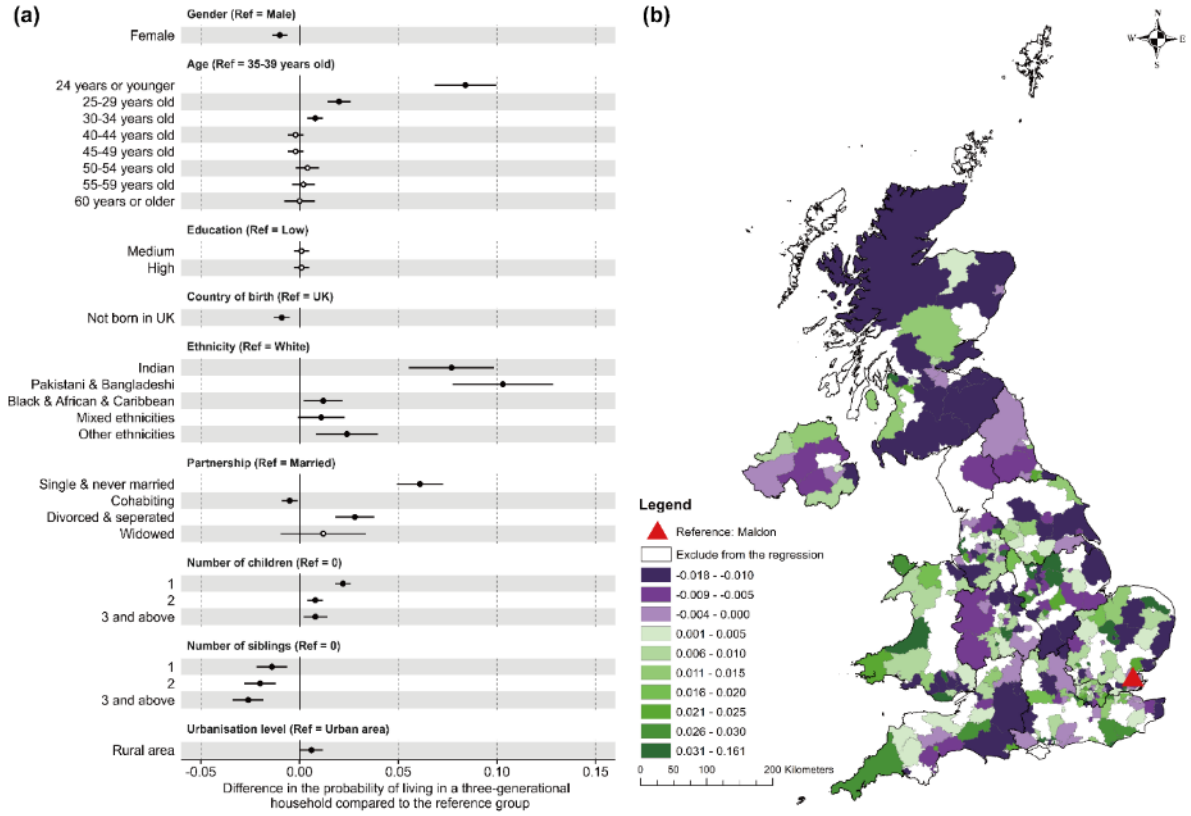


FIGURE 6. AVERAGE MARGINAL EFFECTS FROM THE MODEL OF WHETHER LIVING IN A THREE-GENERATIONAL HOUSEHOLD

Panel (a) shows the difference in the probability of three-generational co-residence compared to the reference group. Panel (b) maps the difference in the probability of three-generational co-residence against the reference local authority, Maldon, which is selected because its share of parents living with both their parents and children is at the median among all local authorities. Note that 94 local authories were excluded from the regression due to a lack of variation in the dependent variable within these regions. Given the non-continuous distribution of local authorities where data for three-generational analysis were available, we omitted the hotspot analysis, which requires a continuous neighbourhood for each area.

DISCUSSION AND CONCLUSION

This research aims to provide a comprehensive picture of intergenerational proximity. We examined geographic proximity through the dual roles of adults as both parents and children within families, including proximity to parents from the perspective of adult children,

proximity to adult children from the perspective of parents, and three-generational co-residence from the perspective of individuals with both living parents and children. This was the first novel contribution of the study. Second, we investigated spatial variation in geographic proximity using local authorities rather than broad regions to improve our understanding of how contextual factors such as opportunity structures and cultural norms shape intergenerational proximity. We applied spatial analysis techniques to detect areas with particularly high or low levels of geographic proximity.

Drawing on data from Understanding Society in the UK, the findings revealed that adult children and parents tend to live close to one another – a pattern more pronounced from the parents' perspective. Three-generational co-residence is uncommon. From the perspective of adult children, the results showed that (1) the likelihood of co-residence is higher among younger, single, and ethnic minority individuals, as well as those residing in Northern Ireland; and (2) living closer to parents is more likely among individuals with low educational attainment, who are UK-born, of South Asian origin, and residing in Northern Ireland, Wales, northern England, and southern Scotland, but less common among those who live in the south such as London, South East, and East of England. For parents, we found that (1) co-residence with adult children is more prevalent among those who are younger, of South Asian origin, and reside in London, South East, and East of Scotland; and (2) among those not co-residing, individuals who are low educated, of South Asian origin, have more children, and live in Northern Ireland, Wales, northern England, and southern Scotland tend to have their children nearby. Focusing on adults with both living parents and children, the results indicated that three-generational co-residence is more likely among those who are younger, of South Asian origin, and single or divorced.

We found that intergenerational proximity is closely associated with life-course stages. This pattern results from the cumulative effects of life-course transitions, such as leaving for

education, starting a job, getting married, or relocating to a larger house (Rogerson et al., 1993). For young adults, residential proximity facilitates access to local resources through extensive family and social networks. As individuals age, the likelihood of relocations increases, leading to greater spatial separation between generations (Michielin & Mulder, 2007).

The findings indicate a strong positive association between higher educational attainment and intergenerational residential separation. Among adult children, this pattern may reflect the tendency of more educated people to engage less frequently with family members, shaped by more individualistic values and a stronger emphasis on personal autonomy (Bordone, 2009). They are also more inclined to pursue employment opportunities farther afield to maximise returns on human capital, particularly when specialised labour markets are concentrated in some large cities (Gillespie & Lei, 2021; Lin & Rogerson, 1995; Michielin & Mulder, 2007; Rogerson et al., 1993). For parents, higher educational attainment may enable them to provide support that is less reliant on physical proximity, thereby sustaining intergenerational ties across greater distances (Leopold et al., 2012).

Notable ethnic differences in intergenerational proximity are observed, partly reflecting diverse cultural norms and values related to family formation and obligations (Choi, 2003). For instance, co-residence between parents and adult children is widely expected among Pakistani and Bangladeshi communities (Beishon et al., 1998). Distinct spatial distributions and migration patterns among ethnic minorities, compared to White populations, may also contribute to these disparities. Prior research indicates that groups such as Pakistanis and Bangladeshis are less likely to reside in areas with low ethnic concentration (Zuccotti, 2019) and exhibit low levels of residential mobility (Finney, 2011), both of which may help explain their greater geographic proximity to family members. In addition, these patterns reflect barriers to establishing independent households among ethnic minorities and incentives to stay

geographically close to family due to financial constraints or discrimination in the housing and labour markets (Choi et al., 2021; De Valk & Bordone, 2019).

Our study maps the detailed geography of intergenerational proximity and reveals its patterns of spatial clustering. We propose several factors to understand these geographies. First, local housing markets influence geographic proximity. In regions such as London and the South East, high housing costs limit the ability to form independent households or secure housing near families. Thus, from the parents' perspective, co-residence with adult children is more common, whereas living nearby occurs less frequently in these areas. Second, the patterns of intergenerational separation are associated with internal migration. Individuals residing in developed regions, such as London, South East, and South West, are often migrants and therefore more likely to live farther from their families. Third, the effect of geography results from its role in shaping cultural and social values related to family solidarity. Northern Ireland exemplifies this, where enduring social structures rooted in religious traditions foster strong community bonds and close familial relationships. As such, there is a higher tendency to live with or close to family. Finally, relative geographic location also plays a role. For example, Northern Ireland's geographic separation from Great Britain and closeness to the Republic of Ireland increase the likelihood of families living nearby or abroad, rather than at greater distances within the UK.

Not surprisingly, three-generational co-residence is uncommon in the UK. This finding does not contradict the prevailing understanding of the grandparent generation's importance in family life, because intergenerational support does not necessarily require shared living arrangements. Rather, our results underscore the vital role that grandparents play during periods of increased need, such as when adult children (i.e., the sandwich generation) are young, raising dependent children, or unpartnered. Grandparents often contribute to child-rearing responsibilities and tend to remain actively involved in the lives of younger generations

(Leopold et al., 2012; Malmberg & Pettersson, 2007; Michielin & Mulder, 2007). Because of the data limitations discussed earlier, we cannot investigate in greater depth how different generations negotiate living arrangements to balance mutual needs. For this to be possible, studies can leverage population register data, where the locations of all three generations are explicitly recorded.

Several limitations of this study warrant further analysis. First, the data do not sufficiently capture both parents' and children's perspectives. Because intergenerational living arrangements involve two (or more) generations, and either party may initiate relocation, a more comprehensive approach that incorporates characteristics from both sides of the kinship dyad would be required for an in-depth understanding. Second, although we have identified several key determinants of geographic proximity, omitted variable issues (e.g., health status) cannot be ignored. Lastly, despite the fact that we provide a detailed examination of spatial variations, the mechanisms driving these differences require further research. Our findings emphasise the need to go beyond characteristics of individuals and households to investigate how broader contextual factors, such as housing prices, regional migration patterns, and cultural norms, shape intergenerational geographic proximity.

The study demonstrates that a nuanced picture of intergenerational proximity emerges when proximity is defined based on the dual roles of adults as both parents and children within families and when regional variation is examined at a finer spatial scale. Spatially proximate kin have become a vital form of social capital that can enhance well-being and help compensate for limited access to various resources. Differences in the spatial distribution of families across social groups may reinforce or reduce socioeconomic inequalities, highlighting the need for greater attention to the determinants and consequences of intergenerational geographic proximity.

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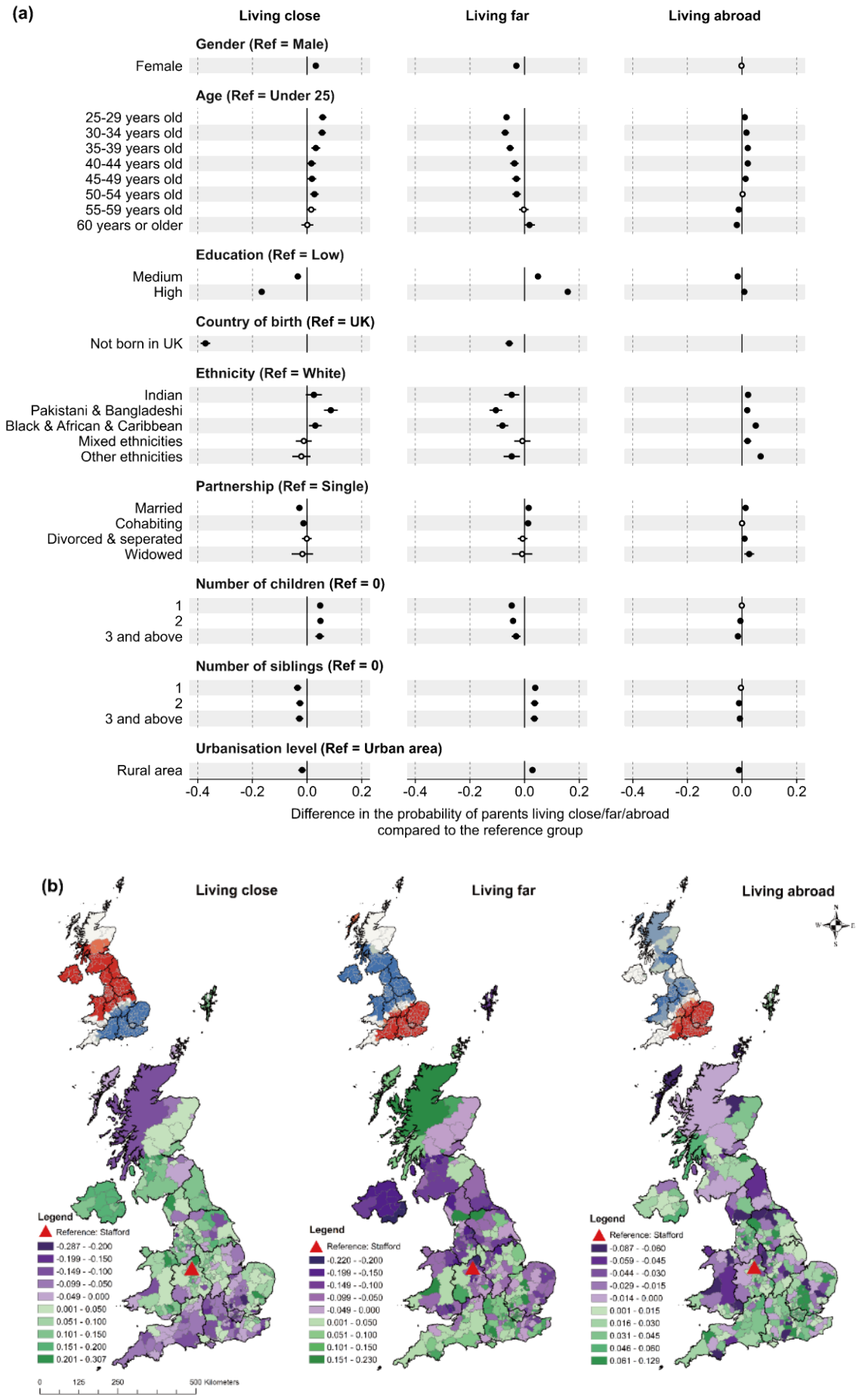

(a)
Living close
Living far
Living abroad
Gender (Ref = Male)
Female
Age (Ref = Under 25)
25-29 years old
30-34 years old
35-39 years old
40-44 years old
45-49 years old
50-54 years old
55-59 years old
60 years or older
Education (Ref = Low)
Medium
High
Country of birth (Ref = UK)
Not born in UK
Ethnicity (Ref = White)
Indian
Pakistani & Bangladeshi
Black & African & Caribbean
Mixed ethnicities
Other ethnicities
Partnership (Ref = Single)
Married
Cohabiting
Divorced & seperated
Widowed
Number of children (Ref = 0)
1
2
3 and above
Number of siblings (Ref = 0)
1
2
3 and above
Urbanisation level (Ref = Urban area)
Rural area
-0.4
-0.2
0.0
0.2
Difference in the probability of parents living close/far/abroad
compared to the reference group
(b)
Living close
Living far
Living abroad
Legend
Reference: Stafford
-0.287 - -0.200
-0.199 - -0.150
-0.149 - -0.100
-0.099 - -0.050
-0.049 - 0.000
0.001 - 0.050
0.051 - 0.100
0.101 - 0.150
0.151 - 0.200
0.201 - 0.307
0
125
250
500 Kilometers
Legend
Reference: Stafford
-0.220 - -0.200
-0.199 - -0.150
-0.149 - -0.100
-0.099 - -0.050
-0.049 - 0.000
0.001 - 0.050
0.051 - 0.100
0.101 - 0.150
0.151 - 0.230
Legend
Reference: Stafford
-0.087 - -0.060
-0.059 - -0.045
-0.044 - -0.030
-0.029 - -0.015
-0.014 - 0.000
0.001 - 0.015
0.016 - 0.030
0.031 - 0.045
0.046 - 0.060
0.061 - 0.129

FIGURE S1. AVERAGE MARGINAL EFFECTS FROM THE MODEL OF DISTANCE TO PARENTS

Panel (a) shows the difference in the probability of having parents living close (within 1 hour), far (over 1 hour), or abroad compared to the reference group. Note that the average marginal effect for "Country of birth" in the "Living abroad" category is 0.43, which is omitted from the figure due to its substantially larger magnitude than other covariates. The main maps in panel (b) show the difference in the probabilities of having parents nearby, far, or abroad against the reference local authority, Stafford. The smaller maps in the upper-left show the hot- and cold-spots for each type, as identified by the Getis-Ord Gi* statistics – that is, areas with significantly higher or lower values compared to the reference local authority.

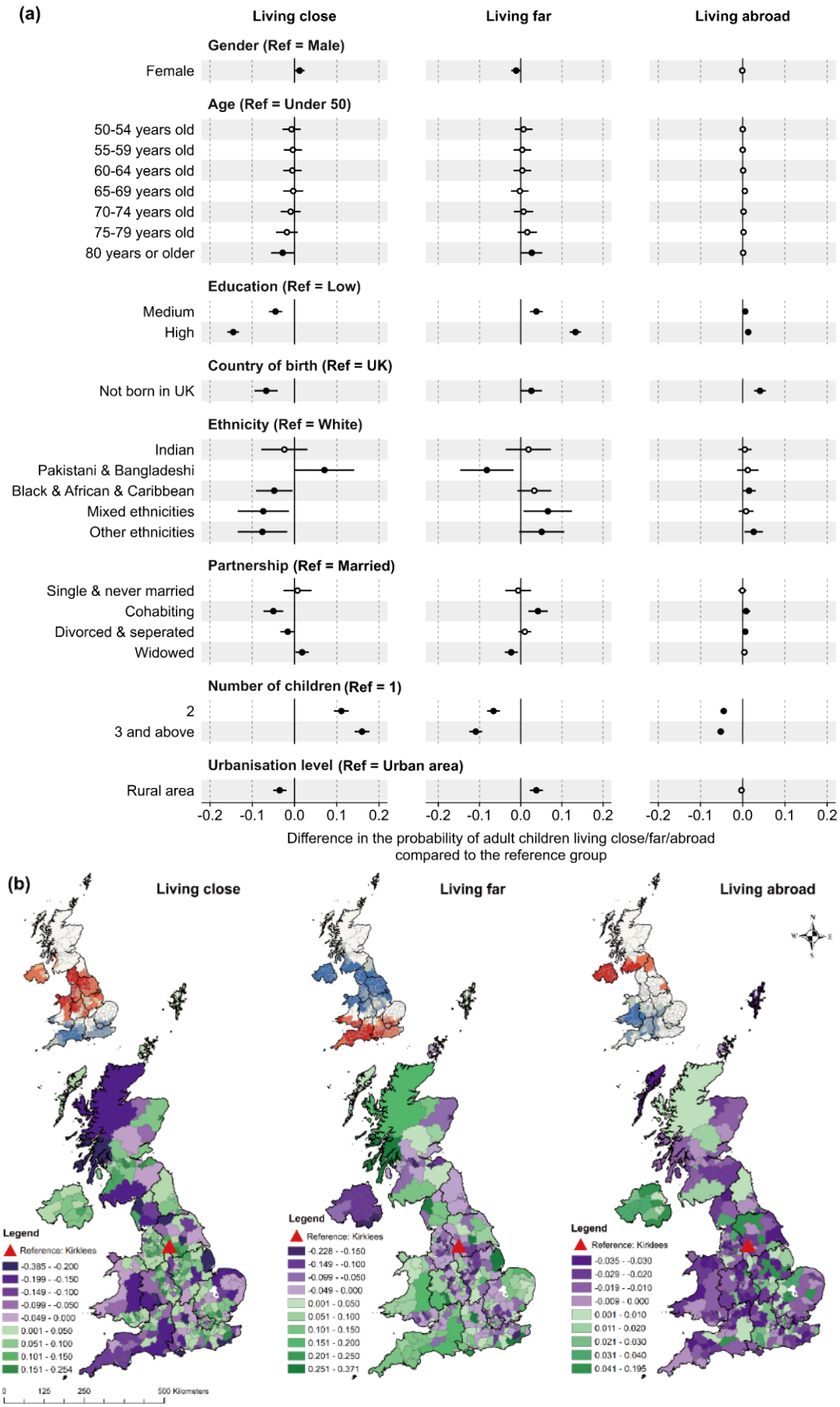
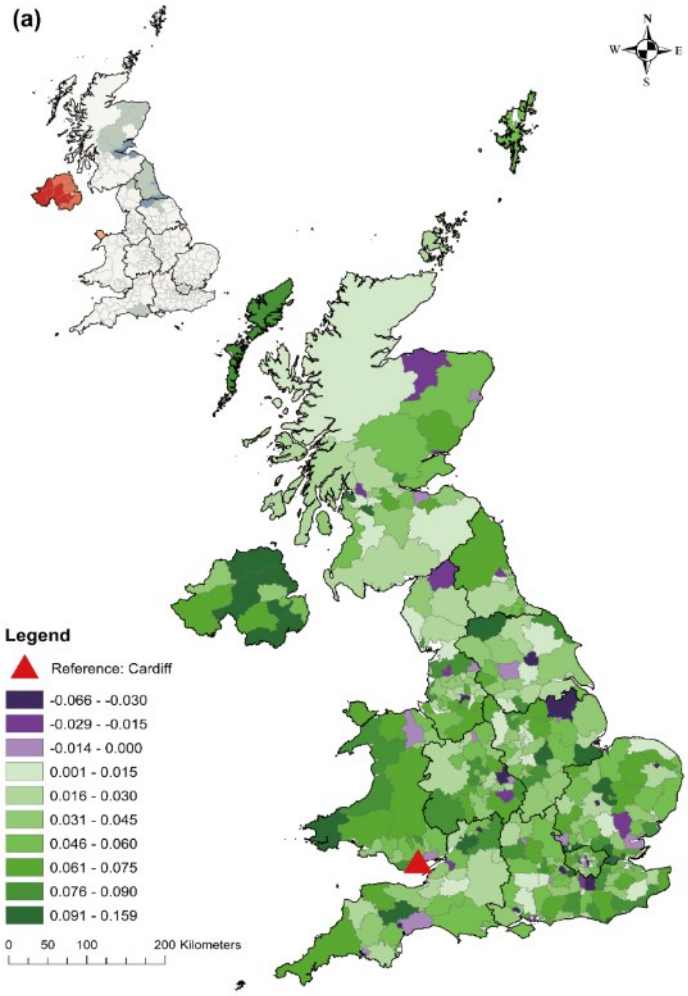
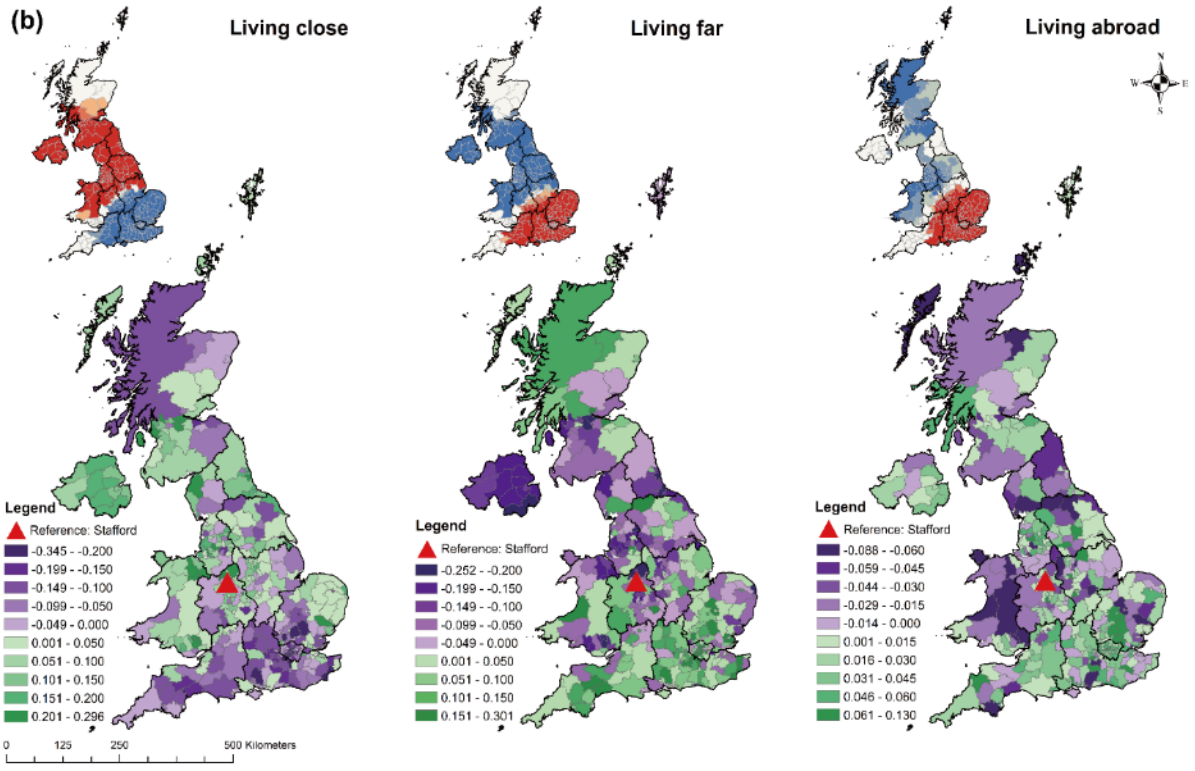
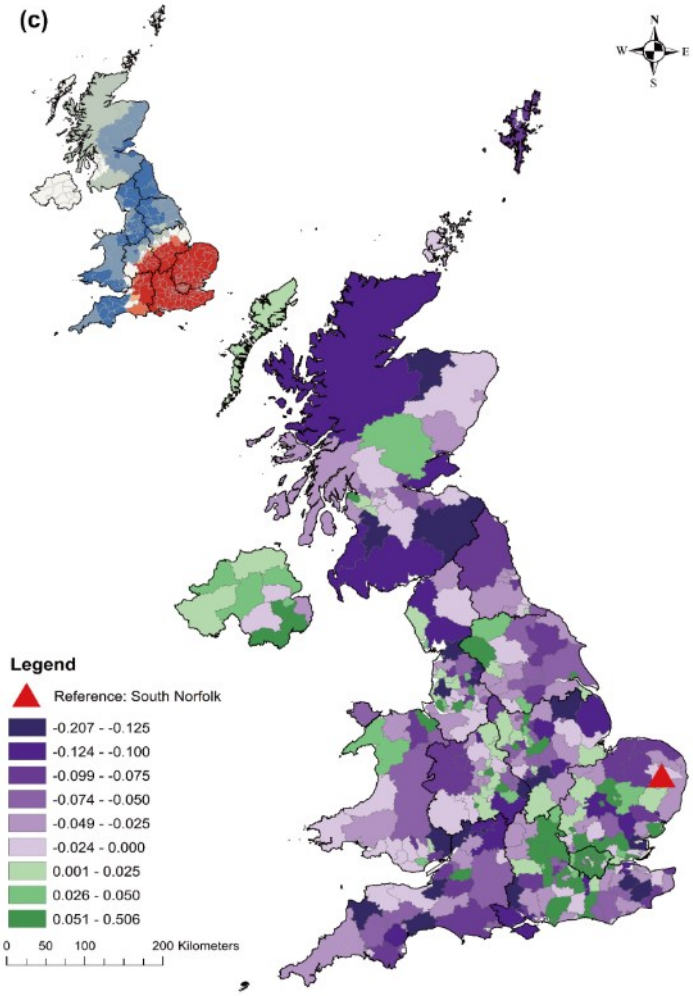

(a)
Living close
Living far
Living abroad
Gender (Ref = Male)
Female
Age (Ref = Under 50)
50-54 years old
55-59 years old
60-64 years old
65-69 years old
70-74 years old
75-79 years old
80 years or older
Education (Ref = Low)
Medium
High
Country of birth (Ref = UK)
Not born in UK
Ethnicity (Ref = White)
Indian
Pakistani & Bangladeshi
Black & African & Caribbean
Mixed ethnicities
Other ethnicities
Partnership (Ref = Married)
Single & never married
Cohabiting
Divorced & seperated
Widowed
Number of children (Ref = 1)
2
3 and above
Urbanisation level (Ref = Urban area)
Rural area
-0.2 -0.1 0.0 0.1 0.2
Difference in the probability of adult children living close/far/abroad compared to the reference group
(b)
Living close
Living far
Living abroad
Legend
Reference: Kirklees
-0.385 - -0.200
-0.199 - -0.150
-0.149 - -0.100
-0.099 - -0.050
-0.049 - 0.000
0.001 - 0.050
0.051 - 0.100
0.101 - 0.150
0.151 - 0.254
0 125 250 500 Kilometers
Legend
Reference: Kirklees
-0.228 - -0.150
-0.149 - -0.100
-0.099 - -0.050
-0.049 - 0.000
0.001 - 0.050
0.051 - 0.100
0.101 - 0.150
0.151 - 0.200
0.201 - 0.250
0.251 - 0.371
Legend
Reference: Kirklees
-0.035 - -0.030
-0.029 - -0.020
-0.019 - -0.010
-0.009 - 0.000
0.001 - 0.010
0.011 - 0.020
0.021 - 0.030
0.031 - 0.040
0.041 - 0.195

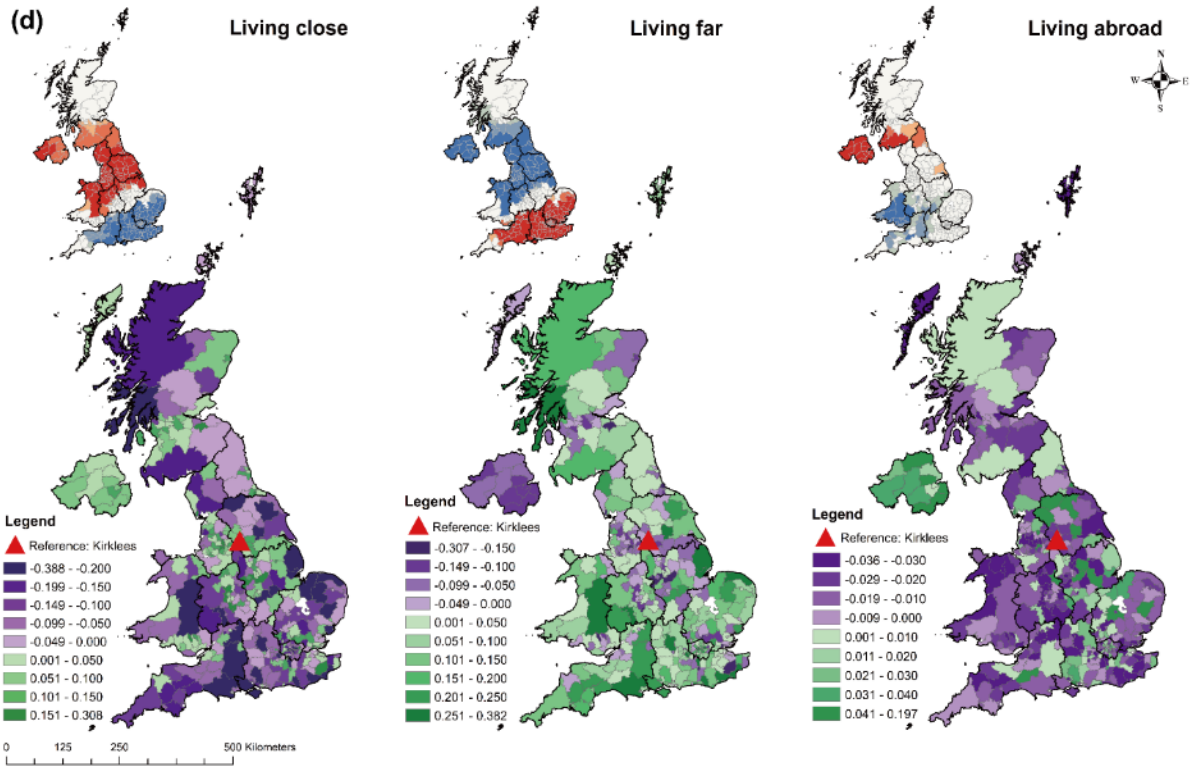
FIGURE S2. AVERAGE MARGINAL EFFECTS FROM THE MODEL OF DISTANCE TO ADULT CHILDREN

Panel (a) shows the difference in the probability of having adult children living close (within 1 hour), far (over 1 hour), or abroad compared to the reference group. The main maps in panel (b) show the difference in the probabilities of having adult children nearby, far, or abroad against the reference local authority, Kirklees. Smaller maps in the upper-left show hot- and cold-spots, that is, areas where values are significantly higher or lower than the reference local authority.




(b)
Living close
Living far
Living abroad
N
W
E
S
Legend
Reference: Stafford
-0.345 - -0.200
-0.199 - -0.150
-0.149 - -0.100
-0.099 - -0.050
-0.049 - 0.000
0.001 - 0.050
0.051 - 0.100
0.101 - 0.150
0.151 - 0.200
0.201 - 0.296
0 125 250 500 Kilometers
Legend
Reference: Stafford
-0.252 - -0.200
-0.199 - -0.150
-0.149 - -0.100
-0.099 - -0.050
-0.049 - 0.000
0.001 - 0.050
0.051 - 0.100
0.101 - 0.150
0.151 - 0.301
Legend
Reference: Stafford
-0.088 - -0.060
-0.059 - -0.045
-0.044 - -0.030
-0.029 - -0.015
-0.014 - 0.000
0.001 - 0.015
0.016 - 0.030
0.031 - 0.045
0.046 - 0.060
0.061 - 0.130


(c)
N
W
E
S
Legend
Reference: South Norfolk
-0.207 - -0.125
-0.124 - -0.100
-0.099 - -0.075
-0.074 - -0.050
-0.049 - -0.025
-0.024 - 0.000
0.001 - 0.025
0.026 - 0.050
0.051 - 0.506
0 50 100 200 Kilometers


(d)
Living close
Living far
Living abroad
Legend
Reference: Kirklees
-0.388 - -0.200
-0.199 - -0.150
-0.149 - -0.100
-0.099 - -0.050
-0.049 - 0.000
0.001 - 0.050
0.051 - 0.100
0.101 - 0.150
0.151 - 0.308
0 125 250 500 Kilometers
Legend
Reference: Kirklees
-0.307 - -0.150
-0.149 - -0.100
-0.099 - -0.050
-0.049 - 0.000
0.001 - 0.050
0.051 - 0.100
0.101 - 0.150
0.151 - 0.200
0.201 - 0.250
0.251 - 0.382
Legend
Reference: Kirklees
-0.036 - -0.030
-0.029 - -0.020
-0.019 - -0.010
-0.009 - 0.000
0.001 - 0.010
0.011 - 0.020
0.021 - 0.030
0.031 - 0.040
0.041 - 0.197
N
W
E
S

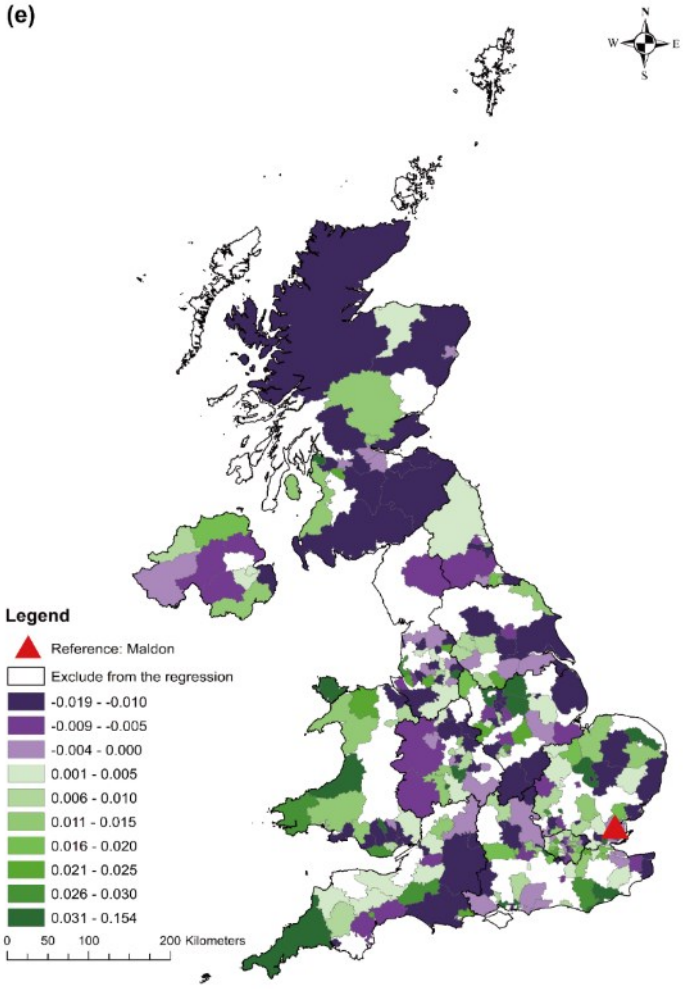

(e)
Legend
Reference: Maldon
Exclude from the regression
-0.019 - -0.010
-0.009 - -0.005
-0.004 - 0.000
0.001 - 0.005
0.006 - 0.010
0.011 - 0.015
0.016 - 0.020
0.021 - 0.025
0.026 - 0.030
0.031 - 0.154
0 50 100 200 Kilometers
N
W
E
S

FIGURE S3. AVERAGE MARGINAL EFFECTS OF THE LOCAL AUTHORITY DUMMY VARIABLE FROM MODELS EXCLUDING THE URBAN-RURAL RESIDENCE VARIABLE

The main maps show the difference in the probabilities of (a) co-residing with parents, (b) having parents nearby, far away, or abroad, (c) co-residing with adult children, (d) having adult children nearby, far away, or abroad, and (e) living in a three-generational household against the respective reference local authority. The smaller maps in the upper-left show hot- and cold-spots, that is, areas where values are significantly higher or lower than the reference local authority. Due to the non-continuous distribution of local authorities where data for three-generational analysis were available, we omitted the hotspot analysis.

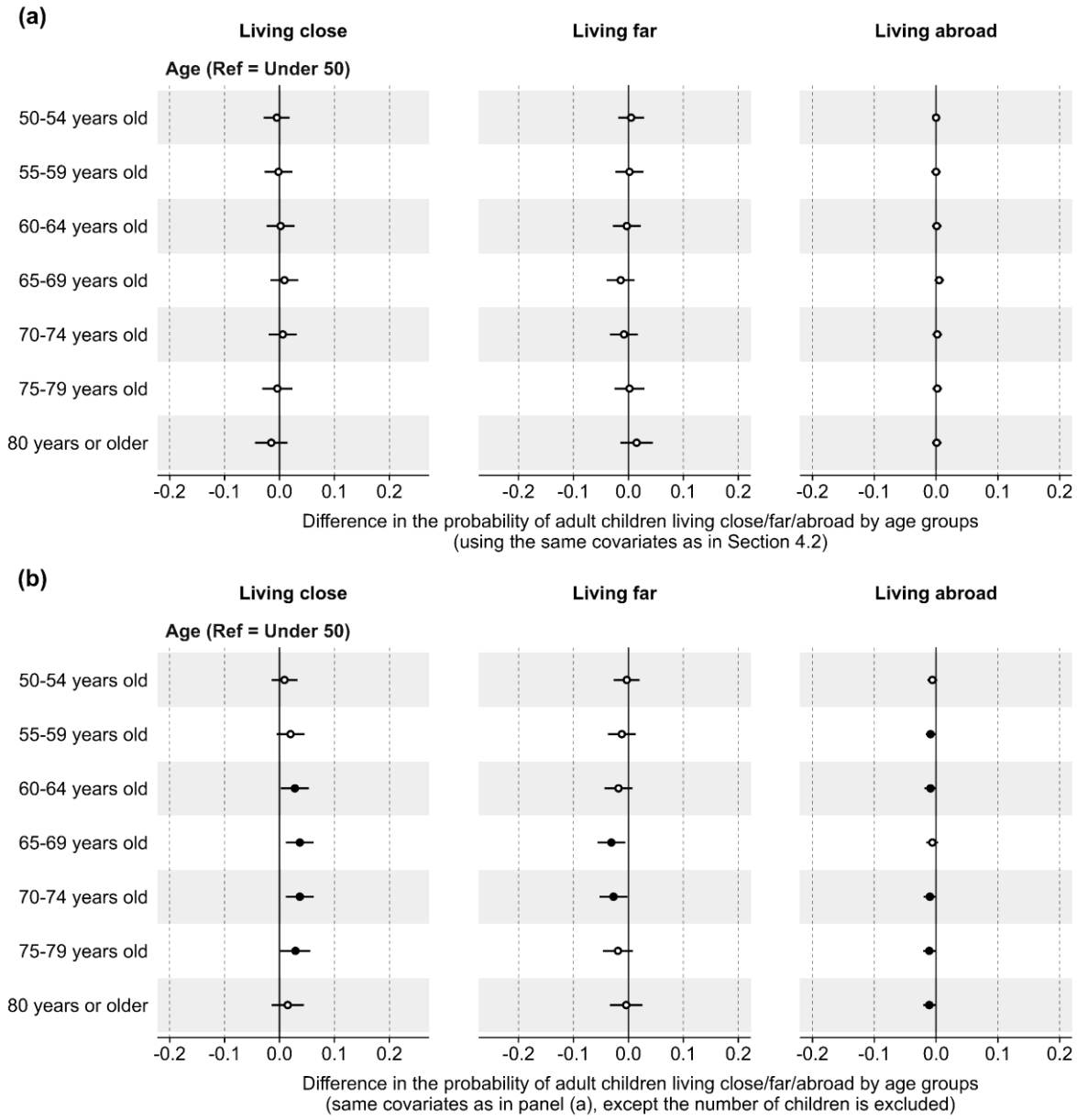


FIGURE S4. COMPARISON BETWEEN THE AVERAGE MARGINAL EFFECTS OF AGE

Panel (a) shows the average marginal effects of age, conditional on all covariates listed in Section 4.2. Panel (b) shows the average marginal effect of age using the same covariates as in panel (a), except that the number of children is excluded. The average marginal effects of the remaining covariates are not shown.