Inequality

The IFS Deaton Review

Early childhood inequalities

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Executive summary

Introduction (Section 1)

- This chapter focuses on inequalities in early childhood cognitive and socio-emotional development, and in the environments in which children are raised. These emerge very early in life and shape individuals' outcomes and experiences, both as children and as adults. This chapter reviews existing evidence and provides new evidence from the UK on the nature, magnitude and long-term implications of these inequalities. It examines how such inequalities have changed over time and provides a critical appraisal of current UK policies aimed at supporting children and their families in the early years.

Inequalities in early development and environments (Sections 2 and 3)

- Large inequalities in cognitive and socio-emotional development emerge early in life. Data on a nationally representative cohort of UK children born in 2000–02 reveal large gaps in development between children at age 3 – by sex and ethnicity, as well as by family socio-economic circumstances, household structure and maternal mental health. There are also important geographic differences.

- There is a clear correlation between cognitive and socio-emotional development, with children with low cognitive scores more likely to also present with high emotional and behavioural problems, suggesting that there exists a double disadvantage for those children who lag behind their peers. This highlights that it is key for policy to address children's inequalities across multiple dimensions.

- There are also large socio-economic and other inequalities by family background in the home environments in which children are raised. These environments can be classified as educational (e.g. maternal educational qualifications, maternal vocabulary skills, regular reading to the child, early childcare), emotional (e.g. parent–child conflict, parental relationships, regularity of bedtimes, parental mental health) and material environments (e.g. housing). Children experience significant inequalities in these environments from a young age.

Drivers of inequalities (Sections 4 and 5)

- A substantial fraction of the inequalities in children's early development at age 3 can be traced back to inequalities in their home, educational, emotional and material environments at the same age: inequalities in these environments explain over 20% of the overall inequalities in

cognitive development and 45% of the inequalities in socio-emotional development at age 3. The quality of relationships between parents and children, and other aspects of the emotional environments provided in the home, are an important source of variation explaining differences in child emotional and behavioural difficulties.

- There are strong differences by income in cognitive and socio-emotional development of children at age 3. This 'income gradient' in early development is almost entirely explained by differences in early environments. However, this does not mean that inequalities in early development should only be tackled by interventions that target children's environments: policies aiming at improving the income of the poorest and socio-economic inequalities at source, and interventions targeting inequalities in children's early childhood environments, likely need to be combined and delivered together, and more research is urgently needed to determine the optimal balance between these.

- Children's genetic endowment is associated with early childhood cognitive and socio-emotional development, and genes are also associated with early home environments. Whilst the exact magnitude of genetic influences on child development remains very much under debate, it is clear that children's genes (and parents' genes) affect child outcomes both directly, and indirectly by shaping the environments in which they are raised. This finding does not imply that social policies cannot affect child development. On the contrary, there is strong evidence from around the world showing that carefully designed and targeted interventions can lead to improvements in children's environments with benefits for their outcomes.

Long-term implications of early inequalities (Section 6)

- Early childhood development has an important influence on later outcomes, including educational attainment at the end of secondary education, and economic and social outcomes in mid life, and a range of evidence shows that policies to improve children's skills in early childhood can have long-lasting benefits. If appropriately targeted towards children from disadvantaged backgrounds or at risk of developmental delays, such policies could reduce socio-economic and other inequalities in adult life.

- Socio-economic inequalities in adult outcomes are shaped both by inequalities in children's development in early childhood, and by their early environments (over and above the impact of early environments on early development). Inequalities in development that build between the ages of 5 and 16 play an important role as well in explaining these inequalities in adult life.

Changes over time (Section 7)

- Comparing two cohorts of children born in England around a decade apart (in 2000–02 and 2010–12), we find that socio-economic inequalities in early cognition and socio-emotional development at age 3 were remarkably stable in magnitude. There was no significant change in the gap in development between children with low- and high-educated mothers, or those in the most and least deprived areas, between these two cohorts.

- Although there were no significant changes in socio-economic inequalities in early development between these two cohorts, there were some important changes to their early home environments: for example, mothers of the younger birth cohort (born 2010–12) were more highly educated than those in the older cohort (born 2000–02) and were more likely to

read to their children every day and provide regular bedtimes; however, there was also a significant drop in homeownership (and a corresponding rise in private renting) among families of young children, and an increase in mothers reporting high psychological distress.

- There is a lack of data evidencing how inequalities in development changed in between these two specific birth cohorts, or how they have been changing over time more recently (among later-born cohorts); however, there are indications that a narrowing of inequalities occurred in early development indicators collected by schools at age 5 prior to the mid 2010s, followed by a widening thereafter, and that the COVID-19 pandemic may have exacerbated early inequalities.

Policy appraisal and going forward (Section 8)

- The past two decades have seen unprecedented public investment in the early years in the UK, which has included sustained increases in public spending on early childcare places (for children aged 2+), and childcare subsidies delivered through the tax and benefit system. This has been accompanied by an initial expansion, and then reduction (since 2010), in investment in services for families.

- The level and targeting of public spending in the early years have shifted considerably across time and governments. In recent years, there has been a relative shift away from spending on the most disadvantaged families and towards families in work. Much policy has focused on children aged 2+, despite evidence of the first three years, starting from conception, being a crucial developmental period.

- There have also been real-terms cuts in benefits for families with young children, through freezes in working-age benefits, the reduction in the overall benefit cap and the introduction of the two-child limit, which currently only affects families with children in their early years (since it is applied to families with more than two children born since April 2017). Collectively, these have led to increases in relative child poverty, with those in extreme poverty of particular concern.

- A lack of progress in reducing early inequalities may not mean that early years policies aimed at supporting families with young children have been ineffective in reducing inequality – they may have prevented further increases in inequality, a counterfactual which we do not observe.

- However, the evidence from this chapter suggests that in order to be effective in reducing early years inequalities, policies need to tackle inequalities in income and/or inequalities in the home environment, at an earlier age. A joined-up approach embedding early childhood intervention as part of a system of family support throughout childhood and that tackles the multiple sources of environmental inequalities is likely to be most effective. The new focus on Family Hubs has promise if invested in sufficiently.

- Based on the evidence provided in this chapter, we recommend an early years policy that includes three pillars: a welfare state supporting sufficient income and a housing policy that ensures secure housing and reduces social segregation; high-quality mental healthcare, with a stronger focus on detection and treatment among mothers and fathers in this period of infancy; and strong support for families including in early parenting to foster the development of strong attachment and parent–child relationships.

1. Introduction

While there is widespread agreement in societies like the UK that every child has the right to a secure childhood and the opportunity to develop to their full potential, this does not match with reality for many of the 4 million children under the age of 5 currently living in the UK. Through the lottery of birth, children are born into different socio-economic circumstances and grow up in environments that are remarkably different from each other. These deep environmental inequalities are present in a multitude of dimensions including educational, emotional and material environments. Increasing evidence shows that genetic differences also matter, and that environmental inequalities correlate and interact with inequalities in genetic endowments. Together, this means that by the time children enter school, their levels of cognitive, socio-emotional and physical development are already vastly unequal.

Inequalities in early childhood – used in this chapter to denote the period from birth to school entry – are concerning not only because of the implications for children's immediate lives and well-being, but also because of their importance for later development. Early childhood is a critical period for laying healthy foundations for subsequent cognitive, social, emotional and physical development and functioning, which in turn play key roles in shaping people's economic, social and health trajectories. Without timely and appropriate mitigation, the developmental gaps already present between 5-year-olds from the most and least advantaged backgrounds persist and can widen, contributing to later inequalities in economic and social outcomes, much of which the IFS Deaton Review is about.

These stark and longstanding inequalities are not confined to the UK. In many countries where early childhood development indicators are available, we see developmental gaps emerging from the earliest age between children from different socio-economic, ethnic and geographical backgrounds. However, this dire evidence needs to be balanced against the messages of hope and opportunity that emerge from a wide range of disciplines: there is a real potential for early childhood intervention to address these inequalities effectively. However, what the many examples of well-crafted and robustly evaluated policies around the world also point to is that early childhood intervention is not a silver bullet and, just like any policy, requires careful design and consideration of the institutional and social system it is aimed to operate in.

The past three decades have seen a rise in public awareness about the importance of early childhood, alongside large increases in public spending on education and care services for the under-5s across many countries, including the UK where early education and childcare have become an increasingly important part of the education spending landscape (Farquharson et al., 2021). Despite these important investments, we are still making very slow progress at reducing early inequalities, which remain stubbornly persistent despite some fluctuations over the past two decades. The COVID-19 pandemic is a further setback, with all signs pointing to the fact that it will have exacerbated early inequalities (Cattan, Farquharson et al., 2021).

We are now at an important crossroads. In light of evidence that early inequalities have not substantially budged, it would be all too easy to dismiss the decades of policy reform and public investments that have been made as ineffective. But, of course, we do not observe what would have happened to early inequalities in the absence of these reforms and investments – over a period when inequalities in many of the dimensions that matter for child development, including child poverty, have been on the rise. But it would also be a mistake not to critically examine what UK policy has achieved over the past three decades and whether it is heading in the right

direction, when we know that the life chances of children are in large part conditioned by the social, emotional and economic environments they are born into.

As we 'build back better', there is an opportunity and an urgent need for fresh thinking on how to address the complex needs of disadvantaged children and their families so that we can drastically reduce the inequalities that exist from the time children are born – and indeed even beforehand. The objective of this chapter is to contribute to this thinking by bringing together systematic and UK-focused evidence on the nature, magnitude and long-term implications of early childhood inequalities, and by providing a critical appraisal of how policy aimed at supporting very young children and their families has fared in terms of reducing inequality. The evidence we provide gives a motivating call to policy to support the complex needs of parents of infants and young children, alongside addressing the structural inequalities that can have devastating long-term consequences for children.

Roadmap

We start the chapter by documenting, in Section 2, differences in two major pillars of development – thinking and language skills on the one hand (hereon, cognition) and social, emotional and behavioural skills on the other hand (hereon, socio-emotional development). This choice is driven by the fact that alongside physical development, these are the two major domains of early development, which have been extensively evidenced to be associated with later outcomes. This choice is also dictated by data availability.[1] Our work builds on an extensive evidence base from a variety of contexts showing that socio-economic disadvantage is associated with developmental deficits, which emerge very early on, and that inequalities in early development grow dramatically during the first few years of life. This chapter substantially updates this evidence base, showing the extent of such inequalities in the UK.

We then turn to discussing inequalities in early environments in Section 3, and Section 4 examines how these inequalities in early environments influence inequalities in early development. We consider the influence of a large array of environmental factors capturing educational, emotional and material environments of children. In line with existing evidence, we find that the environment in the early years plays a crucial role in determining children's development, but we also show in Section 6 that environmental influences continue to shape later outcomes, over and above their direct influence on children's early development. Both of these are key messages around which we develop our policy conclusions.

A novel feature of our work is to account for the role played by genetic endowments both in the drivers of early development and in the associations between early and late inequalities, discussed in Section 5. Studies of twins and adoptees and, more recently, molecular-genetic studies suggest that children's early skills and later-life outcomes are partly influenced by their genetic endowments (Willems et al., 2019; Demange et al., 2021). We outline the multiple and complex pathways through which children's genetic endowments may exert an influence on childhood skill formation and adult-life outcomes. We then explore associations between genetic endowment, early environments and inequalities in childhood development. A key message from

[1] In focusing on these two dimensions, we are likely to be overlooking the role played by other dimensions of early development, and in particular physical development. Given the specific focus on health of other chapters (Case and Kraftman, forthcoming), it is beyond the scope of this one to comment on significant phenomena, such as the stark rise of early childhood obesity and socio-economic inequalities therein over the past two decades (Johnson et al., 2015).

our analysis of genetic endowments is that genes partly condition children's development, but that these effects are heavily intertwined with those of environmental influences.

Most of the evidence presented in this chapter is based on a very rich data set following a cohort of young people born in 2000–02, and in Section 7 we draw on more recent data to discuss what we know of the evolution of inequalities in early development since then, including emerging evidence from the pandemic. In light of the evidence on the origins and consequences of early inequalities in the UK gathered throughout the chapter, we conclude in Section 8 by highlighting key trends in the early years policy landscape since the turn of the century and sharing our reflections on where policy should go next.

Box 1. Data sets used in the chapter

The analysis in this chapter draws on a unique set of nationally representative UK birth cohorts and longitudinal studies of early life. The first data set used is the Millennium Cohort Study (MCS) (Centre for Longitudinal Studies, 2021b), a nationally representative longitudinal study following just over 19,500 individuals born in the UK between 2000 and 2002. We use data from the first seven waves, at ages 9 months, 3, 5, 7, 11, 14 and 17 years, to describe the nature and magnitude of early childhood inequalities and assess both how these early inequalities evolve over time and how they map onto inequalities in socio-economic status and family structures, a rich set of environmental factors and outcomes into adolescence. The last include mental health and educational attainment at age 16, the latter of which has been shown in turn to be highly predictive of a range of socio-economic outcomes in adulthood (Machin, McNally and Ruiz-Valenzuela, 2020).

The second data source used is the 1970 British Cohort Study (BCS70) (Centre for Longitudinal Studies, 2021a), a nationally representative longitudinal study following a cohort of just over 17,000 individuals born in Great Britain in one week of April 1970. Use of this study allows us to measure the longer-term relationship between early childhood and adult outcomes today (Section 6), though of course by necessity this relates to early childhoods of several decades ago. We use five of the ten waves of data collected on the cohort, at ages 5, 7, 10, 16 and 42.

Finally, we take a look forward at how inequalities have evolved since the MCS cohort in Section 7, using data from the Study of Early Education and Development (SEED) (NatCen Social Research / University of Oxford / Department for Education, 2020), a longitudinal study of around 5,600 children born between 2010 and 2012 in England. To do this, we make use of the second wave of data, collected when participants were around 3 years old. The strong overlap in developmental measures between SEED and MCS allows us to study the extent to which early childhood inequalities in England have changed over a decade, between the early 2000s and the early 2010s. This is a period coinciding with an unprecedented increase in public investment into early childhood, making it a particularly salient time over which to compare the extent of early inequalities in development.

2. Inequalities in early childhood development

In this section, we examine inequalities in cognitive and socio-emotional development **at age 3** in the MCS across a variety of demographic and socio-economic factors. As evidenced elsewhere (Goodman et al., 2015), there are large and multifaceted inequalities in early childhood development in the UK, and understanding these inequalities is fundamental to the rest of this chapter. To depict inequalities here, we focus on the likelihood of children from different demographic groups being in the top 20% of cognitive development or bottom 20% of socio-emotional problems.[2]

Throughout this section and the rest of the chapter, we measure cognitive and socio-emotional development using validated scales developed by psychologists: the Bracken School Readiness and British Ability Scales Naming Vocabulary assessments to measure cognition, and the parent-reported Strengths and Difficulties Questionnaire (SDQ) to measure socio-emotional and behavioural difficulties. We refer interested readers to Box 2 for further details on these scales and on the construction of the indicators of development used in our empirical analysis.

Box 2. Measures of cognitive and socio-emotional development

In each cohort used in this chapter, we use a range of tests and measures to proxy for dimensions of development. For socio-emotional development, MCS and SEED contain the Strengths and Difficulties Questionnaire (Goodman, 1997) while BCS70 has its precursor the Rutter Child Behaviour Questionnaire (Rutter, 1967; Rutter, Tizard and Whitmore, 1970). For cognition, different batteries of assessment are used in different cohorts; however, both MCS and SEED contain the British Ability Scales Naming Vocabulary scale, allowing direct comparisons between them (see list below for details). Importantly, we observe cognitive skills, and not cognitive processes such as executive functioning.

Cognitive development

The scales measuring cognitive development are based on age-appropriate assessments which are administered in the home setting by trained interviewers.

- *MCS: Bracken School Readiness Assessment raw scores and British Ability Scales Naming Vocabulary ability scores at ages 3 and 5.* The Bracken School Readiness Assessment measures children's knowledge and understanding of basic concepts, such as colours, letters, numbers and shapes. The British Ability Scales Naming Vocabulary scale measures the spoken vocabulary of children, by testing the ability to name objects in pictures.

- *SEED: British Ability Scales Naming Vocabulary and Picture Similarities scores at age 3.* The British Ability Scales Naming Vocabulary scale is described above for MCS. The Picture Similarities scale measures children's non-verbal reasoning, by testing the ability to recognise a relationship between different pictures based on a common concept or element.

[2] One standard approach in the academic literature is to express differences between socio-economic or other groups in units of standard deviations. We use the approach of comparing likelihoods of being in the top quintile of the distribution as a more accessible formulation for a non-academic audience.

- *BCS70: English Picture Vocabulary Test, Human Figure Test, Complete a Profile Test, Copying Designs Test at age 5.* The English Picture Vocabulary Test measures children's language comprehension, by testing the ability to match a picture to a given word. The Human Figure Test measures children's general and perceptual ability, by asking children to draw a picture of a man or woman. The Complete a Profile Test measures children's spatial development, by testing the ability to add facial features to a drawing of a human face. The Copying Designs Test measures children's visual-spatial ability, by asking children to copy a series of line drawings.

We combine different test scores at each age using factor analysis and generate a factor score, summarising the child's cognitive ability. This factor score is also rescaled to have a mean of 0 and standard deviation of 1. In Section 6, we present analyses of the returns to cognitive scores in both MCS and BCS70. However, without a common measurement across cohorts, these cognitive factor scores are not directly comparable. That is, a one standard deviation change in the MCS cognitive factor is different from a one standard deviation change in BCS70. In Section 7, we measure cognition using only the British Ability Scales Naming Vocabulary test score, which is common across SEED and MCS.

Socio-emotional and behavioural development

Unlike cognition, the measures of socio-emotional and behavioural development used in this chapter are reported by the child's primary carer. This means that they are based on the main carer's own observations, and not externally assessed by someone outside the child's family. In most cases, the primary carer answering the assessment is the child's mother.

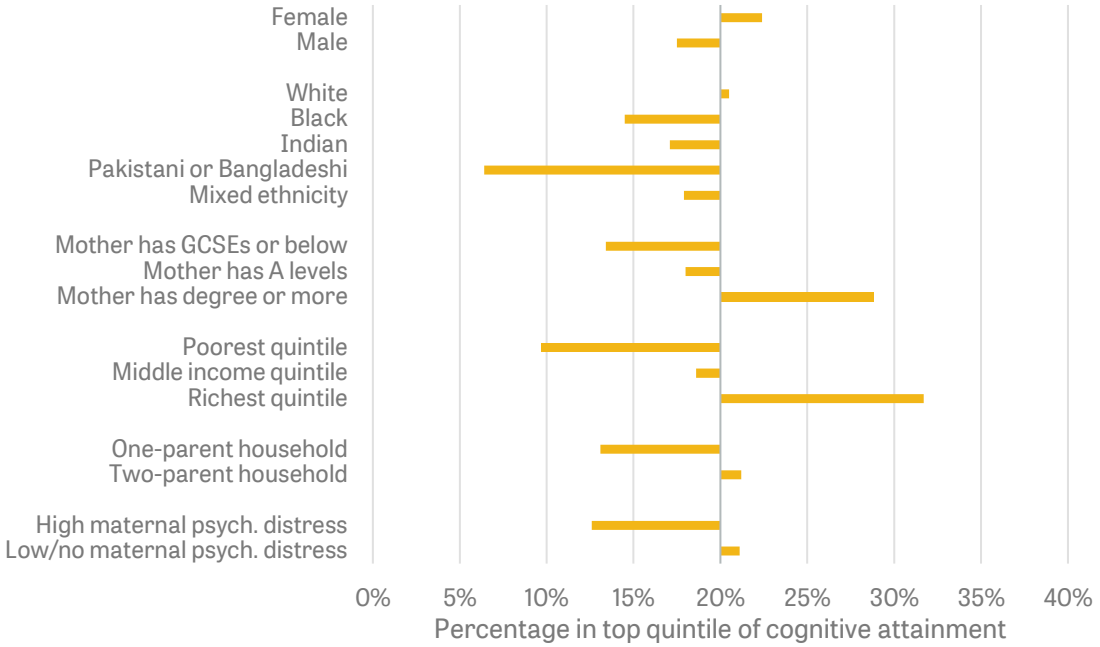
- *MCS: Total Difficulties Score from the Strengths and Difficulties Questionnaire at ages 3, 5, 7, 11 and 14.* This is the sum of four subscales: emotional symptoms (feelings of low mood and anxiety), conduct problems (behaviour difficulties, acting out, disobedience), hyperactivity/inattention (inattentive, fidgeting, unable to focus) and peer relationship problems (having few friends, being bullied). The maximum Total Difficulties Score is 20.

- *SEED: Total Difficulties Score from the Strengths and Difficulties Questionnaire at age 3.* As above.

- *BCS70: Rutter Child Behaviour Questionnaire at age 5.* This is an established set of 19 items which assess children's emotional symptoms, conduct problems, hyperactivity/inattention and peer relationship problems as described above, and combine to give an index of behavioural difficulties in the child (Rutter, Tizard and Whitmore, 1970).

We use test norms to construct a score measuring total difficulties and standardise this score within each cohort and age to have a mean of 0 and standard deviation of 1.

Figure 1. Inequalities in cognitive development, MCS age 3



Note: Figure shows percentage of each group falling in the top 20% of cognitive development. Cognition is measured using a factor score computed via factor analysis of the Bracken School Readiness and British Ability Scales Naming Vocabulary scores; see Box 2 for details. Scores are adjusted for the child's age at wave 2 and standardised to have mean 0 and standard deviation 1 in the sample. Statistics are weighted so that the sample is representative of the whole of the UK.

Source: Millennium Cohort Study.

Figures 1 and 2 highlight stark inequalities in early cognitive and socio-emotional development, respectively, across a range of dimensions including: sex, ethnicity, maternal education, family income, family structure and maternal depression. Whereas an even representation would result in 20% of each group in every quintile, looking first at sex we see that a higher-than-expected percentage (22%) of females score in the top quintile of the distribution of cognitive ability, while a lower-than-expected percentage (18%) of boys do. Females also have lower socio-emotional difficulties at this age than males. This aligns with evidence that females tend to outscore males in cognitive development, and the gender gap in achievement remains throughout the school years (Machin and McNally, 2005; Entwisle, Alexander and Olson, 2007; von Stumm and Plomin, 2015; Paleiwala and Fine, 2015).

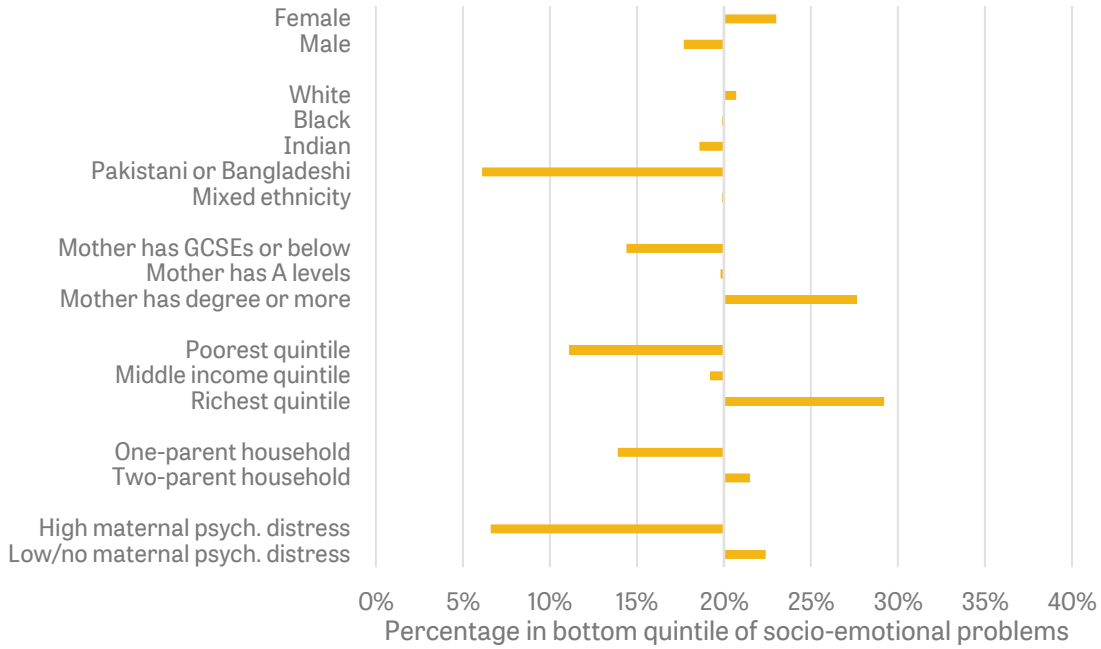
Turning to ethnic differences, compared with white children, children from ethnic minorities score significantly lower in both cognitive and socio-emotional domains. Differences in cognition are stark, with 21% of white 3-year-olds scoring in the top quintile of cognitive ability, compared with just 15% of black and 6% of Pakistani and Bangladeshi children. Whilst the differences across ethnic groups in socio-emotional development are less pronounced for black and Indian children, showing no or small differences in the likelihood of being in the lowest quintile of social and emotional problems compared with white children, parents of children from Pakistani and Bangladeshi backgrounds are much more likely to report social and emotional difficulties, with 10% of them scoring in the bottom quintile of the emotional difficulties distribution, compared with 26% of white children. The reasons behind these inequalities are complex. The early gaps in measured cognition are likely to reflect to some extent differences in English language ability

(Dustmann, Machin and Schonberg, 2010), and differences in academic attainment relative to white children decrease and even reverse as children progress through the education system (Mirza and Warwick, forthcoming). Similarly, differences in the assessment of socio-emotional problems may be the result of differences in interpretation and reporting by parents. For instance, if ethnic minority parents on average have different attitudes to discipline, and as such systematically respond to these scales differently, then this may generate inequalities in measured socio-emotional problems (Phoenix and Husain, 2007).

As discussed further in the chapter on racial and ethnic inequalities (Mirza and Warwick, forthcoming), there are also large differences in socio-economic status between these different groups. The ethnic and racial differences in early development presented in Figures 1 and 2 will therefore reflect, to some extent, the differences in development between children from different socio-economic backgrounds. However, as we will discuss in Section 4, many of these early differences persist, even after controlling for the many differences in the environments children from different ethnic and racial groups grow up in.

Turning to differences in early development by maternal education, the average cognitive scores of children whose mothers have low educational qualifications (GCSEs or lower) are significantly lower than those of children whose mothers have a university degree, and their socio-emotional difficulties are higher, by a similar magnitude. A similar pattern is observed by family income (measured at child age 9 months): 32% of children in the top income quintile have cognitive scores in the top 20% of the distribution, while only 10% of children in the bottom income quintile do so, with a fairly similar picture for socio-emotional difficulties.

Figure 2. Inequalities in socio-emotional difficulties, MCS age 3



Note: Figure shows percentage of each group falling in the bottom 20% of emotional and behavioural problems. Emotional and behavioural problems are measured using the SDQ total difficulties scores; see Box 2 for details. Scores are adjusted for the child's age at wave 2 and standardised to have mean 0 and standard deviation 1 in the sample. Statistics are weighted so that the sample is representative of the whole of the UK.

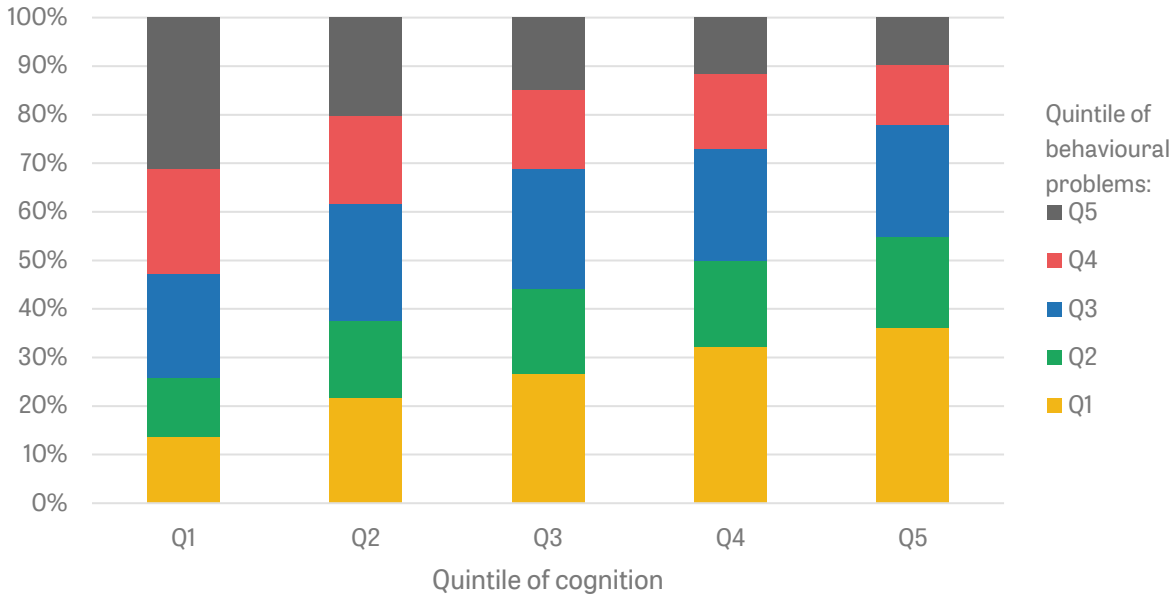
Source: Millennium Cohort Study.

Comparing the development of children living in two- and one-parent households at age 3, we find that children in two-parent households, who tend to face lower levels of poverty, score higher on cognitive measures than those in one-parent households. They are also reported to have much lower levels of socio-emotional difficulties. Inequalities generated by family structure are widely explored in the families chapter of the Review (Kiernan, Crossman and Phimister, 2022), and we return to them later.

The last sets of bars in Figures 1 and 2 examine inequalities in early development by maternal mental health status. Children whose mothers have high levels of psychological distress score significantly lower on cognitive tests at age 3. The gap in early development is particularly stark for socio-emotional development, with 7% (22%) of children with a mother experiencing high (low or no) psychological distress scoring in the bottom 20% of emotional difficulties. One caveat to bear in mind is that this domain is maternal-reported, and mothers with higher levels of psychological distress are likely to overstate children's difficulties compared with those with lower levels (Del Bono, Kinsler and Pavan, 2020). As with family structure, the importance of maternal mental health for children's development is another theme to which we return later in the chapter.

The previous figures have evidenced important gaps in both cognitive and socio-emotional development across a variety of key background measures. Given how important both these domains of early development are for later outcomes, which we discuss in Section 6, any correlation between them – i.e. if children with slower cognitive development tend to have greater socio-emotional difficulties – will further exacerbate the role of early inequalities in determining longer-term inequalities.

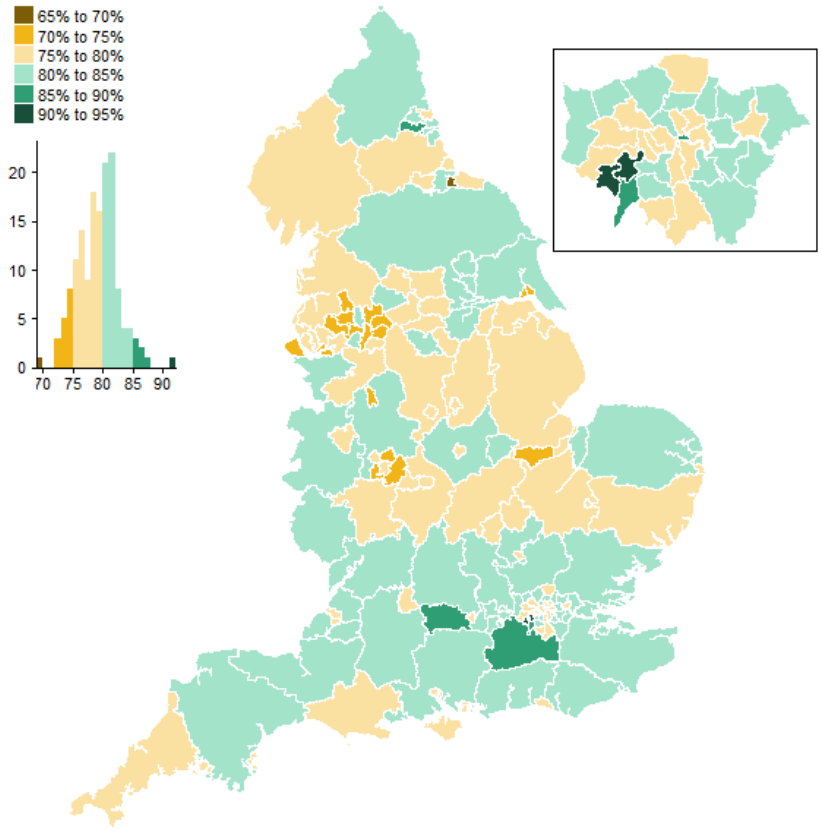
Figure 3. Cognition quintiles by quintile of socio-emotional and behavioural difficulties, MCS age 3



Note: Cognition is measured using a factor score computed via factor analysis of the Bracken School Readiness and British Ability Scales Naming Vocabulary scores. Emotional and behavioural problems are measured using the SDQ total difficulties score. Both scores are adjusted for the child's age at wave 2 and standardised to have mean 0 and standard deviation 1 in the sample. Statistics are weighted so that the sample is representative of the whole of the UK.

Source: Millennium Cohort Study.

Figure 4. Percentage of children reaching at least expected level of development at age 5, Early Years Foundation Stage Profile 2018/19



Note: Percentage of children reaching at least the expected level of development in all three prime areas of learning in the Early Years Foundation Stage Profile (personal, social and emotional development; physical development; and communication and language), 2018/19.

Source: Authors' calculations from Department for Education (https://explore-education-statistics.service.gov.uk/find-statistics/early-years-foundation-stage-profile-results).

Figure 3 demonstrates this correlation by showing the make-up of each quintile of cognitive development at age 3 by the quintiles of socio-emotional problems. Amongst children in the lowest quintile of cognitive development, 31% are in the highest quintile of socio-emotional problems compared with just 14% in the lowest quintile. This contrasts starkly with children in the top quintile of cognitive development, where only 10% are in the highest quintile of socio-emotional problems and 36% are in the lowest. This clear correlation between cognitive and socio-emotional development, with large numbers of children having both low cognitive scores and high numbers of behavioural problems, suggests that there exists a double disadvantage for those children who lag behind their peers.

These inequalities in early development have an important and understudied geographic component. Figure 4 shows the percentage of children reaching expected levels of attainment in the Early Years Foundation Stage Profile, an assessment of 5-year-olds carried out towards the end of their reception year (i.e. first year) of primary school. In the South East, around 82% of

children are reaching at least the expected level of development,[3] compared with around 76% of children in the North West. Regional differences mask starker differences at the local authority level. Just over 72% of children in Manchester and 73% in Rochdale reach expected development, compared with 87% in Kingston upon Thames and 92% in Richmond. These differences mirror well-known geographical inequalities in employment, incomes, life expectancy and well-being (Overman and Xu, 2022).

Taken together, the evidence presented here shows substantial inequalities in the cognitive and socio-emotional development of children by the age of 3. These inequalities exist across a variety of markers of family socio-economic and psychological vulnerability, which intersect with each other. And they also coexist across various domains of development, which is in line with longstanding scientific evidence on the interrelationship between cognitive and socio-emotional skills in the developmental process. These interrelationships are important to underline here as they suggest that a holistic approach recognising and tackling developmental delays across all domains of development is likely to be key to address these inequalities. We return to this later in the chapter.

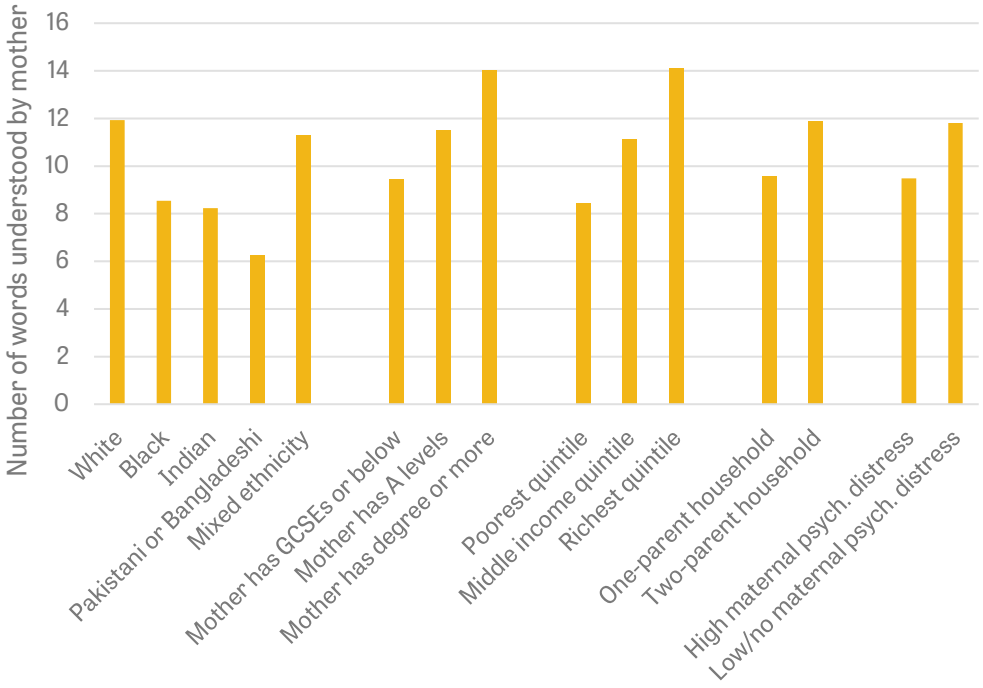
3. Inequalities in early childhood environments

Early home environments are the central drivers of children's early experiences and interactions, and through the lottery of birth, children are born into and grow up in environments that are remarkably diverse. The early years are a time when the development of the brain is particularly sensitive to cognitive stimulation (Tierney and Nelson, 2009) as well as to social and emotional nurturing (Balbernie, 2001; Johnson, Riis and Noble, 2016; Black et al., 2017), and when deficits in nurturing and exposure to negative experiences can have profound long-lasting influences. Having shown large differences in early development in the previous section, in this section we turn to document the large differences in children's early home environments according to the family background indicators of the preceding section.

The Millennium Cohort Study includes a wealth of information about key aspects of the child's educational, emotional and material environments (see Box 3 later for further details of the measures used). We start with the educational environment and consider first, in Figure 5, differences by family background in maternal vocabulary knowledge, a measure that reflects the richness of the child's immediate English language environment and exposure to English word variety, a major determinant of the child's own English language skills (Hart and Risley, 1995; Fernald and Weisleder, 2015). We find stark gaps in maternal vocabulary in English by all family background measures, including significant ethnic differences (undoubtedly partly reflecting different languages besides English spoken in these homes), with the largest gaps found between white and Bangladeshi/Pakistani mothers (12 versus 6 words, out of a test containing 20 words). We also find large gaps by maternal education, and between the top and bottom family income quintiles (14 versus 8 words respectively). Though smaller, deficits in maternal vocabulary knowledge are also present for single- versus two-parent households, and for mothers who have high psychological distress versus those who have lower levels / none.

[3] Specifically, we are referring to the percentage of children achieving at least the expected level across all early learning goals in the prime areas of learning – personal, social and emotional development; physical development; and communication and language.

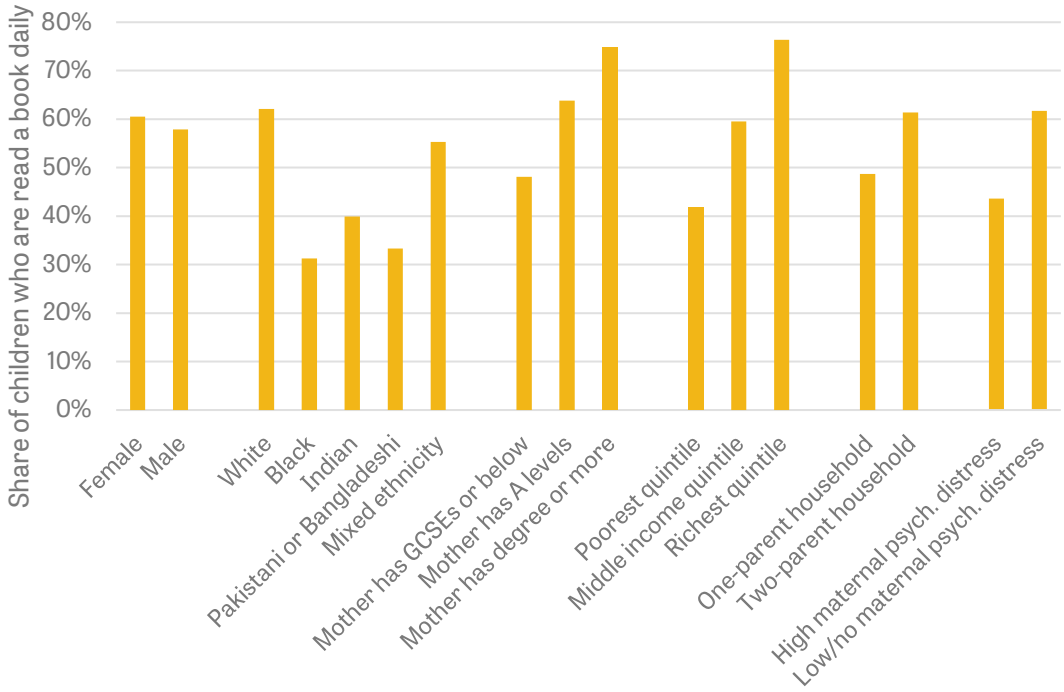
Figure 5. Inequalities in maternal language skills, MCS age 14[a]



[a] Maternal vocabulary was measured at MCS wave 6, child age 14.
Note: For details of word activity task, see Centre for Longitudinal Studies (2020, section 9.3). Statistics weighted to be representative of the UK population.

Source: Millennium Cohort Study.

Figure 6. Inequalities in home learning environment – read to daily, MCS age 3



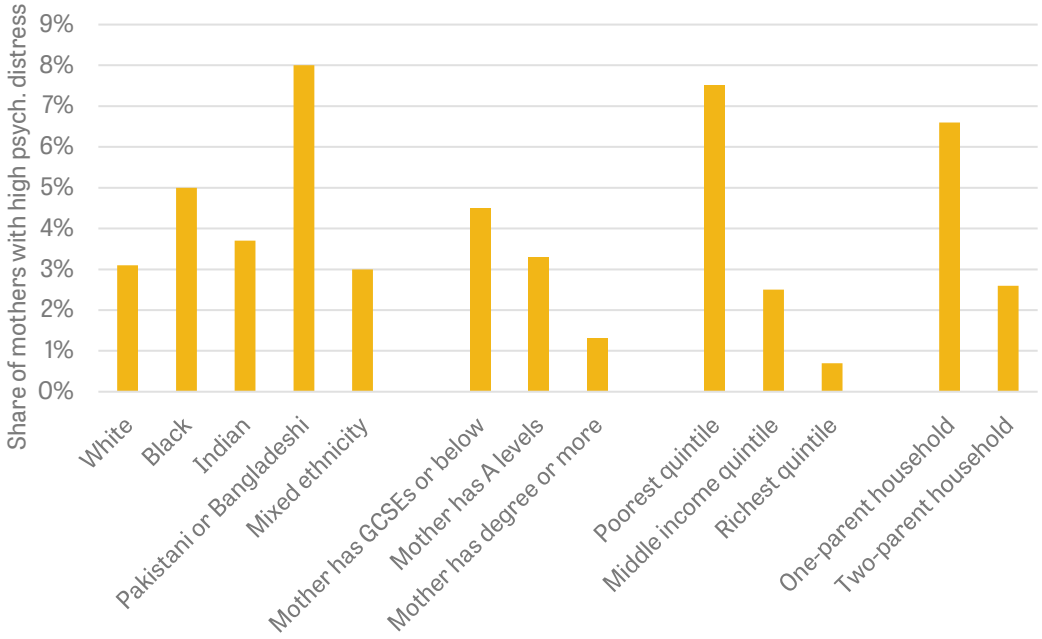
Note: Statistics weighted to be representative of the UK population.

Source: Millennium Cohort Study.

Figure 6 shows differences in another aspect of the home learning environment, the frequency of daily reading to the child (by main caregiver, mostly the mother). Stark ethnic gaps again emerge, with around 60% of white parents reading daily to their child, and much lower frequencies for ethnic minorities, particularly those from black and Pakistani or Bangladeshi backgrounds, at just over 30% each. The extent of daily reading is also strongly correlated with maternal education and family income, with differences in frequency of around 30 percentage points observed across the highest and lowest groups. The differences by maternal psychological distress are also noteworthy, with a reading prevalence of 62% among the group with low psychological distress, compared with 44% among those with high psychological distress. Differences by child sex are fairly low, and we also observe relatively small differences between single- and two-parent households (49% versus 61% respectively).

We next turn to the emotional environments of children, examining differences by family background in maternal psychological distress (Figure 7) and in parent–child closeness and conflict (Figure 8). Maternal depression has been widely shown to be one of the biggest risk factors for a child developing mental health problems, through a number of proposed transmission mechanisms, including heritability, and responsiveness of parenting, among others (Goodman and Gotlib, 1999). Figure 7 plots differences by family background in the prevalence of mothers with high psychological distress at child age 3. The disadvantage faced by Bangladeshi and Pakistani children is further reflected here, with 8% of their mothers suffering from high psychological distress compared with 3% of white mothers. Differences by maternal education and across the income distribution are noteworthy too, at 8% for the poorest compared with 1% for the richest. Mothers in one-parent households are also more than twice as likely as those in two-parent households to report high distress (7% versus 3%).

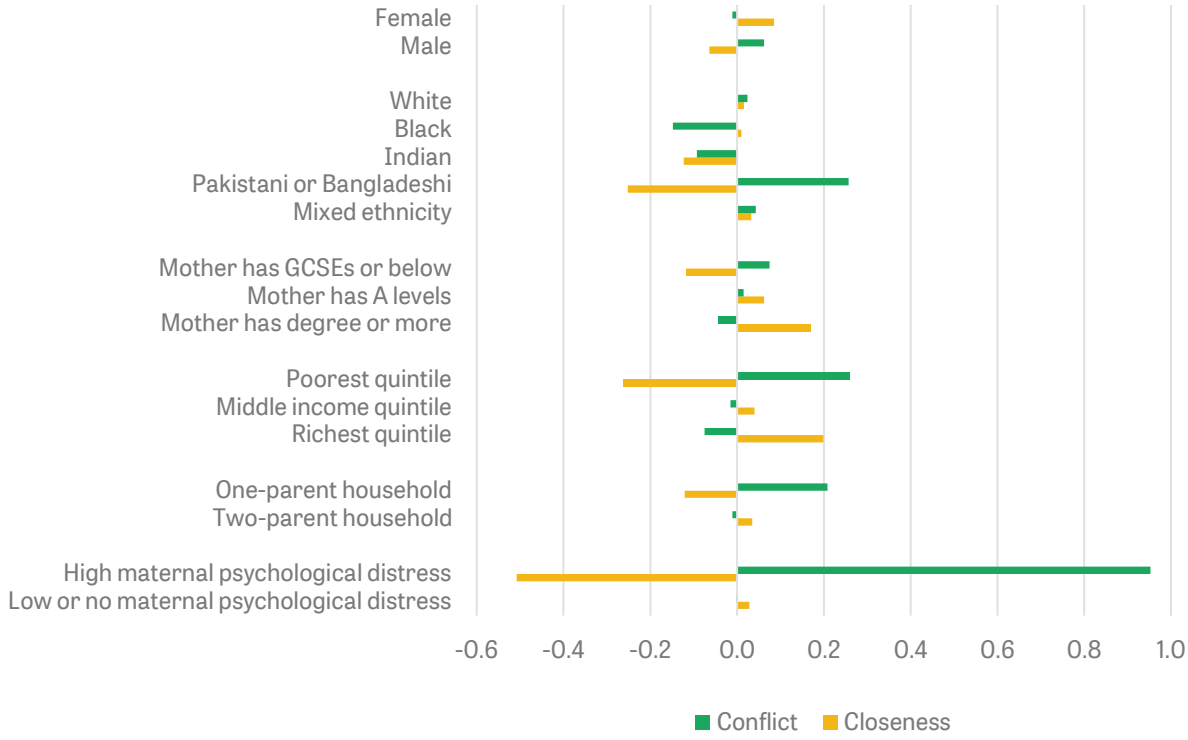
Figure 7. Inequalities in high maternal psychological distress, MCS age 3



Note: Statistics weighted to be representative of the UK population.

Source: Millennium Cohort Study.

Figure 8. Inequalities in parent–child relationship, MCS age 3



Note: Figure shows average values of the parent–child conflict and closeness scores among each group, expressed in units of standard deviations, where 0 represents the average score among the analytical sample. Statistics weighted to be representative of the UK population.

Source: Millennium Cohort Study.

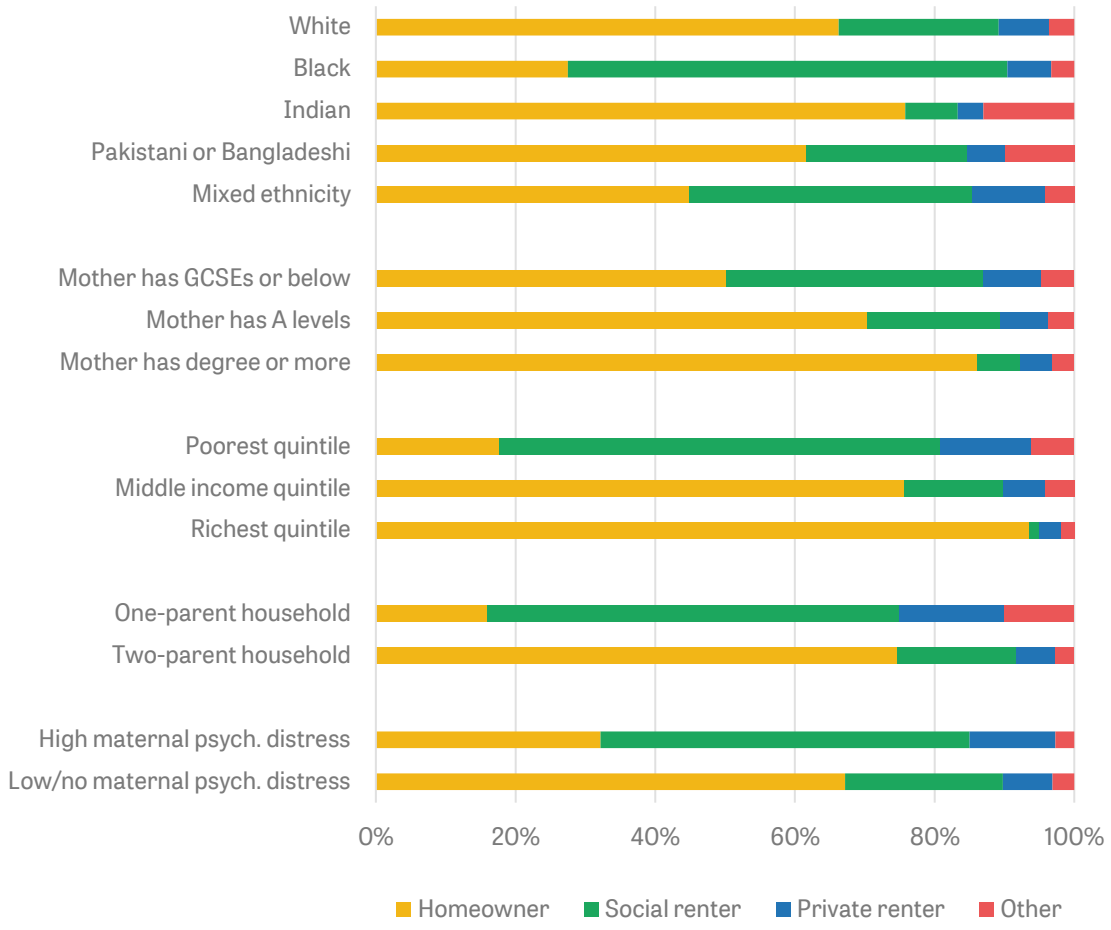
Figure 8 captures inequality in relational aspects of the early emotional environment, presenting differences by family background in two measures of parent–child relationship – parent-reported levels of closeness (e.g. manifested in caregiver–child emotional warmth, support and acceptance) and conflict. We find higher levels of reported closeness and lower levels of conflict with daughters than with sons; lower closeness and higher conflict among Pakistani and Bangladeshi families; and higher closeness and lower conflict for higher levels of family income and maternal education. However, the starkest differences of all are observed by maternal psychological distress, with far lower levels of reported closeness and higher levels of conflict among mothers with high levels of psychological distress. Discordant parent–child relationships are theorised to lead to development of dysfunctional patterns of interaction and difficulties in navigating challenging social contexts (Burt et al., 2005; Weaver et al., 2015). We return to consider the associations between these important aspects of early environment and child development in Section 4.

The material environments in which young children are raised are also a vital factor in their development – here we focus on housing tenure (comparing homeowners with private and social renters), with differences in tenure importantly reflecting and proxying differences in wealth, and in housing and other security or instability (Moulton et al., 2021), as well as in neighbourhood quality and amenities (Chetty, Hendren and Katz, 2016), and physical housing conditions (Coley et al., 2013; Clair and Hughes, 2019). In Figure 9, we show the percentage of families in different quintiles of the family income distribution who are homeowners, social renters and private

renters. The figure indicates that the main types of housing among the sample are homeownership and social housing, and it reveals stark socio-economic differences in these housing tenures. For instance, around nine in ten 3-year-old children in the richest group live in a home that is owned, compared with just two in ten in the poorest group. Ethnic minority differences are less strong, though we note that black families are least likely of all to be homeowners and most likely to live in social housing, compared with other ethnicities. Important differences exist by family structure, with 16% and 59% of children from single-parent households living in owned homes and social housing respectively, a picture that is in dramatic contrast to those in two-parent households, where the respective proportions are 75% and 17%. We also observe that one-third of the families of children whose mothers report high levels of depression and anxiety own their own home, compared with two-thirds of those whose mothers do not report such high levels.

The next section considers how these extensive differences in early environments contribute to inequalities in early childhood development.

Figure 9. Inequalities in housing tenure among families of 3-year-olds



Note: Statistics weighted to be representative of the UK population.

Source: Millennium Cohort Study.

4. Environmental origins of inequality in early development

Sections 2 and 3 show that the environments children grow up in and the levels of development children reach are starkly unequal in the first few years of life. Understanding the relationship between environment and development is of vital importance to policymakers looking to tackle these inequalities, and is the topic of a vast multidisciplinary literature. While a complete review is beyond the scope of this chapter, we first summarise some of this evidence here, focusing on evidence from important intervention studies as well as from observational data.

4.1 Existing evidence

A major body of research focuses on the **home environment** of children, including 'educational' inputs provided by parents via developmental-appropriate play and stimulation, and 'emotional' support such as parent–child relationships and interactions, and parents' mental well-being.

There is little doubt that the family is central to a child's early development. The importance of parents, and of parenting defined in a wide variety of ways (including via parenting styles, parent–child interactions and so on), is well established in the child development literature, and countless observational studies provide evidence on the importance of parenting for early development (e.g. Ermisch, 2008; Kiernan and Mensah, 2011; Pinquart, 2017; Doepke, Sorrenti and Zilibotti, 2019; Madigan et al., 2019). We know that strengthening parent–child interactions, through play and stronger attachment, reaps positive benefits, and while parenting programmes differ in the extent to which they emphasise different aspects of parenting, some evidence pertains to stimulation and play interactions (Jeong et al., 2021), with prominent examples including 'Reach Up and Learn' in developing countries (Grantham-McGregor et al., 1991) and the 'Pro Kind' programme in Germany (Conti et al., 2021). Other research considers broader parental tools and strategies for improving the quality of interactions with their children, such as peer-led parenting programmes 'Empowering Parents, Empowering Communities' in the UK demonstrating, using experimental methods, significant increases in parental competencies and reductions in child behavioural problems (Day et al., 2012). Yet other work considers parenting skills or knowledge, such as the 'Triple P – Positive Parenting Program', which has been shown to improve early child outcomes such as behaviour (Nowak and Heinrichs, 2008).

Other parenting programmes are more all-encompassing, targeting multiple aspects of parenting. One prime example is the Family Nurse Partnership, an intensive programme targeted at the most vulnerable young parents from pregnancy onwards. Experimental evidence from the US shows it improves pregnancy health behaviours, reduces abuse and neglect, and improves children's school readiness (Olds et al., 1997, 2002, 2004), and in the UK it has been shown to improve school readiness at age 5 (Robling et al., 2021) but not other maternal behaviours (Robling et al., 2016).

Another important aspect of the home environment concerns parental mental well-being. Mental health difficulties are a strong risk factor for child development (see citations given in Section 3), negatively affecting parents' ability to support their child's own emotional regulation (Lumsden, 2019). Programmes more specifically targeted at parent and child mental health, such as Parent–Infant Psychotherapy, have shown limited benefits on the whole (Barlow et al., 2015); however, experimental work in Pakistan has shown enduring positive benefits of psychotherapy for women's mental health and parenting practices (Baranov et al., 2020).

Another body of research on the early environment considers the role of **pre-school/childcare** in children's outcomes. Here the causal evidence is somewhat mixed. Intensive programmes such as the Perry Preschool Project and Abecedarian in the US have been shown to boost cognitive development and reduce emotional and behavioural problems (Campbell and Ramey, 1994; Heckman et al., 2010), whilst in the UK programmes such as the Incredible Years Preschool Basic have been shown to reduce behavioural problems among those pre-school children at risk of developing a conduct disorder (Hutchings et al., 2007; Morpeth et al., 2017).

However, experimental and quasi-experimental evaluations of major large-scale childcare programmes find more mixed results in terms of developmental gains (see Bakar (2011) and Elango et al. (2016) for comprehensive reviews). For instance, Fort, Ichino and Zanella (2020) show a negative effect of formal childcare in Italy on IQ and measures of personality characteristics. Similarly, Baker, Gruber and Milligan (2008, 2019) find negative impacts on short- and long-term behavioural problems for subsidised childcare in Canada. By contrast, Cornelissen et al. (2018) show positive effects on school readiness of childcare expansion in Germany, with the largest effects for children from disadvantaged backgrounds; others show similarly positive effects in other contexts including Norway and Spain (Havnes and Mogstad, 2011; Nollenberger and Rodríguez-Planas, 2015). In England, recent evidence suggests small positive effects of an increase in funding of free pre-school education at age 3 on children's school readiness at age 5, which fades out by age 7 (Blanden et al., 2016). The authors argue that the introduction of free entitlement crowded out private expenditure, with fairly limited overall change in the quantity of pre-school attended by children.

This mixed evidence regarding the effectiveness of early-childcare-orientated policies likely reflects the high variability in the quality of childcare in different contexts, which is key to children's outcomes. Certain components of childcare provision have been shown to be beneficial for early development. Araujo et al. (2016) show, in an Ecuadorian setting, the importance of teacher quality – measured using a combination of standard information such as education and experience, soft skills such as inhibitory control, and extended direct observation. Andrew et al. (2019) show that improvements in pedagogical methods can have a significantly positive impact on child development within a randomised controlled trial (RCT) framework. Blanden et al. (2022) find that an additional term of free pre-school education in England has a substantially larger impact on age 5 children's school achievement if this education is received in settings with the highest inspection ratings, though the authors are not able to pinpoint the specific practices which lead to enhanced child development. There is some evidence from the EPPSE project (Effective Pre-School, Primary and Secondary Education), a longitudinal UK study funded by the Department for Education, that attending high-quality pre-school (versus low-quality) is beneficial for children's academic and social outcomes through age 16, mainly for disadvantaged children (Department for Education, 2015).

Whilst containing an element of childcare, other major government investment programmes have been more holistic in nature, providing a range of support services for families with children. The Sure Start programme in England was a major part of the early years landscape from the late 1990s until around 2010, having been significantly reduced since then. It provided a one-stop shop for advice on child and family health, parenting, money, training and employment as well as play sessions and childcare for families living in disadvantaged areas (Eisenstadt, 2011). There remains little evidence on the overall effectiveness of such holistic family programmes, but positive benefits of Sure Start have been found for children's health, lasting well into adolescence (Cattan, Conti et al., 2021).

A whole plethora of other components of a child's environment in relation to development have been studied, largely using observational data. Some examples of the pre- and neo-natal environments and parental behaviours include smoking in pregnancy and lower birthweight (Banderali et al., 2015), and breastfeeding and early cognitive development (Fitzsimons and Vera-Hernández, forthcoming). Other structural aspects such as parental education (Dubow, Boxer and Huesmann, 2009) and household income (Cooper and Stewart, 2013) are strong predictors of early development, mirroring evidence on how poor housing and poverty can hinder the attainment of deprived children (Evans and English, 2002; Office of the Deputy Prime Minister, 2004; Chaudhuri, 2004). A large body of evidence investigates how family structure, instability and parental conflict relate to development, showing that stable relationships are, on average, associated with higher levels of development (see the families chapter (Kiernan, Crossman and Phimister, 2022) for a wider-ranging discussion).

4.2 New evidence from the Millennium Cohort Study

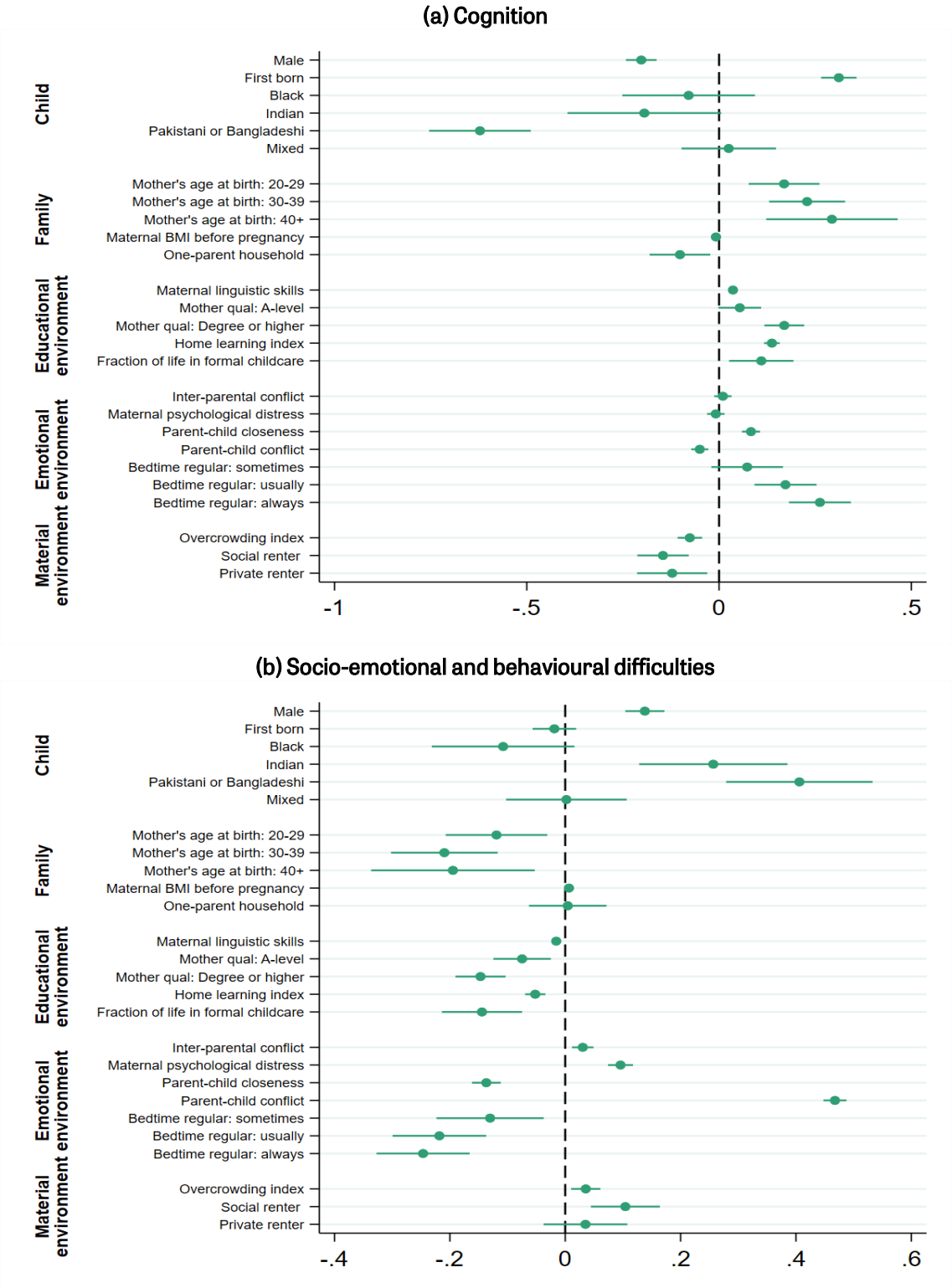
The existing evidence gives a strong indication of the very multifaceted nature of the environments that are important for child development. Now we provide new evidence on how important these different components are, by assessing how different aspects of the early environment are associated with the formation of early cognitive and socio-emotional skills, as measured at age 3, as well as how much variation in early child development they can explain. A caveat is that this is not a causal analysis: while we present extensively adjusted associations, we do not rule out that there are other unmeasured, yet important aspects of the early environment which are correlated with the measured ones, which could be driving the associations between environment and early development that we present.

Multivariable regression estimates are presented in Figure 10, separately for cognition and for socio-emotional and behavioural difficulties at age 3.[4] These coefficients report the association between each of the variables and the two measures of early development, while holding all other variables constant. The multivariate models include as explanatory variables the measures of early environment at age 3 that have been used in the chapter so far, which are further extended to include a wider set of early environmental factors. Box 3 provides details about the measures that we use in our models to capture these and how they are grouped. The five groupings reflect the key aspects of the child's early environment. The vast majority of measures pertain to the home environment; the exception is childcare, which in our categorisation is included as part of the child's 'educational environment':

- **Child characteristics that are fixed at birth**: sex at birth, birth order, ethnicity.
- **Parental and family demographic characteristics**: maternal age at child's birth, whether the child lives in a one- or two-parent household, maternal Body Mass Index (BMI) before pregnancy.
- **Child's educational environment**: mother's highest educational qualification, maternal linguistic skills, home learning environment index (based on the frequency parents do a variety of activities with the child, such as book reading, learning numbers, learning letters, and going outside for walks), formal childcare use.

[4] The estimates and standard errors of the coefficients of the multivariate regression models for cognitive development and socio-emotional and behavioural difficulties are reported in the first column of Appendix Tables 1 and 2, respectively.

Figure 10. Correlates of early childhood development, MCS age 3



Note: The coefficients reported are in units of standard deviations from a multivariate ordinary least squares (OLS) regression of cognitive development and socio-emotional and behavioural difficulties captured in wave 2 (age 3) of the MCS. The regressions control for factors set out in Box 3 and also indicators for missing parental conflict score and for missing linguistic skill score. Sample size = 10,146.

Source: Millennium Cohort Study.

- **Child's emotional environment**: a parental conflict score (capturing conflict in the relationship between two parents, among two-parent households only), maternal psychological distress, regularity of bedtime, parent–child closeness, parent–child conflict.
- **Child's material environment**: housing type, overcrowding index, family income (in some models).

Comparison of Figures 10a (cognition) and 10b (socio-emotional and behavioural difficulties) highlights that the measures of the early environment which explain early cognitive development and early socio-emotional development are similar, in terms of both direction of association and statistical significance. (Those factors that explain higher cognitive development typically explain lower socio-emotional and behavioural difficulties; hence Figures 10a and 10b appear as mirror images of each other.) Most of the relationships are borne out in the expected directions in line with previous research. We also see the model controls explain far more of the variation in socio-emotional development than in cognition: the R-squared, which measures the fraction of variation in the measure of development that is explained by variation in the correlates, is 0.45 for socio-emotional development and 0.22 for cognitive development.

In order to assess the extent to which the raw gaps in early development depicted in Figures 1 and 2 are explained by systematic differences in children's environments, we report in Appendix Table 3 the raw association between each of the variables included in the model in the estimation sample, next to the adjusted association (i.e. holding everything else constant). We now describe the findings for each set of characteristics included in the models, in turn.[5]

Box 3. Measures of children's early childhood environments in the MCS

We consider a variety of indicators of the early environment – both structural and behavioural – alongside individual characteristics, all of which have been shown to be important for child development. We classify them into the following five groups.

Child characteristics

We consider characteristics of the child that are fixed at birth and that previous research has shown are associated with development. These include the child's sex at birth, whether the child is the first-born and ethnicity.

Family/parent characteristics

We consider a range of characteristics describing the family demographic. These include the mother's age when the child was born, for which we create four categories: 19 or under, 20–29, 30–39, and 40 and over. Also included are the mother's Body Mass Index before pregnancy and information on family structure (whether the child is living in a one- or two-parent household at age 3).

[5] We show the partial coefficients in Figure 10, i.e. the coefficient on each variable is shown whilst holding all other variables constant. We additionally conduct this analysis sequentially, adding blocks of covariates – as variables are correlated with each other (e.g. maternal education and parenting behaviours), this is a useful way of showing how correlations change as more variables are incrementally added to the model. These results are shown in Appendix Table 4 for cognition and Appendix Table 5 for emotional and behavioural difficulties.

Child's educational environment

While impossible to capture the full breadth of the child's educational environment, we consider several proxies. We measure mother's highest educational qualification as one of three levels: either GCSEs or lower, A levels, or degree or higher. A direct measure of maternal language skills was taken at child age 14 using a shortened version of the Applied Psychology Unit (APU) vocabulary test (Closs and Hutchings, 1976); for further details, see Centre for Longitudinal Studies (2020). We construct a home learning environment index based on the frequency with which the main caregiver (most usually the mother) does different activities with their child, including reading to them, teaching them numbers and letters, and other activities such as going for walks. Finally, we additionally consider formal childcare arrangements using the fraction of a child's life spent in formal care.

Child's emotional environment

This category aims to capture maternal mental distress, the parent–child relationship, regularity of bedtimes (one aspect of parenting styles) and inter-parental conflict. Maternal psychological distress at child age 3 years was reported using the Kessler-6 measure (Kessler et al., 2003). Total scores range from 0 to 24, higher scores indicating greater distress. The scale has moderate and severe thresholds, and we use the severe threshold (≥13), considered indicative of serious mental illness, which we refer to as 'high psychological distress' (Kessler et al., 2010). To capture the parent–child relationship, we rely on the Pianta measures of closeness and conflict (Pianta, Steinberg and Rollins, 1995). These are derived from attachment theory (Waters and Deane, 1985) and measured through the Short 15-item form of the Child-Parent Relationship Scale (Pianta et al., 1995), of which seven items capture closeness and eight capture conflict. They are scaled to have a mean of 0 and standard deviation of 1 across the analysis sample. We also include regularity of bedtimes, one aspect of parenting styles. Finally, we also consider a measure of conflict between partners (Rust et al., 1990).

Child's material environment

We measure the family's housing type (socially and privately rented versus owner-occupation) and an index of overcrowding (household members per liveable room). All are measured when the child is age 3 (MCS wave 2). In some analysis, we use a measure of family income when the child was 9 months old (measured in wave 1 of the MCS). We equivalise this measure to reflect that purchasing power will depend on the number of adults and children in the household.

Child characteristics

In line with the evidence presented in Section 2, we observe a significant gender gap in both cognitive and socio-emotional development at age 3. Conditional on the other variables in the model, boys have lower scores on cognitive skills, by around 0.2 standard deviations (SD) than girls. Boys are also observed to have higher levels of socio-emotional and behavioural difficulties than girls at age 3. The adjusted gender gaps are slightly smaller than they are in the raw data (see Appendix Table 3), which indicates that some of the gender gap in these skills and difficulties is linked to gender differences in parenting practices. This can be seen for example in Figure 6, which showed a slightly higher fraction of girls than boys being read to by parents on a daily basis, a finding that is consistent across a number of contexts (Baker and Miligan, 2016). Figure 8 also showed higher levels of parent–child conflict for boys than girls.

Compared with white children, we see that black, Indian and particularly Pakistani and Bangladeshi children have lower cognitive scores at age 3 conditional on other characteristics; with the exception of black children, they also have higher levels of socio-emotional and behavioural difficulties at this age. Quite strikingly, once we control for systematic differences in a large array of factors measuring the child's socio-economic and home learning environment, these ethnic differences shrink for some groups but not for others (see Appendix Table 3). For example, the black–white gap in cognitive development reduces by 80% vis-à-vis its magnitude in the raw data and becomes insignificant. In contrast, the gap in cognitive development between Pakistani/Bangladeshi and white children only shrinks by 30% and remains statistically significant. This suggests that a large part of the earlier inequalities by ethnic group are explained by inequalities in the other covariates included in the model for some racial groups, but not for others.

Finally, first-borns score higher on early cognitive skills, in line with evidence that educational attainment tends to be lower for later-born children (Black, Devereux and Salvanes, 2005; Conley and Glauber, 2006) in part because parental investments in later-born are lower than for first-born (Pavan, 2016). Interestingly, we find no evidence of birth order being significantly associated with socio-emotional skills.

Family characteristics

Turning next to the role of family/parental characteristics, as expected they are, on the whole, strongly associated with children's development in both domains. Maternal age at birth is associated with increased cognition and lower difficulties, with the association lessening at older ages. A higher maternal BMI before pregnancy has only a very low association with cognitive or socio-emotional development at age 3. We find an association between single parenthood and children's cognitive scores, but not their socio-emotional difficulties. This is particularly relevant given around 3 million (15.4%) of families in the UK are lone parents, with the vast majority of single parents being mothers (Office for National Statistics, 2022). Interestingly, while we find that living in a one-parent household is negatively associated with cognitive and socio-emotional development in the raw data, this association only remains significant for cognitive development once we control for the vast array of environmental differences between two-parent and one-parent households.

Educational environment[6]

Looking next at characteristics of the child's **educational environment**, a clear gradient is observed for maternal education, with increasing associations observed as we move from lower (GCSEs / A levels, i.e. compulsory schooling / high school graduation) to higher levels of educational qualifications (degree or higher). Our direct measure of maternal language skills,[7] which objectively assesses vocabulary knowledge, plays a significant role in the formation of early skills over and above maternal education, being positively associated with cognitive skills and

[6] The majority of research on caregivers' stimulation has predominantly focused on mothers, but a growing body of evidence has also demonstrated that paternal stimulation, above and beyond maternal stimulation, independently predicts children's cognitive and socio-emotional development outcomes (Tamis-LeMonda et al., 2004). Note that the parenting variables used largely relate to the mother, who was the main respondent to the MCS survey. It is outside the scope of this chapter to also consider paternal involvement, though we note it as a central area for further research.

[7] Note that this measure was captured at a later MCS wave (age 14), but we believe its value in allowing us to understand the direct role of maternal language skills in explaining children's development outweighs concerns around the temporal ordering of the measures.

negatively associated with socio-emotional difficulties (see also Sullivan, Moulton and Fitzsimons (2021)). We find that higher frequencies of stimulating activities with the child are correlated with higher early cognitive skills and lower socio-emotional difficulties.

Children's early educational environment is also shaped by the quantity and quality of care children receive outside the home. In the multivariate model, the fraction of early life spent in **formal childcare** is associated with slightly higher cognition scores and with reduced socio-emotional difficulties. Two caveats should be borne in mind when interpreting these findings. First, the measure of formal childcare use is relatively coarse as it does not capture differences in quality, which have been shown to be important (e.g. Duncan and Magnuson, 2013; Joo et al., 2020). While by the age of 3, a large majority of children have had some experience in childcare, use of formal childcare in this cohort during the first three years of life remains much lower than it is later on and before children enter school.

Emotional environment

We examine separately four interrelated dimensions to do with relationships in the home and the emotional environments in which children are raised: regularity of daily routines, the parent–child relationship, inter-parental conflict, and maternal mental health – all measured at child age 3, the earliest available and in line with the literature.

Consistency in daily routines is measured by regularity of bedtimes, with increased regularity associated with both higher cognition and reduced difficulties. Turning to the parent–child early relationship, we see that higher levels of closeness and warmth between parent and child are associated with higher cognitive scores and fewer socio-emotional difficulties, whilst the reverse is the case for parent–child relationships that have relatively high levels of conflict. A higher level of conflict in the inter-parental relationship, on the other hand, is positively associated with child socio-emotional difficulties, but not with child cognition at age 3. We detect no relationship between maternal psychological distress and their child's cognitive scores. However, it is associated with significantly increased total socio-emotional difficulties.

Material environment

Finally, we consider several aspects of the child's material environment. Housing tenure and household overcrowding are included as a proxy for the important influence of factors such as wealth, housing stability and housing conditions on emotional stability and learning (Blair et al., 2011). Living in social housing is particularly negatively associated with cognition and positively associated with socio-emotional difficulties, and a similar finding is observed for household overcrowding.

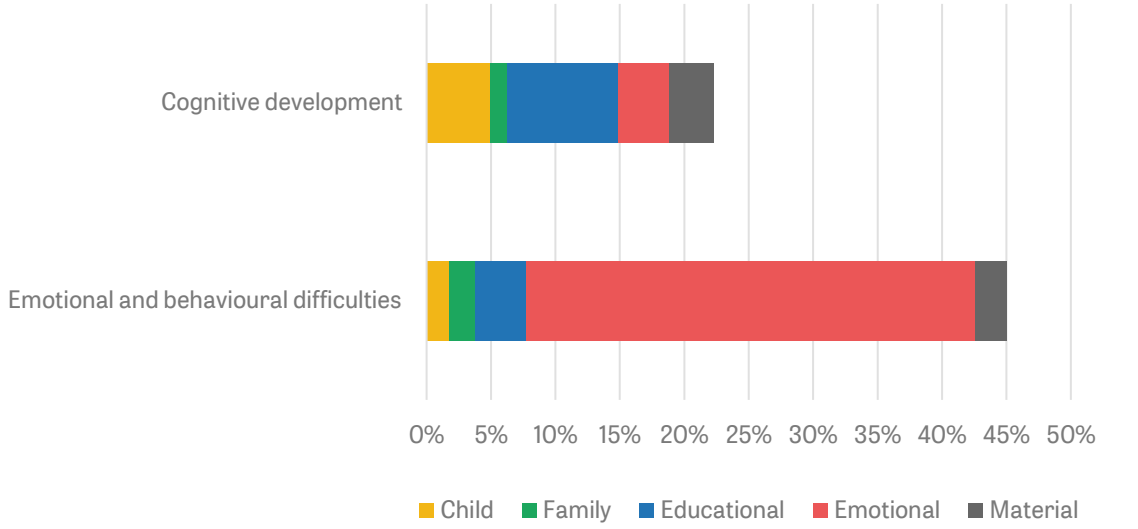
Relative importance of different aspects of early environments for explaining inequality in early development

While these estimates are informative as to the direction, magnitude and significance of the associations between environments and early development, another interesting question we can address from these models is 'What is the relative importance of inequalities in these variables for inequalities in early development?'. To answer this, we use the multivariate regressions underlying Figure 10 to decompose the variance in the two measures of early development. This technique, called a Shorrocks–Shapley decomposition, calculates the proportion of the overall variance explained by all the variables included in the model (the R-squared) that can be attributed to the variance in the different sets of variables considered, and is a useful way to

understand the relative importance of different variables for explaining the overall variation in the outcome of interest. We show this decomposition in Figure 11.

As noted earlier, the R-squared for cognition at age 3 is far lower than it is for socio-emotional development at age 3, as the length of each overall bar in Figure 11 clearly shows. So 22% of the observed variation in cognition can be explained by the model regressors, compared with 45% for socio-emotional development. Considering first the determinants of the cognitive skills factor, shown in the top part of the figure, a key point that emerges is that the child's educational environment explains a dominating 9% of the total variation. There are then three other groups of variables that each explain another 3–5% of the variation: child characteristics, aspects of the child's emotional environment and aspects of the child's material environment. This shows clearly that it is a combination of structural and behavioural influences that influences early cognitive skill formation.

Figure 11. Contribution of inequalities in early life characteristics to inequalities in development at age 3 in the MCS cohort



Note: Shorrocks–Shapley decomposition of the results shown in column 1 of Appendix Tables 1 and 2 (Shorrocks, 1982), generated using the shapley2 command in Stata 16 (Juarez, 2015).

Source: Millennium Cohort Study.

By contrast, looking at socio-emotional development in the lower part of the figure, the most dominant factor to emerge is the child's emotional environment, which explains 35% of the variation in child socio-emotional and behavioural difficulties, or over three-quarters of the overall variation explained by the model. The next-biggest contributors are aspects of the child's educational environment, accounting for 4% of the variation, and material environment, accounting for just 2%.

Taken together, these results highlight, on the one hand, some specific priority areas for action but, on the other hand, that there is not one silver bullet that will reduce inequalities in early development; rather, an approach tackling both structural and behavioural influences is required. It is also important to note the large fraction of variance unexplained by any covariate in the estimation, particularly for cognition. We return to our specific policy recommendations on this in Section 8.

4.3 The income gradient in early development and the role of family income

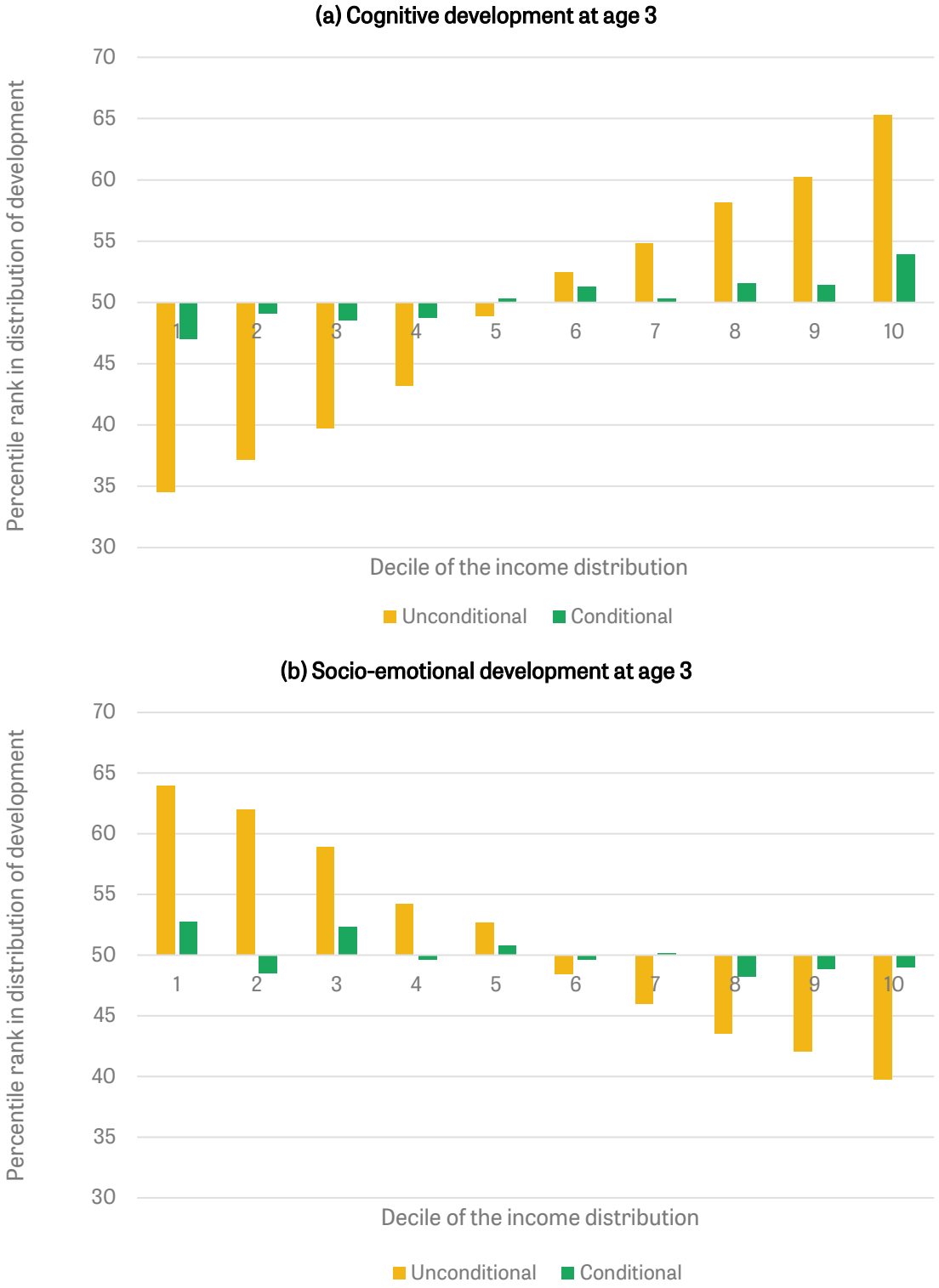
The exercise above is a decomposition of the variance in early development: it attributes any inequality or variability in early development to variability in environmental factors included in our models. It is a helpful exercise to understand the relative predictive power of different aspects of the child's environment for explaining differences in early development. But from a policy perspective, another important question is 'To what extent can gaps in cognitive and socio-emotional development between children from different socio-economic backgrounds, as described in Figures 1 and 2, be explained by gaps in environments?'. Indeed, if policymakers' objectives are to reduce socio-economic inequalities in early development (rather than individual differences per se), it is helpful to know how far policy aimed at reducing gaps in the aspects of the child's environment that we consider in this model can go towards reducing gaps in development.

The results in Figure 12 answer this question by comparing the raw (or 'unconditional') family income gradient in early development with the leftover (or 'conditional') gradient obtained after accounting for systematic environmental differences across families in different deciles of the family income distribution. Each bar shows the average rank of children growing up in families in different deciles of the family income distribution at age 3 in terms of their cognitive development (Figure 12a) and their socio-emotional development (Figure 12b), with the horizonal axis centred at the 50th percentile (middle) of the distribution. The yellow bars depict the unconditional gradient, while the green bars depict the conditional one. As expected, the yellow bars show a strong positive relationship between family income and development in the raw data: children in the poorest 10% of families rank 31 percentiles lower in cognition and 24 percentiles higher in emotional and behavioural difficulties than their counterparts in the richest 10% of families. This is a stark contrast to the 'conditional' association depicted by the green bars, which are fairly flat across the income distribution, suggesting that most of the income gradient in development of children at age 3 can be explained by the factors considered in the model.

It is important not to conclude from the results in Figure 12, where the income gap is largely explained by environmental factors, that intervening on environmental factors alone, and not directly on incomes, is likely to be most effective in reducing early developmental inequalities. Relatively little is known about what the precise balance should be between poverty reduction policies and interventions directly aimed at improving children's environments, and we view this as an area where more research is urgently needed. A number of reviews, including Cooper and Stewart (2017), have suggested that directly boosting income, via either conditional or unconditional cash transfers for poor families, would lead to improvements in early child development. Important trials are currently under way in the US to shed further light on this question.[8] However, our interpretation of the results in Figure 12 is that policies aiming at reducing poverty and socio-economic inequalities at source, and interventions targeting inequalities in children's early childhood environments, should be combined, since direct poverty reduction measures, such as cash transfers for disadvantaged families with young children, reduce the stress families incur because of poverty and allow them to live in more stable conditions, which in turn directly improves the quality of children's educational, emotional and material environments.

[8] One of these trials is the Baby's First Years study (https://www.babysfirstyears.com/) and another is the Bridge Project (https://themonarchfoundation.org/our-work/direct-cash/).

Figure 12. Income inequalities in early development before and after controlling for income inequalities in early childhood environments



Note: Controls included in the conditional estimation include all the variables included in the models presented in Figure 10, i.e. the factors set out in Box 3 and also indicators for missing parental conflict score and for missing linguistic skill score. Weighted to be representative of the UK population.

Source: Millennium Cohort Study.

5. Genetic influences on early development

The previous section describes inequalities in children's physical and emotional environments, and how these are associated with inequalities in early cognitive and socio-emotional development. In this section, we assess the contribution of genetic influences to early development. We first provide a brief summary of research into genetic associations with child development and set out an analytical framework for interpreting these findings, and then analyse associations between genetic measures and childhood skills development alongside the environmental factors already considered in the earlier parts of this chapter. We also add genetic endowment as a control variable to the decomposition models presented in Section 4.2.

Research linking genetics and social and behavioural outcomes is sometimes considered controversial. There have been concerns that it could be used to support misguided notions of biological determinism (i.e. the idea that human behaviour is inevitably determined by biological characteristics) or that it could be used to justify the idea that inequalities in the distribution of resources and power are somehow a natural phenomenon based on biological differences. Furthermore, behaviour genetics research has historically been used to justify human rights violations – for example, in the form of eugenic practices and policies. Taking a sensitive and critical approach to this kind of research is therefore vital.

We include genetic information within our analysis for three reasons. First, previous research indicates that children's genetic endowment contributes to variation in cognitive and socio-emotional development. This suggests that it is a potentially important driver of inequality, alongside environmental and other factors, which should not be overlooked. Second, genetic influences could confound some of the relationships analysed in this chapter, such as between early development and later outcomes or between environmental influences and outcomes, and so controlling for genes in our analysis is important to properly understand the effects of environments. Third, including genetic information offers an opportunity to analyse the interplay of genes and environments in the development of inequalities, which provides additional insight into why the environmental factors considered throughout our work are important.

5.1 Existing evidence

There is a wealth of evidence reporting genetic influences on virtually all human traits and behaviours (Polderman et al., 2015), including children's cognitive and socio-emotional skills and adult social and economic outcomes (Willems et al., 2019; Demange et al., 2021). Much of this prior evidence comes from twin and adoption studies, which compare the resemblance in behaviours among relatives who differ in genetic relatedness (e.g. genetically identical and fraternal twins). Under certain assumptions, these studies produce a measure of genetic influence (sometimes referred to as 'heritability') that indexes how much of the variation in a behaviour among people appears to be due to genetic variation between them. Importantly, these types of estimates of genetic influence are derived by inference based on differences between groups of people and do not rely on genetic information directly measured at the individual level.

Previously reported estimates of genetic influences on childhood cognitive and socio-emotional development from twin and adoption studies vary depending on the specific behaviour and age. For example, genetic influences are thought to account for approximately 40% of variation in cognitive skills in childhood and up to approximately 60–70% of variation in cognitive skills in adolescence and young adulthood (Haworth et al., 2010). The remaining variation is attributed to environmental influences. For socio-emotional skills, genetic influences are estimated to account

for approximately 40–70% of variation across ages, depending on the specific outcome (e.g. analyses of inattention/hyperactivity tend to show higher heritabilities than analyses of children's emotional symptoms) (Burt, 2009).

In addition to twin and adoption studies, newer research has used molecular-genetic methods to estimate genetic influences. Instead of relying on comparisons of relatives, these methods use direct measurements of people's genetic variants, i.e. their DNA (see Box 4 later). It has been difficult to identify genetic variants associated with behaviour, because each individual variant explains only a tiny portion of the total variation, requiring huge sample sizes to detect their effect. Nevertheless, results from molecular-genetic studies mostly corroborate the overall general finding of genetic influences on traits and behaviours. However, these studies report much smaller estimates of association. For example, a recent molecular-genetic study of cognitive skills found that a genetic measure combining multiple genetic variants accounted for 5% of variation in cognitive skills in adulthood (Savage et al., 2018), far below the estimates of 70% reported in twin studies. This percentage is predicted to increase with larger sample sizes that include a sufficient number of people to detect the tiny effects of genetic variants, but simulation studies suggest that even then, estimates of genetic influence derived from molecular-genetic studies will remain below those of twin studies. These findings are similar for socio-emotional skills.

The disparity between molecular-genetic and twin-study estimates has been termed 'missing heritability'. The reasons for it are the subject of ongoing research. On the one hand, molecular-genetic studies most likely underestimate genetic influences, because they do not capture genetic variants that are rare or interactions between genetic variants. On the other hand, twin studies operate under several assumptions, and heritability estimates can be inaccurate if these assumptions are not met; it is possible that twin and adoption studies to some extent overestimate genetic influences – for example, because they may in some cases misidentify environmental for genetic influences. However, even when important assumptions of the twin model are accounted for, twin study estimates of heritability tend to remain higher than those from molecular-genetic studies (Conley et al., 2013; Conley et al., 2014).

In summary, although different study approaches show that there are genetic influences on children's development, the exact estimate of their contribution is not settled. The implication for the analyses presented in this chapter, which rely on molecular-genetic measures, is that our findings likely underestimate the true contribution of genetic endowment to early development, and later outcomes, and, when included as controls in our models of early development, they are likely to under-control for genetic effects. By implication, this may also mean we overstate the relative contribution of environmental effects.

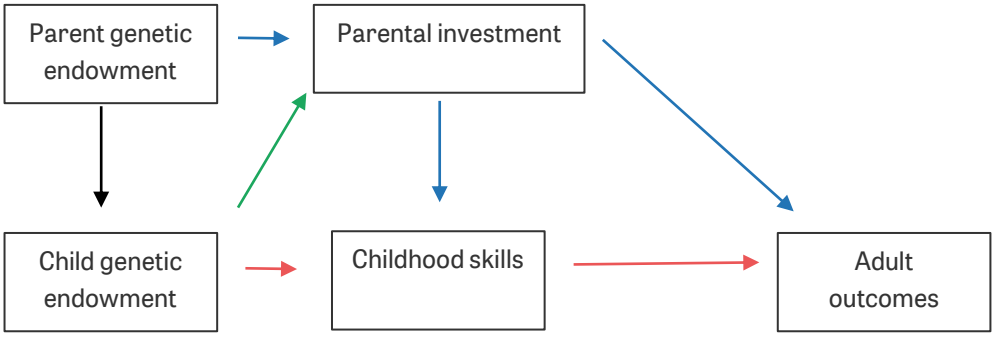
As well as being underestimates of the likely full effects, due to limitations in data availability a further limitation is that these analyses currently can only be undertaken on populations that are white and so do not provide findings relevant to ethnic minority populations. Nevertheless, they provide an important opportunity in an emerging field to understand how the genetic influences that have been identified at the molecular level contribute to inequalities in early environments and development within a nationally representative population.

5.2 Framework

Before showing any empirical evidence, we present a simple framework that outlines three main pathways through which genetic endowments may come to be associated with childhood skill

formation and adult-life outcomes (Houmark, Ronda and Rusholm, 2020). First, children's genetic endowment may influence their ability to acquire certain skills (such as cognitive and socio-emotional skills). These differences in childhood skills might translate into differences in adult-life outcomes (such as educational attainment). This pathway is depicted on Figure 13 via red arrows. This first pathway does not necessarily involve the child's environment. In contrast, the second and third pathways explicitly involve gene–environment interplay. The second pathway implies that children's genetic endowment may elicit different behavioural responses from parents. For example, children's genetic endowments associated with greater interest in reading may evoke more reading by parents to their child. This pathway is represented by the green arrow. Third, parents' genetics may influence the environment they create for their children. For example, parents' own genetic endowments might be associated with the frequency with which they read to their child. Parents' genetic endowment may therefore come to be associated with children's outcomes by shaping the family environments that children are exposed to. This pathway is depicted in blue arrows.

Figure 13. Pathways through which genetic endowment may influence development



This model makes several simplifying assumptions. For example, it assumes that associations between child genetic endowment and adult outcomes are mediated through childhood skills (bottom of the model) and that associations between parent genetic endowment and offspring adult outcomes are mediated through parental investment (top of the model). However, genetic endowment may have effects on offspring adult outcomes that are not mediated via childhood skills or parental investment. For example, children's genetic endowments are associated with their height and weight, which are known to be associated with adult outcomes. Likewise, parents' genetic endowments might be associated with parents' socio-economic status, which could affect children's educational attainment over and above parental investment. The model also does not include the broader social and societal context in which genetic and developmental processes unfold. For example, there is evidence to suggest that the influence of genes may vary by family socio-economic status (Tucker-Drob and Bates, 2016) and the level of intergenerational mobility within a society (Engzell and Tropf, 2019).

5.3 Analysing genetic associations with childhood skills

With these considerations in mind, we begin by exploring associations between children's genetic endowment and early child development in the Millennium Cohort Study. Our measure of genetic endowment is a 'polygenic score', a DNA-based measure that incorporates information from many genetic variants across a person's entire genome (see Box 4). The particular polygenic score we use is based on a previous, large-scale analysis of genetic variants associated with educational attainment (Lee et al., 2018). We use this score because previous research has shown that it is associated not only with educational attainment per se, but also with childhood cognitive

and socio-emotional skills that are on the path to educational attainment (Belsky et al., 2018; Wertz et al., 2018). All models are run only on the subset of MCS participants who identified as white British, because polygenic scores are not portable across populations.

Box 4. Measures of genetic risk

The genetic data used in the chapter were collected as part of the sixth (age 14) wave of the Millennium Cohort Study. Saliva samples were collected from cohort members and their resident biological parents. A DNA bank has been created from the MCS saliva samples. A total of 23,336 samples are available, from 9,259 cohort members, 8,898 mothers and 5,179 fathers (Fitzsimons et al., 2021). Cohort member data only are used in this chapter.

Polygenic score for education

To analyse children's genetic endowments, we use a 'polygenic score', which is a single score for an individual person, based on that person's DNA. A polygenic score is constructed from thousands of genetic variants, called 'single nucleotide polymorphisms' (SNPs) which are locations in the DNA sequence that vary from person to person. Genome-wide association studies measure the DNA of large samples of people, in order to test associations between each of their genetic variants and an outcome of interest – for example, weight or height. The calculation of a polygenic score is done using a scoring algorithm provided by the results of a genome-wide association study (GWAS). These results can then be used to calculate a polygenic score in different samples of people.

In our analyses, we calculate polygenic scores for the cohort members in MCS using the results of a GWAS genetic analysis of educational attainment (Lee et al., 2018). This GWAS found genetic variants associated with how much schooling people complete. On average across people, individuals with higher polygenic scores for education tended to complete slightly more schooling than those with lower polygenic scores. We use this particular polygenic score because previous research shows that it is associated not only with education per se, but also with skills that are on the causal pathway to education and that are of interest in this chapter, including childhood cognitive and socio-emotional skills (Belsky et al., 2018; Wertz et al., 2018).

A limitation of current GWAS studies is that most of them, including the one we are relying on in our analyses, have only been performed in samples restricted to European-descent individuals. For analyses using the polygenic score, we therefore restrict the analysis sample to those participants who identified as white British. Also, as discussed elsewhere in this chapter, the polygenic score will provide a lower estimate of genetic association/variation accounted for than a method based on twin/adoption studies would, due to the issue of 'missing heritability', which is the subject of ongoing research.

Our findings show, as expected, that children's genetic endowment is associated with cognition and with socio-emotional difficulties at age 3 (Table 1, unadjusted associations). For associations with cognition, we observe that children with higher polygenic scores tend to have higher cognitive scores – specifically, a one standard deviation increase in the polygenic score is associated with a 0.20 SD increase in cognitive skills. For associations with socio-emotional difficulties, we observe that children with higher polygenic scores tend to have fewer difficulties –

specifically, a one standard deviation increase in the polygenic score is associated with 0.17 SD decrease in socio-emotional problems. The polygenic score accounts for 4.1% of variation in age 3 cognitive skills and 3.0% of variation in socio-emotional problems. These findings are consistent with evidence from other population studies linking this particular polygenic score with cognitive development (e.g. Allegrini et al., 2019) and socio-emotional skills (e.g. Belsky et al., 2016; Demange et al., 2021).

Table 1. Association between children's genetic endowments and early childhood development, MCS age 3

	Cognitive development	Emotional and behavioural difficulties
Panel A. Unadjusted regression coefficient		
Polygenic score	0.197***	–0.165***
	(0.016)	(0.015)
R-squared	0.041	0.030
Panel B. Adjusted regression coefficient		
Polygenic score	0.090***	–0.051***
	(0.016)	(0.013)
R-squared	0.210	0.418

Note: Authors' calculations using the Millennium Cohort Study, reweighted to be representative of UK population. Controls in adjusted regressions include: child's characteristics (sex, first-born indicator); family characteristics (maternal age at child's birth, one-parent household indicator, maternal BMI before pregnancy); child's educational environment (maternal highest educational qualification, maternal linguistic skills, home learning environment index, proportion of first three years the child has been enrolled in formal childcare); child's emotional environment (inter-parental conflict, parent–child closeness, parent–child conflict, maternal psychological distress, bedtime regularity); and child's material environment (housing type, overcrowding index). The child's genetic endowment is measured with the clumped education polygenic score. Models estimated using white British population sample only. N = 4,648.

Source: Millennium Cohort Study.

Once these models are adjusted for the rich set of child, family and environmental characteristics included in the models of Section 4 (Table 1, Panel B), associations between genetic endowment and child development are much reduced, by approximately half for cognitive skills and two-thirds for socio-emotional problems. This result suggests that genes and environments are correlated and that the influence of the child's genetic endowment on child outcomes is not independent of other environmental characteristics. For example, if parents' own genes are correlated with their behaviour (e.g. their parenting), and parents pass these genes on to their children, as indicated by the blue arrows in the framework in Figure 13, then controlling for parenting would reduce associations between genetic endowments and childhood skills. We analyse gene–environment correlations in more detail in the following section.

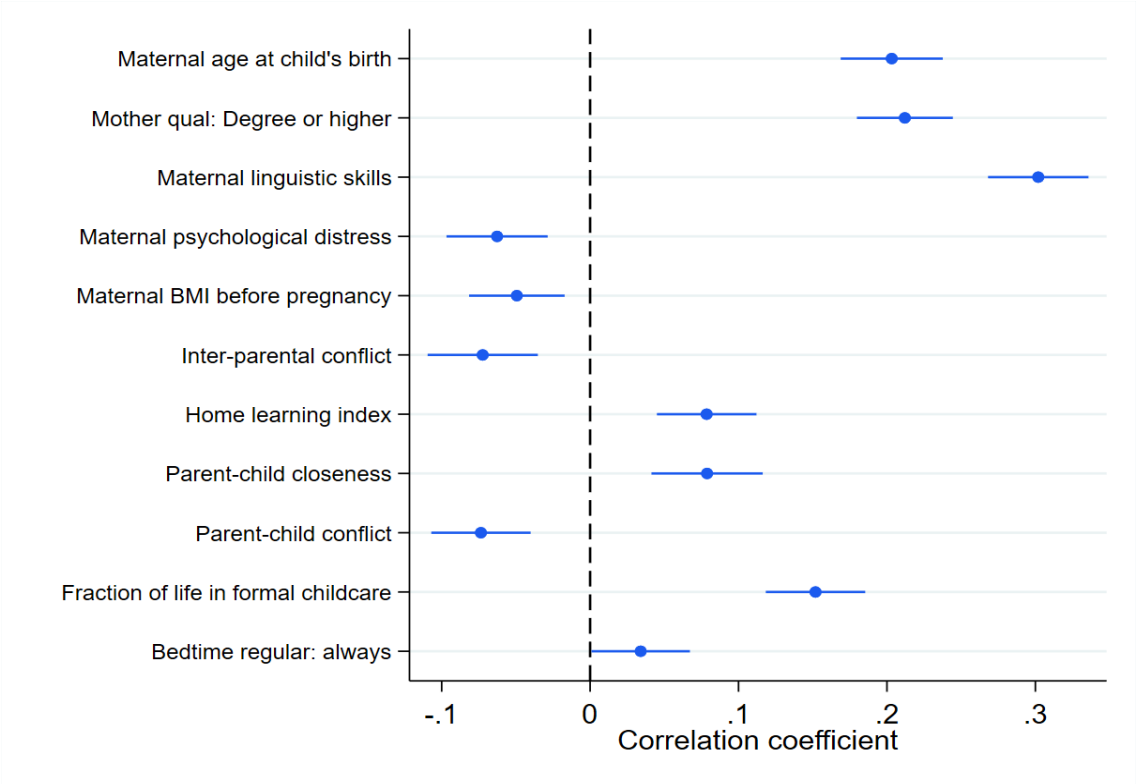
5.4 Analysing gene–environment interplay

Although genetic and environmental influences are often thought of in popular culture as independent and even opposing forces (exemplified by the phrase 'nature versus nurture'), the theoretical framework and empirical findings we present in the previous subsections suggest a degree of interplay between genes and environments. Here we specifically test associations between children's genetic endowments and environments. Figure 14 reports correlation coefficients between children's polygenic scores and a range of maternal characteristics and

family environments that were introduced in Section 4. Our findings show that children with higher polygenic scores tended to be born to older mothers, who were more likely to have a degree, had higher linguistic skills, had lower depression scores and were in better health before pregnancy (as indicated by lower BMI). These children also tended to grow up in home environments characterised by less parental conflict, a richer home learning environment (greater availability of learning opportunities), more formal childcare, closer and more harmonious relationships with parents, and more structure/routines.

The framework presented in Section 5.2 provides guidance on how to interpret these findings. Associations between child genetic endowment and maternal characteristics most likely come about because mothers share genes with their children, so children's polygenic scores in our analyses essentially become a proxy for mothers' own polygenic scores. It is therefore not surprising that a polygenic score linked with cognitive and socio-emotional skills in the child generation would be associated with these same outcomes in the parent generation. Associations between child genetic endowment and home learning environment might similarly index parent genetics (e.g. mothers with higher polygenic scores may provide more learning opportunities to their children (Wertz et al., 2020)) but these might also be mediated by children's own genetically influenced behaviour (e.g. children with higher polygenic scores may evoke more cognitive stimulation and closeness from their parents (Wertz et al., 2020)). The key takeaway from these findings is that the influences of genes and environments are intertwined.

Figure 14. Correlation between child's polygenic score and aspects of the early environment



Note: The figure reports unadjusted, bivariate associations using data from the Millennium Cohort Study, reweighted to be representative of UK population and estimated using white British population sample only. N = 4,648 for all variables, except inter-parental conflict for which N = 4,049 (because it is only available for two-parent families) and maternal linguistic skills for which N = 4,490 (because it is measured in wave 6 of the MCS).

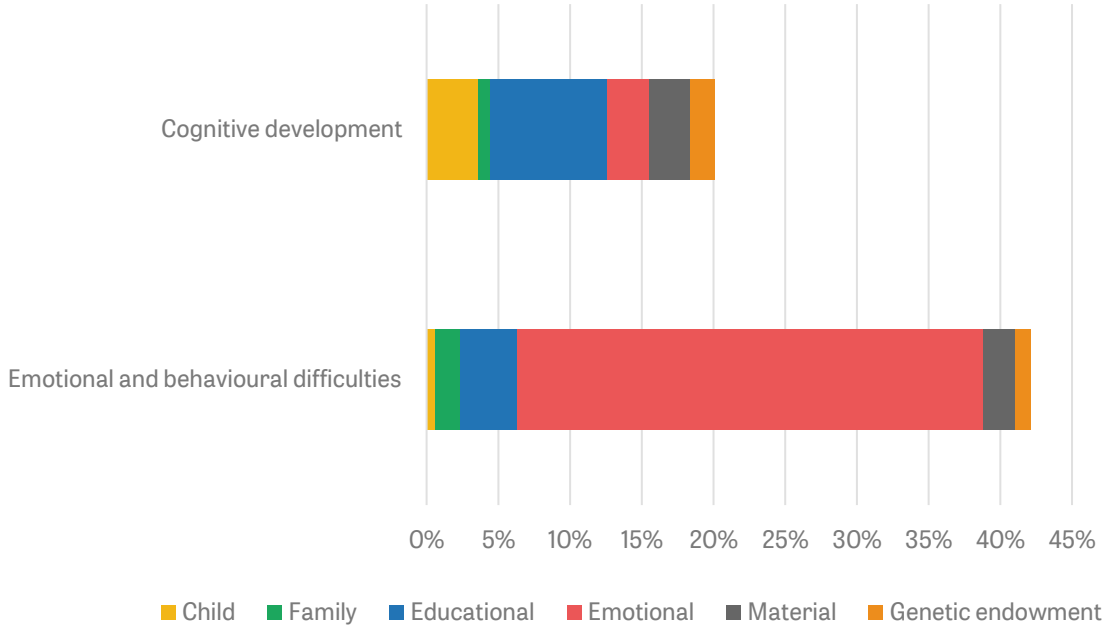
Source: Millennium Cohort Study.

5.5 Incorporating genetic information in models of early development

We next include the polygenic score in multivariate regression analyses that mirror those of Section 4.2, and test the contribution of inequalities in early life characteristics to inequalities in cognition and socio-emotional difficulties. As before, these models adjust for a variety of characteristics of the child and family, as well as aspects of the child's educational, emotional and material environment (see Section 4.2 for a full description). Note that these regressions are run on a restricted sample of white British study members only. We then use the results underlying these regressions to repeat the decomposition exercise of the R-squared into the same variable groupings we considered before, using the Shorrocks–Shapley decomposition (see Figure 11), with the addition of the polygenic score.

The results of this decomposition are shown in Figure 15. After controlling for the full set of model characteristics, the net contribution of genetic endowment as captured by the polygenic score for educational attainment is less than 2% for cognitive development and 1% for socio-emotional difficulties. The findings in Figure 15 also demonstrate that the inclusion of the polygenic score does not change the substantive conclusions from Section 4.2, about the relative importance of environmental factors, especially the educational and emotional aspects of parenting for explaining inequalities in early development. The fact that these associations are robust to the inclusion of genetic data, an often-omitted variable in this vast literature to date, is a noteworthy finding. However, as discussed earlier, a caveat is that the polygenic score most likely underestimates the genetic influences on the outcomes in our study, and it may be that the inclusion of the genetic influences that polygenic scores are currently 'missing' would alter these conclusions.

Figure 15. Contribution of inequalities in early life characteristics to inequalities in development at age 3 in the MCS cohort



Note: The figure reports unadjusted, bivariate associations using data from the Millennium Cohort Study, re-weighted to be representative of UK population and estimated using white British population sample only. N = 4,648. Shorrocks–Shapley decomposition (Shorrocks, 1982), generated using the shapley2 command in Stata 16 (Juarez, 2015).

Source: Millennium Cohort Study.

6. The long-lasting influence of early childhood

As well as valuing early childhood as a precious time of life, in and of itself, the extent to which early childhood inequalities influence later inequalities provides a compelling argument for intervention and investment in early childhood. From an economic perspective, if interventions to reduce early childhood inequalities are sustained (rather than fading out) and have long-lasting benefits, their returns will be reaped over a longer period than those of interventions targeting inequalities later on in life, making them more likely to be cost-effective than interventions later on (Carneiro and Heckman, 2003).

Several early childhood interventions targeted towards children at highest risk provide support for this argument, by showing sustained effects on socially important outcomes years and even decades later and yielding very high rates of return. The Perry Preschool Project, for example, provided high-quality pre-school experiences to highly disadvantaged African-American children aged 4–5 in the 1960s. When followed up at several points in their lives, participants were found to have significantly better outcomes than a group of similar individuals who had been randomised out of the programme: as adults, they had higher educational qualifications and earnings, improved health and health-related behaviours, and lower criminal activity, and these benefits have been found to last until age 54 (García, Heckman and Ronda, 2021). Similarly, long-term benefits were found for a number of other early childhood interventions targeted at very disadvantaged children, including the Jamaican Home Visit Program (Gertler et al., 2014), the Abecedarian Project (Campbell et al., 2012) and the Chicago Child–Parent Center Program (Ou, Yoo and Reynolds, 2021; Varshney, Temple and Reynolds, 2022).

Evidence about the link between early childhood development and adult outcomes has also been gained from longitudinal observational studies that have followed their participants from early childhood to adulthood. The MCS and BCS70 are particularly well suited to describe these relationships, and in Table 2 we present estimates from a regression of a set of adolescent and adult outcomes measured in the MCS (at age 17) and BCS70 (at age 42) on measures of development at age 3 and 5, respectively. Across the six adult outcomes we consider, there is a statistically significant association between early cognition and early socio-emotional development of children and their long-term outcomes (see Panel A). For example, a one standard deviation increase in cognitive ability at age 5 is associated with a 12 percentage point increase in the probability of obtaining a university degree and a £54 increase in weekly earnings at age 42. A one standard deviation increase in emotional and behavioural difficulties at age 5 is associated with a 3.1 percentage point increase in the probability of being obese at age 42 and a 0.9 percentage point increase in the probability of being divorced by age 42.

Of course, children with higher levels of cognitive and socio-emotional development at age 5 are more likely to grow up in disadvantaged households, and the link between early development and later outcomes evidenced in Panel A may in fact reflect a link between characteristics of their environment (e.g. parental education, maternal psychological distress, parenting practices) and later outcomes. To assess the extent to which this is the case, in Panel B we report these associations after controlling for a host of variables characterising the child's family and early environment. We see that the associations between early skills and later outcomes mostly decrease in magnitude but remain statistically significant. This suggests that early skills are likely to play a meaningful role in shaping later outcomes. It also emphasises the sustained importance of early childhood environments in shaping later outcomes, over and above their role in shaping early childhood skills.

Table 2. Associations between early development and later outcomes

	Millennium Cohort Study (age 17)		1970 British Cohort Study (age 42)			
	5 GCSEs A*–C	Emotional and behavioural difficulties	University degree	Weekly earnings (incl. 0 for unemployed)	Obese	Ever divorced
Panel A. Unconditional correlations						
Cognitive skills	0.126***	–0.104***	0.117***	53.870***	–0.030***	–0.005
	(0.010)	(0.014)	(0.006)	(4.860)	(0.006)	(0.004)
Emotional and behavioural difficulties	–0.083***	0.399***	–0.036***	–18.841***	0.031***	0.009***
	(0.011)	(0.015)	(0.006)	(4.884)	(0.006)	(0.004)
R-squared	0.13	0.187	0.072	0.028	0.012	0.001
Panel B. Controlling for characteristics of the child, family and environment						
Cognitive skills	0.079***	–0.068***	0.078***	38.522***	–0.019***	–0.002
	(0.009)	(0.015)	(0.006)	(4.592)	(0.006)	(0.004)
Emotional and behavioural difficulties	–0.046***	0.295***	–0.011*	–12.245**	0.020***	0.010***
	(0.010)	(0.019)	(0.006)	(4.975)	(0.007)	(0.005)
R-squared	0.246	0.234	0.181	0.204	0.031	0.017
Panel C. Controlling for characteristics of the child, family, environment, and skills measured in adolescence						
Cognitive skills	0.067***	–0.034***	0.039***	25.880***	–0.013**	0.002
	(0.008)	(0.012)	(0.006)	(4.642)	(0.006)	(0.004)
Emotional and behavioural difficulties	–0.019*	0.081***	–0.003	–7.254	0.018***	0.008
	(0.011)	(0.017)	(0.006)	(5.002)	(0.007)	(0.005)
R-squared	0.277	0.503	0.307	0.229	0.035	0.021
Observations	6,592	5,889	5,938	5,444	5,378	7,717
Mean	0.708	–0.180	0.29	377.4	0.21	0.13

Note and source: See the next page.

Note and source for Table 2

Note: Table displays regression coefficients of cognitive skills and socio-emotional difficulties at age 3 in the MCS or age 5 in BCS70, on a series of later outcomes. These are: achieving five good GCSEs or equivalent (MCS); standardised total difficulties score aged 17 from the SDQ (MCS); whether or not achieved a university degree by age 26 (BCS70); weekly earnings at age 42 (including zeros for those who are unemployed) (BCS70); whether or not respondent is obese (according to their BMI) at 42 (BCS70); and whether or not the individual has ever been divorced by 42 (BCS70). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. In Panels B and C, control variables in MCS regressions include same family/parent and environmental characteristics as those specified in Box 3. In Panels B and C, control variables in BCS70 regressions include: male, first-born, ethnicity indicators, age at which mother left education and its square, an index measuring mother's psychological distress when child is 5, maternal age at child's birth and its square, indicators for social class based on father's occupational category, type of housing at age 5, variables measuring parenting styles and parental attitudes towards TV viewing and hospital visiting, indicators for whether the child was in any formal childcare at ages 3–4 and 4–5. In Panel C, the MCS models also include measures of cognitive skill at age 14 and a variable measuring the number of emotional and behavioural difficulties at age 14. In Panel C, the BCS models also control for measures of adolescent skills at age 16 and indicators for whether these variables are missing. These measures are of grades, reading ability, malaise and temperament when the cohort member is aged 16.

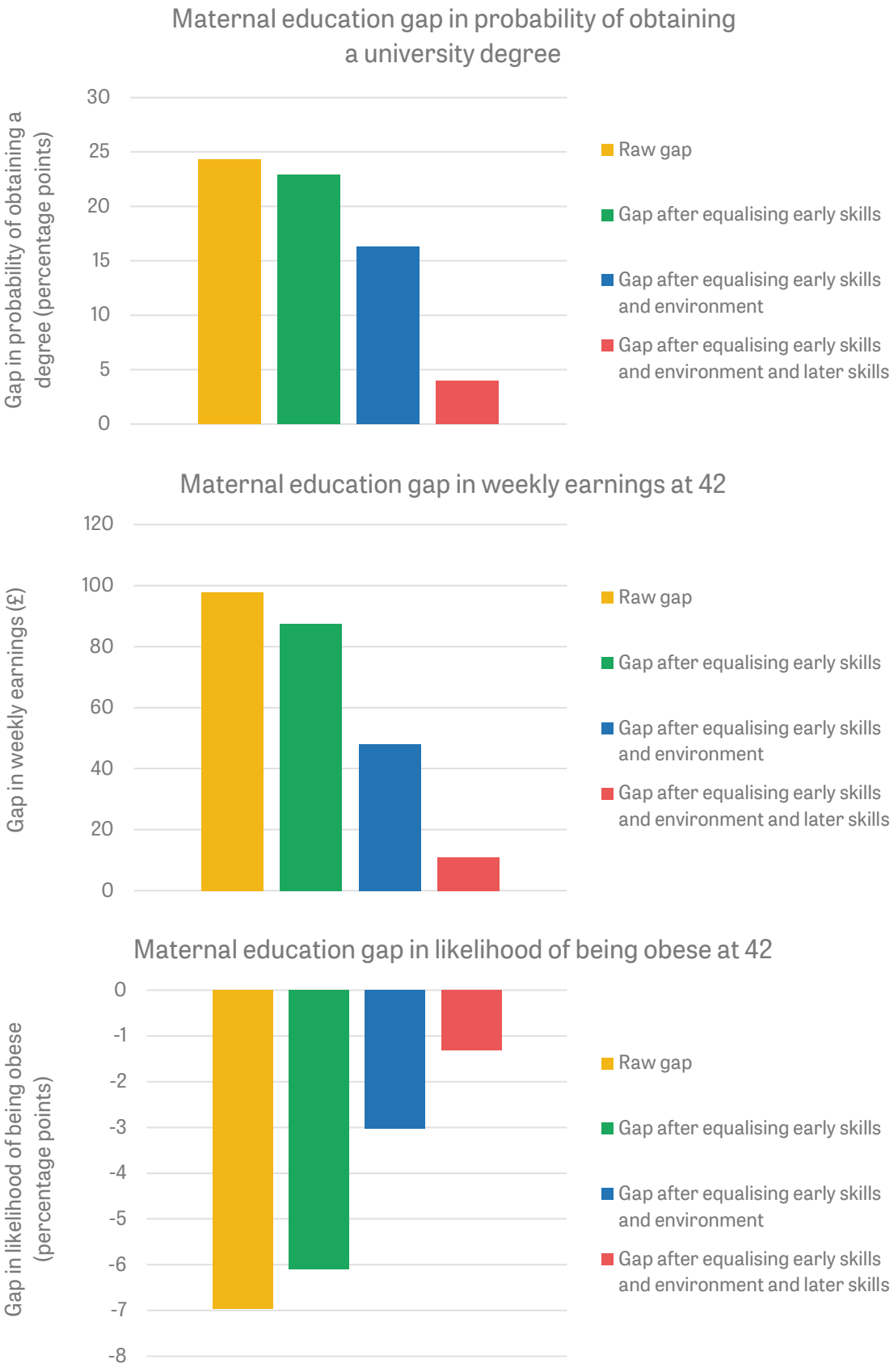
Source: Authors' calculations using the Millennium Cohort Study and the 1970 British Cohort Study.

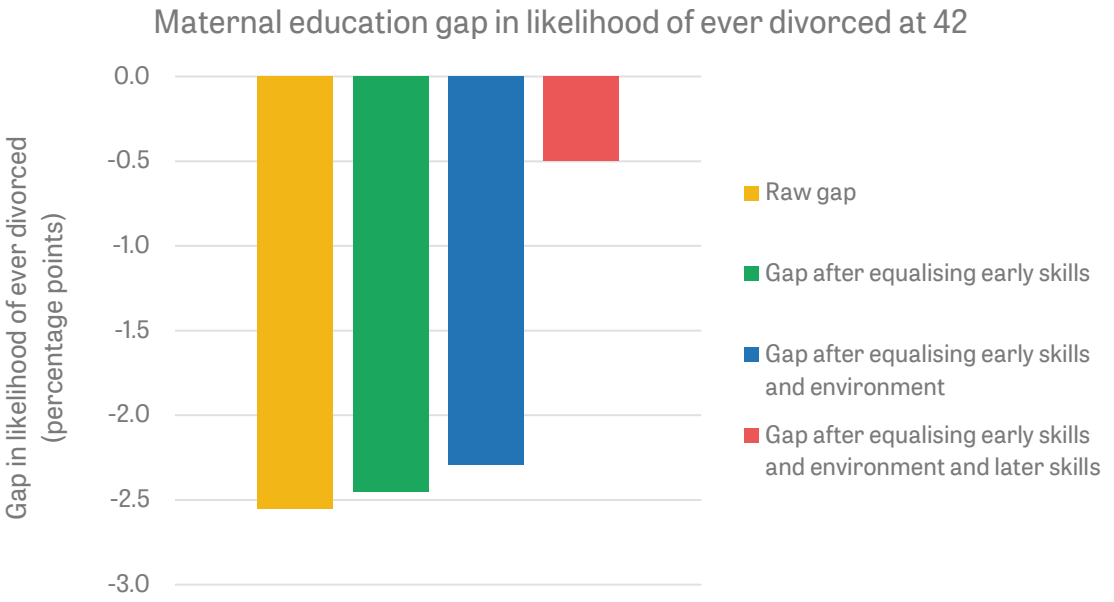
The pathways through which early skills shape later outcomes are likely to be complex, but researchers believe that one important reason has to do with the fact that skills beget skills. In other words, early skills serve as foundations in the learning process, helping to augment the skills attained later on. This evidence is consistent with estimates presented in Panel C, where we now also control for skills measured at age 14 in the MCS and age 16 in BCS70. Compared with the estimates in Panel B, the coefficients on early childhood cognitive skills and socio-emotional difficulties in Panel C are further reduced, suggesting that their impact is, at least partly, mediated by the impact of adolescent skills. For some outcomes, however, the effect of early childhood skills remains significant, over and above that of adolescent skills, suggesting that it is the whole trajectory of skills, from early childhood to adolescence, that matters in shaping long-term outcomes. Together, the results of Table 2 indicate that to shape later outcomes (and hence inequalities therein), it is critical to target skill development *throughout* childhood as well as children's environments. From a policy perspective, this calls for a joined-up approach across different stages of life, thinking about sequential interventions over childhood and adolescence, rather than just early childhood interventions as the way to reduce inequalities. A current policy initiative, Family Hubs, which support children and families from 0 to 18 and across a range of issues, could be a good framework for such a whole childhood approach. We come back to this when discussing policy in Section 8.

Finally, we build on these analyses (specifically the results in Panel C of Table 2) to estimate how much of the gap in adult outcomes between children born into different socio-economic environments could be reduced, were differences in early skills, later skills and early environments between them removed. While this thought experiment implies a causal interpretation to our models – which, as we stated earlier in the chapter, requires strong assumptions – it nevertheless can help us to understand the relative importance of policies targeted towards gaps in early skills and early environments versus gaps in skills acquired later in childhood and adolescence.

Because the BCS70 does not include as strong a measure of family income as younger cohorts, we define socio-economic gap in outcomes as the gap between children whose mothers left education at 16 or after (higher level of education) and children whose mothers left education at 15 or before (low level of education).

Figure 16. Gap in adult outcomes between individuals whose mothers left education at 16 or after and those whose mothers left education at 15 or before





Note: This figure reports the results of a Gelbach decomposition (Gelbach, 2016) using the Stata command b1x2, which measures the portion of the gap in adult outcomes between individuals whose mothers left education at 16 or after and individuals whose mothers left education at 15 or before that is attributable to the gap in: (a) cognition and socio-emotional skills at age 5; (b) measures of early environment; and (c) adolescent skills measured at age 16. See notes to Table 2 for exact definitions of the variables included in measures of early environment and the measures of skills at age 16. All results weighted to be representative of the UK population. The average outcomes for individuals whose mothers have left education at 15 or before are: 0.19 for having obtained a degree by age 26; £336.3 for weekly earnings at age 42; 0.24 for being obese at age 42; and 0.14 for being ever divorced at age 42.

The results of this analysis are presented in Figure 16 for a selected set of outcomes. Focusing on the first graph, we see (in the yellow bar) that the probability of getting a university degree is 24 percentage points higher among individuals whose mothers have a higher level of education than it is for individuals whose mothers have a low level of education. Were we to equalise the average level of early development among these two groups of individuals, the maternal education gap in university degree completion would reduce to 23 percentage points (green bar). Were we to equalise these individuals' early environments as well, that would reduce the maternal education gap in university degree completion much further, to 16 percentage points (blue bar). Further closing the gap in these individuals' levels of skill at age 16 would close the gap in degree attainment somewhat more, to 4 percentage points (red bar). A fairly similar picture is observed for all the other adult outcomes at age 42 we consider, with equalising early environments and later skills playing the strongest role in reducing the maternal education gap in all adult outcomes.

The evidence provided in Figure 16 reinforces a key message of this chapter about the importance of early childhood environments. Focusing on reducing inequalities in children's environments can yield a double dividend because not only do early childhood environments play a crucial role in shaping early childhood development of skills (as seen in Section 4), but they also play an important role in shaping adult outcomes, over and above their impact on early development. This is perhaps why Bailey et al. (2017, 2020) identify interventions that produce a sustained impact on children's environments as those more likely to see their effects persist in the long term.

This evidence can be helpful to inform how policymakers should be thinking about early childhood interventions. It suggests that it may be more beneficial to focus intervention on creating sustained improvements in the environments of children rather than focusing more narrowly on improving specific early skills in the short term, a point we return to in the policy discussion in Section 8. Our findings on the effectiveness of equalising later skills also provide a strong message that while early years interventions are extremely important, reducing gaps that appear and potentially widen throughout the schooling years is also vital.

7. Evolution of early childhood inequalities over the past two decades

Having established the presence of sizeable inequalities in the early development and environments of the MCS cohort born in 2000–02, a key question is how these inequalities have evolved since then. The two decades since their birth have seen important economic and demographic changes affecting key dimensions of children's environments that we have shown are major factors influencing early and later inequalities. Moreover, public investments in early childhood have significantly risen during this period, with quite dramatic changes in policy direction before and after 2010 (Stewart and Reader, 2021a).

To examine how inequalities have evolved, we use an additional data set, the Study of Early Education and Development (SEED), which follows a cohort of children born in 2010–12 and contains indicators of early development and environments that are comparable to those in the MCS.[9] We note the comparison relates to England only, as SEED only sampled children growing up in England.

Comparing inequalities in early developmental indicators between MCS and SEED cohorts

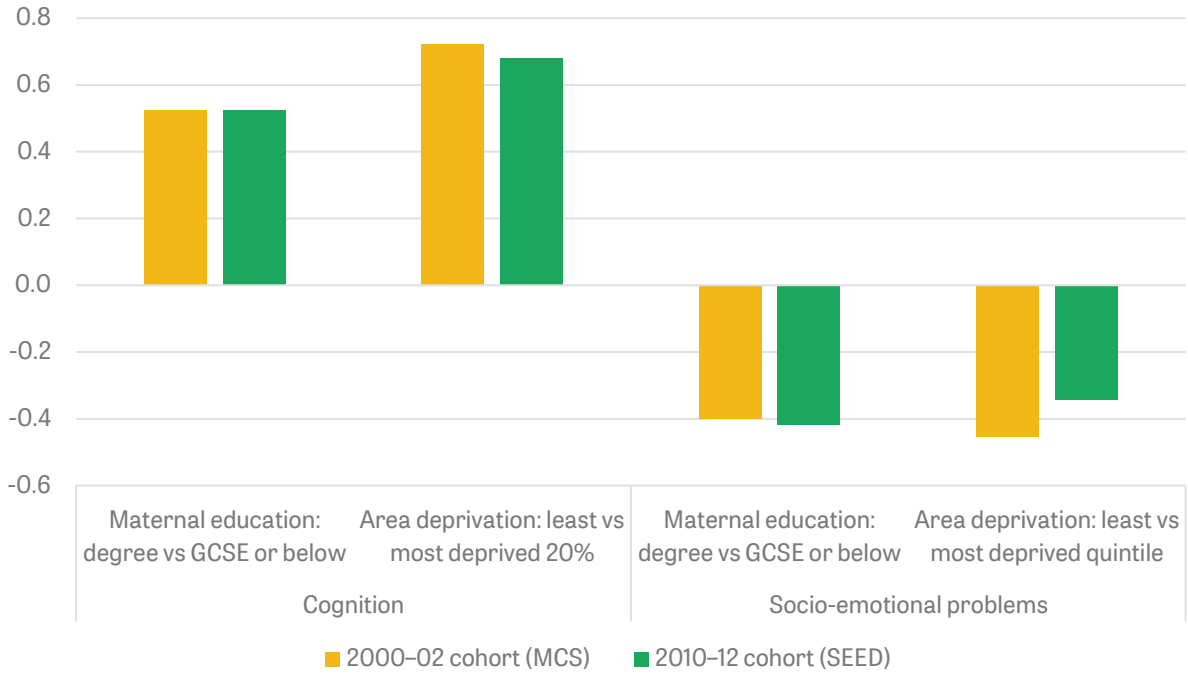
Looking first at early development, Figure 17 considers 3-year-old children in England – those born in 2000–02 (MCS) and those born in 2010–12 (SEED). It shows that the gap in development between children of mothers whose highest qualification is a university degree or above versus GCSEs or below has not changed at all in the intervening decade since the turn of the millennium, despite maternal education levels rising during this period (OECD, 2022).

The figure also shows a slight compression of socio-economic inequalities when measured by area deprivation, particularly with respect to socio-emotional development. However, whether this pattern reflects a weakening of the link between poverty and early childhood development is uncertain, as it may reflect the fact that the 20% most deprived areas in 2014–15 are richer than the 20% most deprived areas were in 2003–05. Unfortunately, SEED does not have a comparable measure of family income to allow us to study the change in the relationship between family income and development between the two cohorts.

This evidence of a small reduction in inequalities, particularly for socio-emotional development, is somewhat consistent with evidence from other sources. For example, there was a 22% reduction in the gap between disadvantaged and non-disadvantaged pupils at age 5, measured by the Early Years Foundation Stage Profile between 2001–02 and 2009–10 (Hutchinson, Dunford and Treadaway, 2016).

[9] To facilitate cross-cohort comparisons of gaps in development across the dimensions considered earlier, we standardise the distribution of the cognitive and socio-emotional development scores in SEED using the mean and standard deviation of the distribution in the MCS.

Figure 17. Evolution of age 3 development inequalities between the MCS and SEED cohorts



Note: Average cognition and socio-emotional and behavioural problems by demographic characteristics in the MCS and SEED cohorts. Cognition is measured using the British Ability Scales Naming Vocabulary Ability Score. Socio-emotional problems are measured by the Strengths and Difficulties Questionnaire. Weighted to be representative of the population of England.

Source: Authors' calculations from Millennium Cohort Study wave 2 and Study of Early Education and Development wave 2.

Comparing inequalities in early environmental indicators between MCS and SEED cohorts

We now turn to consider the extent to which early environmental inequalities have changed between the early 2000s and the early 2010s. Figure 18 shows changes in the characteristics of parents of 3-year-old children in England between MCS and SEED. Starting with demographic characteristics, the figure shows a significant increase in maternal education for the more recently born cohort (SEED), evidenced by the proportion of mothers with GCSEs or below dropping by 26% (from 52% to 39%) and the proportion of mothers with a university degree or more rising by 20% (from 34% to 41%). As further discussed in the chapter of the Review focusing on gender inequalities (Andrew et al., 2021), this increase in maternal education reflects the rapid increase in female education in the UK since the mid 1990s (Costa Dias, Elming and Joyce, 2016).

During the same period, the UK experienced important economic changes. Child poverty fell between 2000 and 2010 but has been on the rise since 2010, and the same is true for income inequality (Cribb et al., 2021). The Great Recession of 2008–09 shifted these trends in income inequality somewhat and this led to unprecedented falls in UK real wages (Giupponi and Machin, 2022). These changes in economic conditions have been coupled with significant rises in house prices (Miles and Monro, 2019), resulting in important changes to the housing conditions of families with young children (Oppenheim and Milton, 2021). Among families with a 3-year-old, Figure 18 shows that the proportion of homeowners has fallen by more than a quarter, from over 60% to around 45%. This fall in homeownership appears to have been matched by a commensurate rise in private renting, with the proportion of social renters remaining fixed over time.

Figure 18. Average characteristics of children's parents and environments in the MCS and SEED cohorts

Note: Weighted to be representative of the population of England.

Source: Authors' calculations from Millennium Cohort Study wave 2 and Study of Early Education and Development wave 2.

Family structures have continued to change over this period, with an increase in the number and proportion of one-parent households – and as the chapter focusing on families shows (Kiernan, Crossman and Phimister, 2022), this is likely driven by an increase in parental separation after childbirth, given that the fraction of births to single parents has remained relatively stable since 2000.

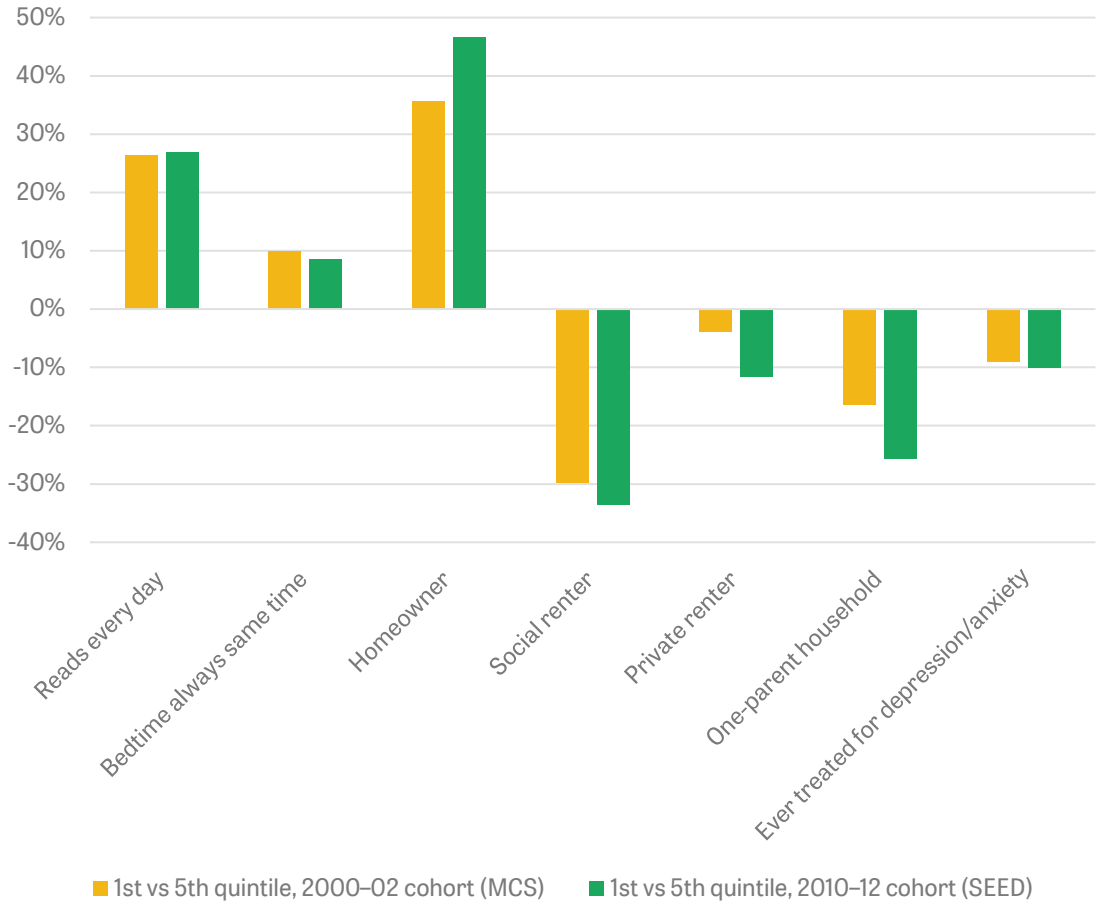
There has also been a rise in psychological distress among mothers over this period (Abel et al., 2019). While some of this change could reflect a reduction in stigma in reporting mental health issues, this is unlikely to account for all of it, and the rise in maternal depression is in line with findings presented in the health inequalities chapter (Case and Kraftman, forthcoming), which points to an important rise in the incidence of mental illness.

Whilst these trends are all concerning, and would suggest we might see a worsening of early developmental indicators among children, during the same period we witness significant improvements in factors that are positively associated with early development. As Figure 19 shows, there were improvements in some parenting practices, with increased frequency of daily book reading and regularity of bedtime routines. It is not clear what has led to these changes in

parenting practices, though the increase in maternal education during the period is likely to be one driver, and public investments in programmes such as Sure Start and the Family Nurse Partnership, which provide parenting support to families with young children, may have also played a role.

Finally, we take a more direct look at how socio-economic gaps in early childhood environments have changed between the two cohorts. Figure 19 shows, for a variety of domains listed on the horizontal axis, the gap between children of mothers with degree-level education and those whose mother has GCSE-level education or less.[10] The figure highlights inequalities within and between cohorts. Overall, the story is one of fairly constant inequalities over time. If anything, there is some evidence that socio-economic inequalities in housing tenure and with respect to one-parent households have widened for recent cohorts, but we do not find compelling evidence to suggest changing inequalities in the other domains examined across the decade or so under consideration.

Figure 19. Change in socio-economic inequalities in early life experiences between the MCS and SEED cohorts: difference between children of mothers with high vs low educational qualifications



Note: Weighted to be representative of the population of England.

Source: Authors' calculations from Millennium Cohort Study wave 2 and Study of Early Education and Development wave 2.

[10] SEED and MCS do not have a comparable measure of family income.

The somewhat mixed picture as to how socio-economic inequalities in children's early environments have evolved between the MCS and SEED cohorts, provided by Figures 18 and 19, is consistent with the overall stability in inequalities in early development over time seen in Figure 17, suggesting that multiple changes in environments, in different directions, may have been counteracting each other.

Time series of inequalities in early childhood development

The analysis presented thus far in this section has made comparisons in inequalities in early childhood development and environments between two cohorts born in 2000–02 (MCS) and 2010–12 (SEED), roughly a decade apart. It has found a remarkable level of stability in the socio-economic gap in cognitive and socio-emotional development of children at age 3 at two points in time, i.e. in 2003–05 and 2014–15. However, it is not clear from the evidence provided whether there was no change in these inequalities in the intervening period rather than, say, a pattern of falling then rising inequality, nor what has been happening since. This has been a very active time for government investment in the early years, with increases followed by retrenchment in major policy initiatives such as Sure Start, re-targeting of childcare subsidies, and cuts in means-tested benefits for families (see Section 8 for more details). Understanding more about the patterns over time could give greater insights into the efficacy of early years policies for reducing inequalities.

Unfortunately, there is no consistent annual time series of early childhood cognitive and socio-emotional development scores at a national level in the UK that we can use to systematically address this question. Stewart and Reader (2021b) provide a careful discussion of the use of the Early Years Foundation Stage Profile (EYFSP), which is available in national administrative data records for every child in the state school system at the end of reception year (the first year of formal schooling), for these purposes. While this measure does capture elements of both cognitive and socio-emotional development at age 5, the authors also provide strong words of caution about its interpretation, due both to changes in the EYFSP producing an inconsistent series over time and to the narrowness and potential biases within the measures recorded. Nevertheless, comparing children who are eligible for free school meals (FSM) with children who are not, Stewart and Reader show a year-on-year narrowing of the FSM gap in the proportion of children who had achieved a good level of development by the end of reception year between 2007 and 2017, and a widening gap thereafter in 2018 and 2019. Although infant health is not a topic covered in this chapter, Stewart and Reader find other measures of early childhood development related to infant health showed a similar pattern of narrowing inequalities followed by a widening over a similar period.

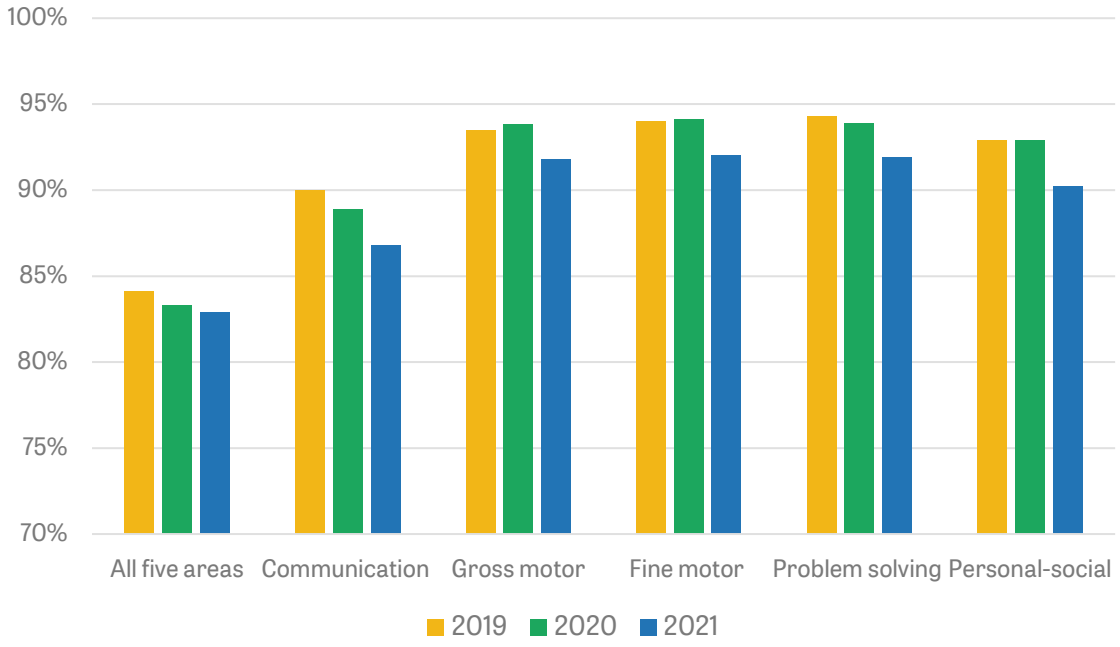
The COVID-19 pandemic

The pandemic has brought important changes to the family environment and lowered children's attendance at early years settings. Early years settings were closed during the first lockdown, but even after they reopened, attendance was a lot lower than before the pandemic (La Valle et al., 2022). These changes to patterns of care and to family lives could have important consequences for children's early development. Given that the pandemic has most adversely affected households that had the worst employment and financial circumstances to begin with, there is a suspicion that it may have increased inequalities in children's outcomes.

Since the collection of standardised measures of school readiness as captured within the Early Years Foundation Stage Profile was interrupted during the pandemic (academic years 2019–20 and 2020–21), there is little evidence so far available on the impact of the pandemic on trends in

school readiness. However, there is evidence emerging from other early development measures – for example, developmental indicators collected by health visitors using the Ages and Stages Questionnaire at age 2. As Figure 20 shows, the percentage of children at or above the expected level of development at age 2–2½ may be lower in 2021 than it was in 2019, in all domains of development. Survey data collected both in a study conducted by the Education Endowment Foundation (2022) and by Ofsted (2020) also suggest that parents and nursery and school leaders share important concerns that cohorts of children starting school during the pandemic were less school ready than previous cohorts.

Figure 20. Percentage of children at or above the expected level of development at age 2–2½



Source: Office for Health Improvement and Disparities (2021), 'Child Development Outcomes at 2 to 2 and a Half Years: Annual Data', for 2021 and earlier years, https://www.gov.uk/government/statistics/child-development-outcomes-at-2-to-2-and-a-half-years-annual-data. Note that these are 'experimental statistics' based on voluntary returns by local authorities held by NHS Digital in the Community Services Dataset.

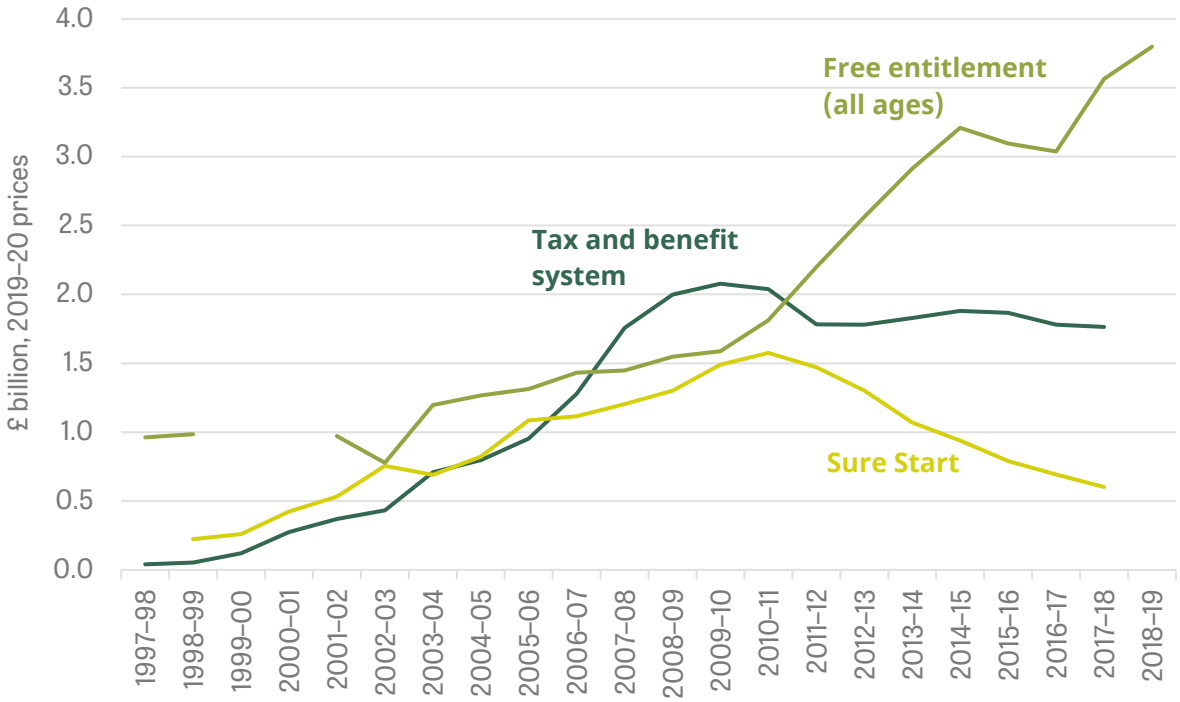
8. What does this mean for policy?

Key trends in early childhood policy over the past two decades

There has been an important increase in public investments in the early years in the UK over the past two decades. Key elements include: funded pre-school/childcare places for the under-5s (labelled as the 'Free entitlement' in Figure 21), which is largely focused on children aged 2+; childcare subsidies delivered through the tax and benefit system for low-income and working families ('Tax and benefit systems'); and universal family-based programmes delivered mainly through Sure Start.[11]

[11] Parental leave policies are another important area of government investment in the early years, but these are not discussed here.

Figure 21. Total early years spending through various programmes (2019–20 prices)



Note: Data on spending through the tax and benefit systems will be an underestimate for 2005–06 and 2006–07, when data on the cost to the public purse of employer-supported childcare vouchers are not available.

Source: Figure 2.6 from Britton, Farquharson and Sibieta (2019).

Figure 21 shows a number of important trends. The first is the rise and fall of universal family programmes. The main programme during this period has been Sure Start Children's Centres, introduced in the late 1990s by the Labour government as a one-stop shop for families, providing help and advice on child and family health, parenting, money, training and employment as well as play sessions and (in some cases) childcare for families living in disadvantaged areas (Eisenstadt, 2011). The figure shows a strong increase during the late 1990s and 2000s followed by a sharp decline in expenditure over the past decade, by around two-thirds since the peak of Sure Start around 2010–11. Whether we will see a shift back to a more holistic approach towards family well-being, with the recent development of Family Hubs and their Start for Life services as flagged in the government's recent early years review (HM Government, 2021), remains to be seen. Its focus on the whole of childhood, ages 0–18, is a potentially useful framework for supporting families with children across the whole of childhood.

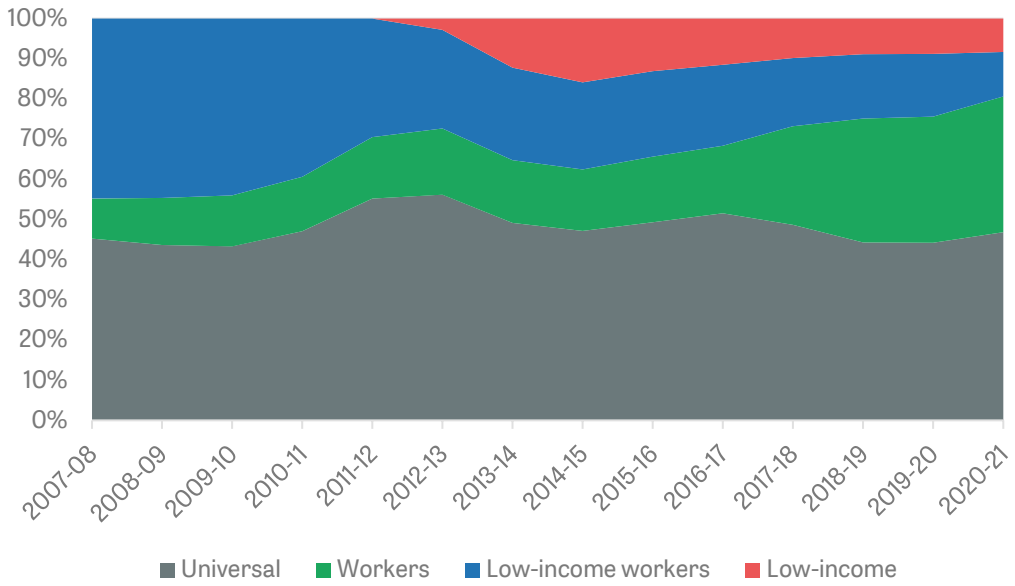
Another major feature of early years policies has been the so-called 'free entitlement' to early years childcare places, spending on which has risen steeply during Labour, Coalition and Conservative governments, though its composition and targeting have shifted considerably. Introduced initially for all children aged 3+ (for up to 15 hours per week), extensions have included the funding of free places for children aged 2+ among disadvantaged families only (eligibility was initially restricted to the 20% most disadvantaged children, and has been extended to the 40% most disadvantaged children). There was an increase in the free entitlement from 15 to 30 hours of free childcare for 3- and 4-year-olds living in working families only in 2017. This change has considerably dented the policy's progressivity, since to benefit from this extension to childcare hours parents have to earn at least a certain amount (National Minimum Wage or Living Wage for

16 hours a week on average), meaning that many very low-earning families and those not in work at all remain ineligible. The 2-year-old entitlement remains the only childcare subsidy that is targeted at disadvantaged children and that is not conditional on parental working status.

Finally, a number of childcare subsidies are provided through the tax and benefit system, the composition and targeting of which have also changed substantially over time. The shift from working tax credit and child tax credit to universal credit has included an increase in generosity of means-tested childcare subsidies, while a new 'tax-free childcare' scheme provides a tax subsidy for taxpaying parents of children aged 0–2 and 3- and 4-year-olds (for childcare not covered by the free entitlements) which is mainly not means tested (but is restricted to earners below £100,000).

Taking these together, Figure 22 shows how much of spending on the free entitlement and childcare subsidies delivered through the tax and benefit system is universal versus targeted. It shows that throughout the past 20 years, around half of all spending on subsidies for pre-school education and childcare has remained universal in nature. However, within the half of spending that is targeted expenditure, there has been overall a strong shift in the proportion of spending away from means-tested support targeted at low-income working families towards programmes targeted towards working families in general. This has largely been driven by the extension of the free childcare entitlement from 15 to 30 hours for 3- and 4-year-olds living in working families as well as by the tax-free childcare scheme.

Figure 22. Share of early education and childcare subsidies targeted at different groups



Note: 'Universal' refers to spending on the universal 3- and 4-year-old free entitlement. Childcare support targeted at low-income families includes the 2-year-old free entitlement, and support for low-income working families comprises childcare subsidies in the benefits system. Support targeted at working families includes the extended entitlement for 3- and 4-year-olds and the cost of employer-supported childcare and tax-free childcare.

Source: Figure 5 at https://ifs.org.uk/education-spending/early-years.

More broadly, the shift towards subsidies for working families reflects the fact that early education and childcare have been heavily used as a policy tool to raise maternal labour supply as well as a tool for improving children's outcomes. This heavy shift towards working subsidies has been criticised by some as highly regressive, with concerns as to whether they are reaching the families most in need.

Despite these major increases in early years investment, our analysis in Section 7 has shown that inequalities in early cognitive and socio-emotional development remained stubbornly persistent over the past two decades, with some scant evidence of a possible widening in recent years. While it is impossible to assess the counterfactual – how much inequalities would have risen in the absence of these policies – overall this lack of progress may not be all that surprising, given the evidence presented in this chapter.

In particular, the strong focus of policy has been on early education and childcare, mostly for children aged 2+, with limited direct targeting at disadvantaged families, and with a much reduced emphasis on the family since 2010. By contrast, the evidence presented in this chapter shows the central role of the family and the importance of the early infancy period, with stark inequalities already present by age 3. The centrality of early education and childcare within early years public investments contrasts with evidence we presented in Section 4 of the limited role of time spent in formal care in determining development by the age of 3 (though we did not examine differences in quality – although that has not been a clear focus of more recent policy either) and the relative importance of home environments.

Income and housing policies

Our chapter has also highlighted the important role of income (see discussion in Section 4), yet the real-terms cuts in means-tested benefits and tax credits beyond those badged as childcare subsidies are another important – yet sometimes overlooked – feature of government policy affecting families with young children in recent years. The effects of benefit cuts now being felt are especially severe among large families with young children due to the two-child limit that applies to families with more than two children born since April 2017, although families with fewer children are also adversely affected by broader benefit cuts, including real-terms freezes in working-age benefits over several years and a reduction in the overall benefit cap. Collectively, these have led to increases in relative child poverty over a decade or so, the first increase sustained over such an extended period since the 1990s, with current levels of child poverty at their highest in decades, with the rise in children in extreme poverty of particular concern (Hood and Waters, 2017; Waters, 2019; Cribb et al., 2021).

This chapter has also evidenced important inequalities in housing: Section 3 showed that around nine in ten 3-year-old children in the richest group in MCS lived in a home that was owned, compared with just two in ten in the poorest group; black families were least likely of all ethnic groups to be homeowners and most likely to live in social housing; and stark differences in homeownership exist between single-parent and two-parent families. As we saw in Section 7, rates of homeownership had dropped remarkably (and rates of private renting had increased) among families with young children over the decade gap between the MCS (born 2000–02) and SEED (born 2010–12). At the extreme end, at the end of September 2021, there were around 96,000 households living in temporary accommodation, and around three-fifths of these were families with children (Wilson and Barton, 2022). More broadly, the housing affordability crisis in the UK is accentuating social segregation even more and is further reducing access to better neighbourhoods and high-quality schools for low-income groups, as well creating insecurity and

instability for the increased volume of families renting. This needs urgent action: we know from the US 'Moving to Opportunity' experiment that moving to a lower-poverty neighbourhood when children are young has major beneficial long-term effects, increasing college attendance and earnings and reducing single-parenthood rates (Chetty, Hendren and Katz, 2016). Whilst this finding applies to families who move when they have a child below age 13 (with no or even detrimental effects as adolescents), it shows that the effects are linear with age, so the younger we intervene the better.

Genetic influences on early development and policy implications

A question that may be raised by our analysis of genetic influences on child development is about the policy implications of this. We emphasise that, counter to the notion of 'nature versus nurture', a finding of genetic influences does not imply that social policies cannot affect child development. First, changes in environments can and do alter associations between genes and outcomes. A classic example is myopia (short-sightedness), which is genetically influenced, yet its negative effects can be ameliorated using glasses. Another example, from the UK context, comes from a 1972 policy reform that increased the school-leaving age from 15 to 16. This additional schooling led to a decrease in unhealthy body size, particularly among those at the highest genetic risk for obesity (Barcellos, Carvalho and Turley, 2018). The reform thereby reduced health inequalities related to genetic risk for obesity. Second, our findings of gene–environment interplay suggest that genes influence child development partly through children's environments, such as the availability of learning materials in the home. These aspects of children's environments are modifiable through policy interventions, some of which we reviewed in Section 4).

9. Concluding comments

In conclusion, our chapter and the wider literature have underscored that the central influence on children's development during the early years is within the family home, and in particular the primary carer(s) who, through the emotional environments they are able to provide, exert a profound and lasting influence on children's emotional regulation and subsequent behaviour, interactions and relationships; and who also have a profound influence on cognitive development, including through nurturing, cognitive stimulation and play.

We have argued that reducing inequalities in early childhood requires intervention at multiple levels – focusing not just on narrow measures of skills (such as school readiness) in the years just prior to primary school, but on children's environments throughout the early years. This requires **early parenting support from birth**, centred on attachment and parent–child relationships, identifying and recognising any barriers parents face in developing nurturing relationships with their children, and helping them to overcome them. This would also include much stronger **mental health care** that is of high quality and with a far stronger focus than at present on detection and treatment among mothers (and, while not an explicit feature of our own analysis, fathers) in this period of infancy. We have also argued that intervention is needed not just directly on family environments themselves, but on major structural factors too, such as **reducing child poverty** through a strong welfare state and ensuring a **housing policy that creates stable and high-quality housing and neighbourhoods**, in order to create the stability and safety that are needed for healthy development. Addressing such inequalities early, and at their roots, would have lasting benefits throughout life and have positive spillovers onto many other aspects of inequalities that are addressed in the IFS Deaton Review.

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Appendix. Additional results

Appendix Table 1. Estimates of multivariate models of cognitive development, age 3

	(1)	(2)	(3)	(4)
Sample	**All**	**Whites only**	**Whites only**	**Whites only**
			Those with non-missing genetic data only	
Control for genetic endowment	**No**	**No**	**No**	**Yes**
Child characteristics				
Male	−0.202***	−0.212***	−0.204***	−0.202***
	(0.020)	(0.021)	(0.030)	(0.029)
First born	0.311***	0.317***	0.343***	0.338***
	(0.023)	(0.024)	(0.034)	(0.034)
Race/ethnicity (ref = white)				
Black	−0.079			
	(0.088)			
Indian	−0.194*			
	(0.102)			
Pakistani or Bangladeshi	−0.622***			
	(0.067)			
Mixed	0.025			
	(0.063)			
Other	−0.055			
	(0.207)			
Family/parent characteristics				
Maternal age at child's birth (ref = 19 or lower)				
20–29	0.169***	0.178***	0.143*	0.145**
	(0.047)	(0.049)	(0.073)	(0.073)
30–39	0.229***	0.224***	0.138*	0.126
	(0.050)	(0.052)	(0.077)	(0.077)
40 or over	0.293***	0.351***	0.286**	0.266**
	(0.087)	(0.087)	(0.128)	(0.127)
Maternal BMI	−0.008***	−0.008***	−0.008**	−0.007**
	(0.002)	(0.002)	(0.003)	(0.003)
One-parent household	−0.102**	−0.090**	−0.007	0.007
	(0.040)	(0.042)	(0.066)	(0.066)
Educational environment				
Maternal linguistic skills	0.036***	0.038***	0.041***	0.037***
	(0.003)	(0.004)	(0.005)	(0.005)
Maternal highest educational qualifications (ref = GCSEs or lower)				

A-level	0.054*	0.043	0.025	0.015
	(0.028)	(0.030)	(0.042)	(0.042)
Degree or higher	0.169***	0.154***	0.126***	0.109***
	(0.026)	(0.027)	(0.038)	(0.038)
Other	0.017	0.060	0.072	0.007
	(0.238)	(0.305)	(0.490)	(0.463)
Home learning environment index	0.137***	0.139***	0.145***	0.142***
	(0.010)	(0.011)	(0.015)	(0.015)
Proportion of first three years in formal childcare	0.110**	0.076*	0.033	0.024
	(0.043)	(0.044)	(0.064)	(0.064)
Emotional environment				
Inter-parental conflict	0.010	0.009	–0.001	0.001
	(0.012)	(0.012)	(0.017)	(0.016)
Maternal psychological distress	–0.008	–0.013	0.003	0.002
	(0.012)	(0.012)	(0.018)	(0.018)
Parent–child closeness	0.083***	0.081***	0.076***	0.076***
	(0.012)	(0.013)	(0.019)	(0.019)
Parent–child conflict	–0.050***	–0.046***	–0.047***	–0.044***
	(0.011)	(0.012)	(0.016)	(0.016)
Bedtime regularity (ref = never)				
Usually	0.073	0.049	0.140**	0.129*
	(0.048)	(0.051)	(0.070)	(0.070)
Often	0.173***	0.144***	0.229***	0.217***
	(0.041)	(0.044)	(0.059)	(0.058)
Always	0.262***	0.237***	0.297***	0.285***
	(0.041)	(0.043)	(0.058)	(0.058)
Material environment				
Overcrowding index	–0.076***	–0.076***	–0.055**	–0.052**
	(0.016)	(0.017)	(0.024)	(0.023)
Housing type (ref = homeowner)				
Social renter	–0.146***	–0.173***	–0.195***	–0.184***
	(0.034)	(0.036)	(0.052)	(0.052)
Private renter	–0.122***	–0.125***	–0.109	–0.101
	(0.047)	(0.048)	(0.073)	(0.074)
Other	0.069	0.076	0.009	0.010
	(0.067)	(0.071)	(0.098)	(0.098)
Genetic endowment				
Education polygenic score				0.090***
				(0.016)
Observations	10,146	9,245	4,648	4,648
R-squared	0.226	0.215	0.203	0.210

Note and source: See next page.

Note and source for Appendix Table 1

Note: This table reports the estimates of multivariate regressions where the dependent variable is a measure of cognitive development at age 3. The first column reports estimates of this model on the white and non-white sample. The second column reports estimates of the same model on the white sample only. The third column reports estimates of the same model on the white sample for which polygenic scores for educational attainment can be computed. The fourth column reports estimates of a model that also controls for the child's education polygenic score (in addition to all of the same covariates included in the model reported in the first three columns) and that is estimated on the white sample for which polygenic scores for educational attainment can be computed. Regressions are weighted so that estimates are representative of the UK population. Robust standard errors are given in parentheses. *** p<0.01, ** p<0.05, * p<0.1. More details about the measures used as dependent variable and as covariates are available in Box 2 and Box 3, respectively. Details about the polygenic score are available in Box 4.

Source: Authors' calculations from Millennium Cohort Study wave 2.

Appendix Table 2. Estimates of multivariate models of emotional and behavioural difficulties, age 3

	(1)	(2)	(3)	(4)
Sample	**All**	**Whites only**	**Whites only**	**Whites only**
			Those with non-missing genetic data only	
Control for genetic endowment	**No**	**No**	**No**	**Yes**
Child characteristics				
Male	0.138*** (0.017)	0.141*** (0.018)	0.136*** (0.025)	0.135*** (0.025)
First born	–0.019 (0.019)	–0.016 (0.020)	–0.004 (0.028)	–0.002 (0.028)
Race/ethnicity (ref = white)				
Black	–0.108* (0.063)			
Indian	0.257*** (0.066)			
Pakistani or Bangladeshi	0.406*** (0.065)			
Mixed	0.002 (0.053)			
Other	–0.207 (0.169)			
Family/parent characteristics				
Maternal age at child's birth (ref = 19 or lower)				
20–29	–0.119*** (0.045)	–0.125*** (0.047)	–0.043 (0.067)	–0.044 (0.066)
30–39	–0.210*** (0.047)	–0.206*** (0.049)	–0.121* (0.070)	–0.114 (0.070)
40 or over	–0.195*** (0.072)	–0.167** (0.079)	–0.161 (0.106)	–0.150 (0.105)
Maternal BMI	0.006*** (0.002)	0.007*** (0.002)	0.008*** (0.003)	0.008** (0.003)
One-parent household	0.004 (0.034)	0.002 (0.036)	0.007 (0.052)	–0.001 (0.052)
Educational environment				
Maternal linguistic skills	–0.016*** (0.003)	–0.016*** (0.003)	–0.017*** (0.004)	–0.014*** (0.004)
Maternal highest educational qualifications (ref = GCSEs or lower)				

A-level	−0.075*** (0.025)	−0.075*** (0.026)	−0.076** (0.037)	−0.071* (0.037)
Degree or higher	−0.147*** (0.022)	−0.152*** (0.023)	−0.132*** (0.032)	−0.123*** (0.032)
Other	−0.569*** (0.097)	−0.583*** (0.115)	−0.537*** (0.152)	−0.501*** (0.143)
Home learning environment index	−0.052*** (0.009)	−0.052*** (0.009)	−0.064*** (0.013)	−0.062*** (0.013)
Proportion of first three years in formal childcare	−0.144*** (0.035)	−0.144*** (0.037)	−0.232*** (0.053)	−0.227*** (0.053)
Emotional environment				
Inter-parental conflict	0.030*** (0.010)	0.032*** (0.010)	0.019 (0.014)	0.019 (0.014)
Maternal psychological distress	0.096*** (0.011)	0.094*** (0.012)	0.078*** (0.017)	0.079*** (0.017)
Parent–child closeness	−0.137*** (0.013)	−0.130*** (0.014)	−0.135*** (0.020)	−0.135*** (0.020)
Parent–child conflict	0.468*** (0.010)	0.462*** (0.011)	0.454*** (0.015)	0.452*** (0.015)
Bedtime regularity (ref = never)				
Usually	−0.130*** (0.047)	−0.125** (0.050)	−0.137* (0.070)	−0.130* (0.070)
Often	−0.218*** (0.041)	−0.202*** (0.044)	−0.149** (0.062)	−0.141** (0.062)
Always	−0.246*** (0.041)	−0.238*** (0.043)	−0.187*** (0.061)	−0.181*** (0.061)
Material environment				
Overcrowding index	0.036*** (0.013)	0.032** (0.014)	0.043** (0.022)	0.041* (0.021)
Housing type (ref = homeowner)				
Social renter	0.104*** (0.031)	0.102*** (0.032)	0.110** (0.046)	0.104** (0.046)
Private renter	0.035 (0.037)	0.025 (0.039)	0.063 (0.055)	0.059 (0.055)
Other	0.006 (0.058)	−0.015 (0.062)	−0.018 (0.076)	−0.019 (0.075)
Genetic endowment				
Education polygenic score				−0.051*** (0.013)
Observations	10,146	9,245	4,648	4,648
R-squared	0.443	0.431	0.416	0.418

Note and source: See next page.

Note and source for Appendix Table 2

Note: This table reports the estimates of multivariate regressions where the dependent variable is a measure of emotional and behavioural difficulties at age 3. The first column reports estimates of this model on the white and non-white sample. The second column reports estimates of the same model on the white sample only. The third column reports estimates of the same model on the white sample for which polygenic scores for educational attainment can be computed. The fourth column reports estimates of a model that also controls for the child's education polygenic score (in addition to all of the same covariates included in the model reported in the first three columns) and that is estimated on the white sample for which polygenic scores for educational attainment can be computed. Regressions are weighted so that estimates are representative of the UK population. Robust standard errors are given in parentheses. *** p<0.01, ** p<0.05, * p<0.1. More details about the measures used as dependent variable and as covariates are available in Box 2 and Box 3, respectively. Details about the polygenic score are available in Box 4.

Source: Authors' calculations from Millennium Cohort Study wave 2.

Appendix Table 3. Comparison of estimates of univariate and multivariate models of cognitive development and emotional and behavioural difficulties, age 3

	(1)	(2)	(3)	(4)
Dependent variable	**Cognitive development**		**Emotional and behavioural difficulties**	
Type of regression	**Univariate**	**Multivariate**	**Univariate**	**Multivariate**
Child characteristics				
Male	−0.250***	−0.202***	0.196***	0.138***
	(0.023)	(0.020)	(0.023)	(0.017)
First born	0.352***	0.311***	0.015	−0.019
	(0.023)	(0.023)	(0.023)	(0.019)
Race/ethnicity (ref = white)				
Black	−0.412***	−0.079	0.033	−0.108*
	(0.096)	(0.088)	(0.091)	(0.063)
Indian	−0.176	−0.194*	0.155	0.257***
	(0.116)	(0.102)	(0.114)	(0.066)
Pakistani or Bangladeshi	−0.898***	−0.622***	0.746***	0.406***
	(0.077)	(0.067)	(0.089)	(0.065)
Mixed	−0.021	0.025	0.073	0.002
	(0.073)	(0.063)	(0.073)	(0.053)
Other	−0.207	−0.055	0.048	−0.207
	(0.180)	(0.207)	(0.222)	(0.169)
Family/parent characteristics				
Maternal age at child's birth (ref = 19 or lower)				
20–29	−0.149***	0.169***	0.224***	−0.119***
	(0.023)	(0.047)	(0.023)	(0.045)
30–39	0.230***	0.229***	−0.349***	−0.210***
	(0.023)	(0.050)	(0.022)	(0.047)
40 or over	0.175**	0.293***	−0.200***	−0.195***
	(0.080)	(0.087)	(0.070)	(0.072)
Maternal BMI	−0.008***	−0.008***	0.005	0.006***
	(0.003)	(0.002)	(0.003)	(0.002)
One-parent household	−0.356***	−0.102**	0.376***	0.004
	(0.033)	(0.040)	(0.035)	(0.034)
Educational environment				
Maternal linguistic skills	0.034***	0.036***	−0.024***	−0.016***
	(0.002)	(0.003)	(0.002)	(0.003)
Maternal highest educational qualifications (ref = GCSEs or lower)				
A-level	0.005	0.054*	−0.009	−0.075***
	(0.029)	(0.028)	(0.029)	(0.025)

Degree or higher	0.494*** (0.023)	0.169*** (0.026)	−0.403*** (0.022)	−0.147*** (0.022)
Other	−0.221 (0.256)	0.017 (0.238)	−0.482*** (0.120)	−0.569*** (0.097)
Home learning environment index	0.230*** (0.011)	0.137*** (0.010)	−0.024*** (0.002)	−0.052*** (0.009)
Proportion of first three years in formal childcare	0.698*** (0.042)	0.110** (0.043)	−0.540*** (0.043)	−0.144*** (0.035)
Emotional environment				
Inter-parental conflict	−0.085*** (0.012)	0.010 (0.012)	0.182*** (0.012)	0.030*** (0.010)
Maternal psychological distress	−0.127*** (0.012)	−0.008 (0.012)	0.356*** (0.013)	0.096*** (0.011)
Parent–child closeness	0.204*** (0.013)	0.083*** (0.012)	−0.354*** (0.017)	−0.137*** (0.013)
Parent–child conflict	−0.118*** (0.011)	−0.050*** (0.011)	0.571*** (0.010)	0.468*** (0.010)
Bedtime regularity (ref = never)				
Usually	−0.326*** (0.036)	0.073 (0.048)	0.299*** (0.037)	−0.130*** (0.047)
Often	0.001 (0.023)	0.173*** (0.041)	−0.011 (0.023)	−0.218*** (0.041)
Always	0.237*** (0.023)	0.262*** (0.041)	−0.228*** (0.023)	−0.246*** (0.041)
Material environment				
Overcrowding index	−0.267*** (0.016)	−0.076*** (0.016)	0.170*** (0.015)	0.036*** (0.013)
Housing type (ref = homeowner)				
Social renter	−0.535*** (0.028)	−0.146*** (0.034)	0.533*** (0.031)	0.104*** (0.031)
Private renter	−0.222*** (0.049)	−0.122*** (0.047)	0.258*** (0.048)	0.035 (0.037)
Other	−0.012 (0.072)	0.069 (0.067)	0.137** (0.070)	0.006 (0.058)
Observations	10,146	10,146	10,146	10,146
R-squared		0.226		0.443

Note and source: See next page.

Note and source for Appendix Table 3

Note: This table reports the estimates of univariate and multivariate regressions where the dependent variable is a measure of cognitive development at age 3 (columns 1 and 2) and a measure of emotional and behavioural difficulties at age 3 (columns 3 and 4). Columns 1 and 3 report estimates of univariate regressions where these dependent variables are regressed on the variable indicated in the first column. Columns 2 and 4 report estimates of multivariate regressions where these dependent variables are regressed on all the variables in the first column at once. Regressions are weighted so that estimates are representative of the UK population. Robust standard errors are given in parentheses. *** p<0.01, ** p<0.05, * p<0.1. More details about the measures used as dependent variable and as covariates are available in Box 2 and Box 3, respectively.

Source: Authors' calculations from Millennium Cohort Study wave 2.

Appendix Table 4. Estimates of multivariate models of cognitive development, age 3, where blocks of covariates are added sequentially

	(1)	(2)	(3)	(4)	(5)	(6)
Child characteristics						
Male	–0.256*** (0.022)	–0.260*** (0.021)	–0.210*** (0.021)	–0.201*** (0.020)	–0.202*** (0.020)	–0.202*** (0.020)
First born	0.347*** (0.023)	0.468*** (0.023)	0.352*** (0.022)	0.356*** (0.022)	0.311*** (0.023)	0.292*** (0.024)
Race/ethnicity (ref = white)						
Black	–0.390*** (0.094)	–0.320*** (0.091)	–0.233*** (0.087)	–0.159* (0.086)	–0.079 (0.088)	–0.096 (0.089)
Indian	–0.209* (0.111)	–0.266** (0.107)	–0.190* (0.103)	–0.183* (0.102)	–0.194* (0.102)	–0.197** (0.100)
Pakistani or Bangladeshi	–0.873*** (0.076)	–0.825*** (0.075)	–0.650*** (0.065)	–0.615*** (0.066)	–0.622*** (0.067)	–0.592*** (0.066)
Mixed	–0.057 (0.072)	–0.012 (0.070)	–0.027 (0.065)	0.001 (0.063)	0.025 (0.063)	0.010 (0.063)
Other	–0.216 (0.185)	–0.241 (0.191)	–0.159 (0.207)	–0.122 (0.198)	–0.055 (0.207)	–0.064 (0.208)
Family/parent characteristics						
Maternal age at child's birth (ref = 19 or lower)						
20–29		0.435*** (0.046)	0.270*** (0.045)	0.201*** (0.046)	0.169*** (0.047)	0.148*** (0.047)
30–39		0.680*** (0.048)	0.371*** (0.047)	0.288*** (0.049)	0.229*** (0.050)	0.176*** (0.051)
40 or over		0.814*** (0.088)	0.423*** (0.087)	0.358*** (0.087)	0.293*** (0.087)	0.249*** (0.088)
Maternal BMI		–0.011*** (0.002)	–0.008*** (0.002)	–0.008*** (0.002)	–0.008*** (0.002)	–0.007*** (0.002)
One-parent household		–0.268*** (0.033)	–0.175*** (0.032)	–0.084** (0.037)	–0.102** (0.040)	–0.086** (0.040)
Educational environment						
Maternal linguistic skills			0.041*** (0.003)	0.038*** (0.003)	0.036*** (0.003)	0.033*** (0.003)

Maternal highest educational qualifications (ref = GCSEs or lower)						
A-level			0.100*** (0.029)	0.075*** (0.028)	0.054* (0.028)	0.047* (0.028)
Degree or higher			0.242*** (0.027)	0.204*** (0.026)	0.169*** (0.026)	0.136*** (0.027)
Other			0.020 (0.247)	0.002 (0.242)	0.017 (0.238)	0.007 (0.242)
Home learning environment index			0.161*** (0.010)	0.139*** (0.010)	0.137*** (0.010)	0.139*** (0.010)
Proportion of first three years in formal childcare			0.183*** (0.043)	0.154*** (0.042)	0.110** (0.043)	0.066 (0.043)
Emotional environment						
Inter-parental conflict				0.006 (0.012)	0.010 (0.012)	0.015 (0.012)
Maternal psychological distress				−0.018 (0.012)	−0.008 (0.012)	−0.004 (0.012)
Parent–child closeness				0.086*** (0.012)	0.083*** (0.012)	0.082*** (0.012)
Parent–child conflict				−0.051*** (0.011)	−0.050*** (0.011)	−0.052*** (0.011)
Bedtime regularity (ref = never)						
Usually				0.088* (0.048)	0.073 (0.048)	0.066 (0.047)
Often				0.196*** (0.041)	0.173*** (0.041)	0.161*** (0.041)
Always				0.290*** (0.041)	0.262*** (0.041)	0.247*** (0.041)
Material environment						
Overcrowding index					−0.076*** (0.016)	−0.054*** (0.016)
Housing type (ref = homeowner)						
Social renter					−0.146*** (0.034)	−0.111*** (0.034)
Private renter					−0.122*** (0.047)	−0.099** (0.046)

Other					0.069 (0.067)	0.088 (0.067)
Family income (£ thousand)						0.475*** (0.069)
Observations	10,146	10,146	10,146	10,146	10,146	10,146
R-squared	0.063	0.114	0.197	0.219	0.226	0.232

Note: Each column of this table reports the estimates of different multivariate models where the dependent variable is a measure of cognitive development at age 3 and blocks of covariates are inserted sequentially. Regressions are weighted so that estimates are representative of the UK population. Robust standard errors are given in parentheses. *** p<0.01, ** p<0.05, * p<0.1. More details about the measures used as dependent variable and as covariates are available in Box 2 and Box 3, respectively.

Source: Authors' calculations from Millennium Cohort Study wave 2.

Appendix Table 5. Estimates of multivariate models of behavioural and emotional difficulties, age 3, where blocks of covariates are added sequentially

	(1)	(2)	(3)	(4)	(5)	(6)
Child characteristics						
Male	0.196*** (0.023)	0.200*** (0.022)	0.163*** (0.022)	0.137*** (0.017)	0.138*** (0.017)	0.138*** (0.017)
First born	0.018 (0.023)	–0.111*** (0.023)	–0.019 (0.023)	–0.041** (0.019)	–0.019 (0.019)	–0.009 (0.019)
Race/ethnicity (ref = white)						
Black	0.044 (0.089)	–0.028 (0.087)	–0.062 (0.086)	–0.062 (0.062)	–0.108* (0.063)	–0.098 (0.063)
Indian	0.174 (0.112)	0.229** (0.111)	0.220** (0.112)	0.251*** (0.066)	0.257*** (0.066)	0.258*** (0.065)
Pakistani or Bangladeshi	0.756*** (0.089)	0.698*** (0.087)	0.589*** (0.085)	0.400*** (0.064)	0.406*** (0.065)	0.390*** (0.065)
Mixed	0.090 (0.073)	0.050 (0.070)	0.062 (0.069)	0.016 (0.054)	0.002 (0.053)	0.010 (0.053)
Other	0.074 (0.215)	0.093 (0.202)	0.042 (0.200)	–0.174 (0.174)	–0.207 (0.169)	–0.202 (0.170)
Family/parent characteristics						
Maternal age at child's birth (ref = 19 or lower)						
20–29		–0.442*** (0.053)	–0.311*** (0.053)	–0.139*** (0.044)	–0.119*** (0.045)	–0.108** (0.045)
30–39		–0.734*** (0.054)	–0.508*** (0.055)	–0.245*** (0.046)	–0.210*** (0.047)	–0.181*** (0.047)
40 or over		–0.758*** (0.086)	–0.483*** (0.085)	–0.233*** (0.072)	–0.195*** (0.072)	–0.171** (0.073)
Maternal BMI		0.011*** (0.003)	0.009*** (0.003)	0.007*** (0.002)	0.006*** (0.002)	0.006*** (0.002)
One-parent household		0.245*** (0.036)	0.174*** (0.035)	0.003 (0.033)	0.004 (0.034)	–0.004 (0.034)
Educational environment						
Maternal linguistic skills			–0.020*** (0.004)	–0.017*** (0.003)	–0.016*** (0.003)	–0.014*** (0.003)

Maternal highest educational qualifications (ref = GCSEs or lower)						
A-level			−0.131*** (0.031)	−0.087*** (0.025)	−0.075*** (0.025)	−0.071*** (0.025)
Degree or higher			−0.226*** (0.027)	−0.167*** (0.022)	−0.147*** (0.022)	−0.129*** (0.022)
Other			−0.712*** (0.117)	−0.563*** (0.099)	−0.569*** (0.097)	−0.564*** (0.098)
Home learning environment index			−0.124*** (0.011)	−0.052*** (0.009)	−0.052*** (0.009)	−0.053*** (0.009)
Proportion of first three years in formal childcare			−0.168*** (0.044)	−0.169*** (0.035)	−0.144*** (0.035)	−0.121*** (0.036)
Emotional environment						
Inter-parental conflict				0.033*** (0.009)	0.030*** (0.010)	0.028*** (0.010)
Maternal psychological distress				0.101*** (0.011)	0.096*** (0.011)	0.093*** (0.011)
Parent–child closeness				−0.139*** (0.013)	−0.137*** (0.013)	−0.136*** (0.013)
Parent–child conflict				0.468*** (0.010)	0.468*** (0.010)	0.469*** (0.010)
Bedtime regularity (ref = never)						
Usually				−0.137*** (0.047)	−0.130*** (0.047)	−0.127*** (0.047)
Often				−0.231*** (0.041)	−0.218*** (0.041)	−0.212*** (0.041)
Always				−0.262*** (0.041)	−0.246*** (0.041)	−0.238*** (0.041)
Material environment						
Overcrowding index					0.036*** (0.013)	0.024* (0.013)
Housing type (ref = homeowner)						
Social renter					0.104*** (0.031)	0.086*** (0.031)
Private renter					0.035 (0.037)	0.023 (0.037)

Other					0.006 (0.058)	−0.004 (0.058)
Family income (£ thousand)						−0.252*** (0.055)
Observations	10,146	10,146	10,146	10,146	10,146	10,146
R-squared	0.020	0.076	0.120	0.441	0.443	0.445

Note: Each column of this table reports the estimates of different multivariate models where the dependent variable is a measure of emotional and behavioural difficulties at age 3 and blocks of covariates are inserted sequentially. Regressions are weighted so that estimates are representative of the UK population. Robust standard errors are given in parentheses. *** p<0.01, ** p<0.05, * p<0.1. More details about the measures used as dependent variable and as covariates are available in Box 2 and Box 3, respectively.

Source: Authors' calculations from Millennium Cohort Study wave 2.