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Maternal Education, Changing Family Circumstances, and Children's Skill Development in the United States and UK

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Abstract

Among the core dimensions of socioeconomic status, maternal education is the most strongly associated with children's cognitive development, and is a key predictor of other resources within the family that strongly predict children's well-being: economic insecurity, family structure, and maternal depression. Most studies examine these circumstances in isolation of one another and/or at particular points in time, precluding a comprehensive understanding of how the family environment evolves over time and contributes to educational disparities in children's skill development and learning. In addition, very little research examines whether findings observed among children in the United States can be generalized to children of a similar age in other countries. We use latent class analysis and data from two nationally representative birth cohort studies that follow children from birth to age five to examine two questions: 1) how do children's family circumstances evolve throughout early childhood, and 2) to what extent do these trajectories account for the educational gradient in child skill development? Cross-national analysis reveals a good deal of similarity between the U.S. and U.K. in patterns of family life during early childhood, and in the degree to which those patterns contribute to educational inequality in children's skill development.

Introduction

Socioeconomic status during childhood has important consequences for children's development and opportunities for social mobility. Among the key findings of the Coleman report was that, much to the surprise of government sponsors and researchers, the strongest predictor of students' performance was their parents' education and social background; in comparison, the influence of educational resources was weak to nonexistent. The finding that student achievement differences *within* schools were as large or larger than differences between schools suggested to many observers that schools were not the great equalizers that offset the substantial inequalities between children. In that vein, socioeconomic status (SES) inequality in children's skill development is present well before they enter school, and the

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degree of inequality increases throughout childhood and adolescence (Adler et al. 1994; Currie and Stabile 2003; Finch 2003; Duncan, Ziol-Guest and Kalil 2010). Among the core dimensions of SES (occupation, income and education), maternal education shows the strongest association with children's cognitive development (Harding, Morris and Hughes 2015; Reardon 2011), and is a key predictor of other resources within the family that strongly predict children's well-being: economic insecurity, family structure, and maternal depression. Today, parents with low levels of education not only face more economic insecurity than they did in the past, but they are also more likely to raise their children in unstable family environments (McLanahan 2004). Mothers with low levels of education are also more likely to suffer from mental health problems, such as depression, making it harder for them to care for their child (Kiernan and Huerta 2008; Meadows et al. 2008).

Although existing research documents important associations between maternal education and each of the components described above, most studies examine these circumstances in isolation of one another and/or at particular points in time, precluding a comprehensive understanding of how the family environment evolves over time and how it contributes to educational disparities in children's skill development. In addition, very little research examines whether findings observed among children in the United States can be generalized to children of a similar age in other countries. Great Britain provides a useful point of comparison to the United States because of country differences in the provision of social services affecting children and families, along with many demographic and cultural similarities. In this paper, we use data from two nationally representative birth cohort studies that follow children from birth to age five—the American *Fragile Families and Child Wellbeing Study* (FFS), and the British *Millennium Cohort Study* (MCS)—to examine two questions: 1) how do children's family circumstances evolve throughout early childhood, and 2) to what extent do these trajectories account for the educational gradient in children's cognitive development? To address these questions we use latent class trajectory analysis to construct longitudinal measures of family income, family structure and maternal depression throughout early childhood that take account of the duration and stability of each circumstance, and to examine the extent to which these trajectories explain the educational gradient in children's cognitive development.

Background

Maternal Education, Family Circumstances and Child Well-Being

Although much of our understanding of the educational “gradient” in well-being comes from research on adults, growing evidence points to similar patterns among children. The appearance of disparities so early in life has led to an increased recognition that the reproduction of intergenerational inequality begins at a very young age (Jonsson 2010). Among the core dimensions of SES (occupation, income and education), maternal education is most strongly associated with children's health, behavior and cognitive development (Harding, Morris and Hughes 2015; Reardon 2011). Moreover, education is a strong—increasingly strong—predictor of other important developmental resources within the family: education shapes children's cognitive development by shaping their family lives, including their income, family structure and parents' mental health. The strong

contemporary association between parental education and the broader family environment has important implications for children's social mobility.

Rising income inequality in recent decades has motivated research on family income and its relationship with children's development, with some evidence suggesting that the independent effects of income on children's development have increased in recent years (Reardon 2011). Income-based inequalities in children's learning are present at the beginning of the school years, a troubling fact given the strong correlations among achievement, completed schooling and economic status (Duncan, Ziol-Guest and Kalil 2010). While income likely exerts independent effects on children's development, it is also strongly predicted by education (Goldin and Katz 1999).

Alongside research on the effects of income is a rich literature documenting the effects of family structure and stability on children's development in many countries, including the United States, United Kingdom, Australia, Canada, Germany and Sweden (e.g., Amato 2005; Bernardi 2013; Kiernan and Mensah 2010; McLanahan, Tach and Schneider 2013; Sigle-Rushton and McLanahan 2004). Children who live apart from their biological father are less likely than their peers to graduate from high school and college (Brown 2004; Cherlin et al. 1991; McLanahan and Sandefur 1994), more likely to be unemployed or out of the labor force, and more likely to become teen parents (Kiernan and Hobcraft 1997; Wu 1996). These children exhibit more withdrawn, anxious and aggressive behavior in early childhood (Amato 2001; Chase-Lansdale, Cherlin and Kiernan 1995; Jekielek 1998; McCulloch et al. 2000), and they are more likely to smoke, drink heavily and use drugs in adolescence (Amato 2001; Estauigh and Power, 1991). More recent research indicates that family instability, defined as changes in parents' relationship status, is also associated with a host of negative child outcomes. (Fomby and Cherlin 2007; McLanahan and Beck 2010). Part of the association between family structure/instability and poor child outcomes is due to low levels of education among women who become single mothers. For example, increasing union dissolution, non-marital childbearing and single motherhood are now concentrated most heavily among poorly educated families (Edin and Kefalas 2005; Ellwood and Jencks 2004; Loughran 2002; Martin 2004; McLanahan and Percheski 2008). Another part is due to family circumstances that are a consequence of father absence, including poverty, residential instability and parenting stress (McLanahan, Tach and Schneider 2013).

Finally, ample research documents the association between maternal depression and children's well-being (National Research Council and Institute of Medicine 2009). Children raised by depressed mothers are also more likely to exhibit behavior problems, particularly externalizing behavior, and to show more problems with educational development, including language and cognitive deficits (Brennan et al. 2000; Pettersen and Albers 2001; Kiernan and Huerta, 2009). As is the case for income and family structure, mothers who suffer from depression have lower levels of SES (Kessler, 1982), with the association between educational attainment and depression being particularly well documented. Mothers with less education not only experience more depressive symptoms, but their depression is also more severe (McLoyd, 1998; Mirowsky and Ross 2003; Meadows et al 2008).

In addition to their independent associations with parental education and child well-being, these different domains of family life—income, family structure and maternal depression—also affect one another (e.g., Kiernan and Mensah 2009; Meadows, McLanahan and Brooks-Gunn 2008; Mollborn 2016). Poverty, for example, is associated with greater family instability and maternal depression, both of which independently affect poverty. The disproportionate concentration, and frequent co-occurrence, of poverty, single motherhood, and less supportive relationships among families with low-educated mothers has led to speculation that the composition and content of family life provide the central explanation for large and persistent (or, in some cases, increasing) gaps in cognitive skills between children in different socioeconomic groups (e.g., Heckman 2008).

Temporal Dimensions of the Relationship between Family Circumstances and Child Development

Existing research demonstrates a strong relationship between maternal education and family circumstances, and between family circumstances and children's development, establishing the importance of both material resources and family relationships for children. Implicit in much existing work is the idea that family circumstances play an important role in explaining the educational gradient in both early childhood outcomes, and in the persistence of gaps throughout childhood. Despite speculation, however, little research takes account of the temporal dimension of children's exposure to multidimensional family circumstances (but see Mollborn 2016), and little is known about whether family circumstances throughout early childhood explain the persistent educational gradient in skill development. Life course theory emphasizes the possibility that circumstances across ages may have differing and combined effects on childhood and adulthood outcomes, pointing to the importance of the timing, duration and stability of a circumstance (Ben-Schlomo and Kuh 2002; Ferraro et al. 2009; Schoon et al. 2002).

With respect to duration and stability, if children in more highly-educated families experience a longer duration of positive economic, family structure and mental health circumstances, as well as greater stability in those resources, they may be less likely to experience the compounding developmental effects of family disadvantage. There is ample evidence, for example, that *chronic* exposure to poverty is particularly detrimental for children, to the extent that it persistently increases exposure to stressors and limits opportunities for human capital development, social and economic advancement (McLeod and Shanahan 1996; Wagmiller et al. 2006). Similarly, continuously married mothers are in better mental and physical health than single mothers (Meadows, McLanahan and Brooks-Gunn 2008). *Instability* in family circumstances during childhood is also associated with poorer development among children several years later—moving in and out of poverty is negatively associated with high school graduation (Lee 2014), and family structure instability during the first few years of childhood is negatively associated with mothers' mental health and stress (Cavanaugh and Huston 2008; Meadows, McLanahan and Brooks-Gunn 2008).

The effects of instability may intersect with those of timing, to the extent that transitioning in or out of a more disadvantaged circumstance (e.g., moving out of poverty) implies

exposure to that circumstance during a more or less sensitive period of development. A growing body of evidence demonstrates that disadvantage during very early childhood has a durable impact on development because it hampers cognitive development during critical or sensitive periods of development (Jackson 2010; Palloni 2006; Torche 2011). In this vein, a growing number of studies consider the dynamics of economic disadvantage and child development, demonstrating important effects of the timing of poverty and economic disadvantage (Holmes and Kiernan 2013; Lee 2014; Wagmiller et al. 2006; Lee 2014). Similarly, prior work has examined the importance of the timing of exposure to different family structures, focusing on the timing and type of different transitions (Kiernan and Mensah 2010; Lee and McLanahan 2015; Osborne and McLanahan 2007). While there is compelling evidence that both early childhood and middle/late childhood circumstances are associated with child outcomes, the preponderance of evidence suggests that *early* exposure to family disadvantage may be more important than later exposure (e.g., Duncan et al. 1998). Because education is associated with greater economic resources, higher levels of biological father involvement, and better mental health among mothers, children in more highly-educated families may be less likely to experience economic disadvantage, single motherhood and maternal depression during early childhood (Duncan, Ziol-Guest and Kalil 2010).

A Comparative Lens on Family Circumstances and Child Well-Being

An important benefit of this study is its cross-national approach, which reveals whether findings observed among children in the U.S.—which comprise the majority of research on this topic—can be replicated among children of a similar age in Great Britain. Great Britain provides a useful comparison because of variation in the provision of social services affecting children and families, despite many demographic and cultural similarities to the United States. The U.S. and U.K. share similar socioeconomic and cultural profiles, despite differences in their population composition and social policies. Both countries have racially and ethnically diverse populations and large immigrant communities, albeit from different sending countries (Hernandez, McCartney, and Blanchard 2009). In addition, both the U.S. and the U.K. have experienced similar economic and demographic changes during the past several decades. The two societies share patterns of family formation, with levels of non-marital birth and divorce that are higher in the U.S. but also high in the U.K. (Haskey 1996); both countries also exhibit a strong socioeconomic and racial/ethnic patterning to family structure. The two countries also share trends in social inequality: income inequality is higher in the U.S. (e.g., Banks, Blundell and Smith 2003) but levels in both societies are high and have increased over the last several decades.

Despite similar patterns of family formation (Kiernan et al. 2011) and income inequality (Banks, Blundell, and Smith 2003; Wilkinson and Pickett 2009), the two countries have different health care and social welfare systems, resulting in different levels of government support for children and families. The United Kingdom provides more universal health services than does the United States, including health care through the British National Health Service, home visits for new mothers, priority in scheduling medical appointments for children, and child centers with integrated childcare services. Welfare state policies in the

United Kingdom are also more generous than those in the United States with respect to family cash assistance, social housing, and childcare (Meyers and Gornick 2005).

Perhaps because of important institutional differences amidst many similarities, many studies compare broad patterns of inequality in the U.S. and U.K. as they relate to family formation, economic inequality, and social mobility (e.g., Banks et al. 2003; Kerckhoff 1993; Kiernan et al. 2011). While there is more research comparing macro-level processes in the U.S. and U.K., a growing body of research focuses on how micro-level processes at the family level influence children's development. Cross-sectional research shows that children's skill development is strongly predicted by maternal education, family income, family structure and maternal depression (Cherlin et al. 1991; Joshi et al. 1999; McCulloch et al. 2000; Parcel, Campbell and Zhong 2012). In addition, strong socioeconomic gradients in children's development exist in both countries (Banks et al. 2003). There is a dearth of research, however, that examines the dynamics of family circumstances in a multidimensional and longitudinal way.

In this paper we use longitudinal data and latent class analysis to identify the most prevalent trajectories of family circumstances throughout early childhood, to link these trajectories to children's cognitive development, and to examine their role in mediating the education gradient. Given existing cross-sectional research showing a strong relationship between family resources and child well-being, one plausible hypothesis is that we will observe a similar association between maternal education and child development across both countries, and a similar role of family resources in explaining the educational gradient in child development. In this case, maternal education and family economic and social capital may act as fundamental causes of children's development (e.g., Link and Phelan 1995; Olafsdottir 2007; Parcel, Campbell and Zhong 2012). At the same time, Esping-Anderson (2002) suggests that countries with stronger government investments in child and family services should exhibit a weaker relationship between family-level factors and child development, since government investments may compensate for a lack of resources among low-SES families. If true, we should observe a weaker relationship between maternal education and both family resources and child development in the U.K., as well as a weaker role for family-level processes in explaining the gradient (but see Parcel, Campbell and Zhong 2012 for contrasting evidence).

Data

Our analysis is based on two surveys: the Fragile Families and Child Wellbeing Study (FFS) in the United States, and the Millennium Cohort Study (MCS) in the United Kingdom. Both birth cohort studies are representative of national populations, contain rich longitudinal information on children's family environments, health and development, and oversample disadvantaged and ethnic minority families. The FFS follows approximately 5,000 children born between 1998 and 2000 in large U.S. cities, including a large oversample of births to unmarried parents. Mothers, and most fathers, were interviewed in the hospital soon after birth, with additional interviews at ages one, three, five and nine. When weighted, FFS data are representative of births in cities with populations over 200,000—we use weights in estimating descriptive statistics and trajectories. A key component of the FFS study design

was the use of a hospital-based sampling frame. By starting at the hospital, the FFS was able to obtain higher response rates than studies that sample from birth records and interview mothers in their homes.

The MCS is the fourth of Britain's national birth cohort studies. The first wave of the MCS took place during 2001–2002 and included 18,552 families and 18,818 cohort children. Information was first collected from parents when their children were nine months old, with follow-up interviews with the main caregiver (usually the mother) at ages three, five, and seven. The sample design included an overrepresentation of families living in areas with high proportions of child poverty or ethnic minority populations.

In both surveys, we use data through age 5, in order to maximize the comparability of the two surveys. Sensitivity analyses using similar outcomes at age 9 in the FFS yield highly similar results with respect to both family trajectories, as well as the association between family trajectories and cognitive development. Sensitivity analyses using outcomes at age 7 in this MCS data also show highly similar patterns of results, using a slightly different measure of cognitive skill.¹

Measures

Maternal Education—Our focal measure of socioeconomic status is maternal education, given compelling evidence that education predicts other resources in the family, as well as child development. Because education remains relatively fixed over the adult life course, it is also less likely than other measures to be affected by the dimensions of family circumstances we consider. In the United States, our measure of maternal education separates mothers with less than a high school education, a high school diploma, some college, and a college diploma or higher. In the United Kingdom, we use a comparable measure, separating mothers with no qualifications, Ordinary Level examinations (typically school leaving qualifications taken at age 16), A-level college entrance exams and vocational equivalents, and university degrees.

We treat children's well-being as a function of maternal education around the time of children's birth, plus family circumstances (family income, family structure and maternal depression) during early and middle childhood. We examine the shape of family trajectories in early and middle childhood, as well as the collective contribution of these dimensions to the size of the educational gradient.

Family Income—At each survey wave we measure family income using the household poverty ratio, which adjusts income for number of adults and children in the household. We construct binary categories, differentiating between children living in or near poverty and those with a higher income. Specifically, in both samples we distinguish between families with adjusted incomes below 200% of the federal poverty line (reference category) from families with adjusted incomes above the poverty line.²

¹The measure of cognitive development in the MCS at age 7 is the British Ability Scales Pattern Construction and Word Reading tests.

²Substantive results do not change when we use a slightly stricter definition of poverty/near poverty (175%).

Family Structure—To measure *family structure* at each wave, we use a binary measure in both samples differentiating between mothers who are living with their child's biological father (married or cohabiting) and mothers who are not living with the father. This measure affords clear examination of the composition and stability of family structure throughout early childhood and recognizes the importance of biological father involvement for children's development (Carlson 2006). We explore the sensitivity of the results to several alternative measures of family structure, including a binary measure that makes family structure at each age contingent on marriage (to the biological or social father), compared to cohabiting and single mothers; and a three-category measure of family structure that distinguishes mothers who are married/cohabiting with the biological father, married/cohabiting with a non-biological father and living alone. Results using these alternative measures are similar to those based on the original measure, and so we use the binary measure in final analyses.³ We also compare results with and without a control for the number of mother's romantic partnerships and observe identical findings. We do not include this measure in the final models because of concerns that it is conflated with our family structure trajectories, which also capture some aspects of relationship stability.

Maternal Depression—Finally, in both surveys we examine *maternal depression* as an indicator of maternal well-being.⁴ At each wave we distinguish between mothers who are depressed or not. In the FFS this measure is constructed from the Composite International Diagnostic Interview (CIDI)—Short Form, which includes items that comprise a score for Major Depression. In the MCS measures at each age are based on mothers' self-reports about whether they have been diagnosed with depression or anxiety. Maternal mental health is a commonly used indicator of mothers' ability to engage in stimulating parenting behavior, given the strong association between mental health and the content of parent-child relationships (Brooks-Gunn and Markman 2005). Moreover, maternal mental health is strongly predicted by family circumstances (e.g., Meadows, McLanahan and Brooks-Gunn 2008). In each survey we examine the extent to which available measures of mothers' engagement with children at each age correlate with depression, and find strong relationships across age and samples.

Child Cognitive Development—We measure *cognitive development* using the British Ability Scales Naming Vocabulary Test (MCS) and the Peabody Picture Vocabulary Test (FFS). We convert raw scores to z-scores to enable comparable and relative assessment.

Other Variables—We also measure several variables that are expected to be correlated with both family environments and child well-being, including maternal race/ethnicity, child sex, number of children in the household, and mothers' age at the time of the child's birth.

³Analyses using a three-category family structure measure identify a small cluster of children who experience a transition from a single-mother living arrangement to an arrangement with a non-biological father in the household, and larger clusters of children who are in stable family structure arrangements with or without the biological father. Regression results using three-category family structure trajectories, instead of binary marriage trajectories, produce identical results with respect to the magnitude of the educational gradient before and after measuring family structure trajectories.

⁴We also examine maternal physical health (on a self-reported scale) and results are similar to those examining depression.

Rather than drop children with missing information from a particular module within a wave, we use multiple imputation (five imputations, estimation via chained equations in Stata) to replace missing values on independent and dependent variables, based on predictions from the independent variables described above (Allison 2002). Values are not imputed if a child is entirely missing from a wave.

Analysis

The analysis proceeds in several steps. First, we use the measures described above to identify trajectories of family circumstances throughout early childhood that include family income, family structure and maternal depression. We use longitudinal latent class analysis (LCA) to identify trajectory classes of family types. Rather than analyzing the timing, duration, and stability of exposure to particular family circumstances separately, we apply LCA to simultaneously account for each of these temporal dimensions. Children's family circumstances at each age are time-ordered, permitting differentiation among the temporal dimensions of exposure (Jones and Nagin 2007; Muthén 2004). LCA identifies a latent categorical variable, C , that consists of a limited number of trajectory classes, j . LCA assumes a finite mixture of unobserved groups of individuals (i.e., latent classes), estimating the probability of falling into a trajectory class, j , of the latent variable C . LCA relaxes the assumptions of growth curve modeling, which assumes that all individuals are drawn from a single population and that the degree of deviation from the population mean intercept and slope captures individual variation.

We use this modeling strategy to find the best-fitting number of trajectories of family income, family structure and maternal depression from birth through age 5 in the FFS, and ages 1 through age 5 in the MCS.⁵ To determine the best-fitting number of latent class trajectories, we rely on substantive knowledge from previous research, as well as two statistical criteria: the Bayesian Information Criterion (BIC) and Entropy criteria (Raftery 1996). Models that provide a better fit to the data, and that are more parsimonious, produce a lower BIC value, and higher entropy values indicate better differentiation among trajectory classes. We use these criteria to compare models with two through five classes, for each family dimension (economic status, family structure and maternal depression). All descriptive and LCA results use national weights at age five.

After describing the evolution of family circumstances throughout early childhood, we estimate OLS regression models that examine the relationship between maternal education and children's well-being, while examining the mediating role of the family trajectories in explaining the educational gradient in each sample.

⁵We also estimate latent class growth analysis (LCGA) models, a variant of LCA models that impose a stricter functional form by estimating growth curve factors among each class, and specifying a functional form of the growth parameters prior to estimation. While the results are generally quite similar, we present LCA results because of their more flexible estimation.

Results

Describing the samples

Table 1 presents weighted descriptive statistics for each sample. Mothers in the FFS are more likely to be poorly educated than MCS mothers—29% with less than high school vs. 16% with no qualifications. FFS mothers are also slightly less likely than MCS mothers to have a college degree. The distribution of race/ethnicity in the FFS reflects the urban composition of the sample, with over half of mothers identifying as non-Hispanic black (35%) or Hispanic (29%). [About half of Hispanic mothers are immigrants from Mexico, which accounts for the high prevalence of US mothers with less than a high school degree.] In the MCS, the largest ethnic minority group is South Asians (9%), with smaller percentages of black (African and Caribbean, 4%) and other (3%), largely East Asian, mothers.

How do children's family circumstances evolve throughout early childhood?

Our first goal is to identify trajectories of family income, family structure and maternal depression that account for the timing, duration, and stability of exposure to each circumstance. Before presenting the trajectories, Table 2 shows model selection criteria for the LCA analyses. We proceed with the four-class model for family structure in both samples; a four-class model for economic status in the U.S., and three-class model in the U.K.; and a two-class model for maternal depression in both samples. Figures 1 and 2 show results from the longitudinal LCA.

Figures 1A and 2A show the estimated weighted probability of children's living with the biological father by age. For family structure, the best-fitting models include four trajectories in both the FFS and MCS samples. In both samples, inspection of these probabilities reveals four trajectory classes: a group with a consistently high probability of living with the biological father ("always living with the biological father"), a group with a consistently low probability of living with the biological father ("never lives with the biological father"), a group that has a low early probability that increases with age ("transitions to biological father"), and a group that has a high early probability that decreases with age ("transitions away from biological father"). Both samples experience similar patterns of timing, duration and stability of exposure to marriage. In the FFS, children who "always" live with the biological father (in either a married or cohabiting household) comprise 66% of children—among these children, the probability of living with the biological father is close to 1 at every age, meaning that these children experience a long duration, as well as a stable, exposure to the biological father. In the MCS, this group comprises about 57.5% of the sample.

The "never lived with biological father" group is smaller than the previous type but prevalent in both samples, at 15.4% in the FFS and 17.4% in the MCS. This group of children has a very low probability of living with the biological father at every age, meaning that they experience a long and stable duration of single motherhood. In addition to the two largest groups in each sample, the analysis also reveals two smaller groups that experience a greater degree of instability and variation in the timing of exposure. About 4% of FFS children, and

7% of MCS children, experience an increase in the probability of moving in with their biological fathers after living apart during the first year of life. This group of children experiences very early childhood biological father absence. About 14% of FFS children, and 18% of MCS children, experience the exit of a biological father after age 1. For these children, the probability of living without the biological father is lowest around age five, rather than very early childhood.

Figures 1B and 2B show the probability of exposure to economic disadvantage by age. The first comparison to note between the two samples is that the best-fitting model includes four trajectories in the FFS, and three in the MCS. Second, the majority of children in both samples live stably in either low-income or higher-income households. 36.3% of FFS children, and 27.7% of MCS children, are “always higher income,” with a very low probability of living in/near poverty at all ages. About 44% of FFS children consistently live in low-income families between birth and age five, compared to 27.8% of MCS children. Third, there is a greater deal of economic instability among FFS children. While the third group in the MCS sample is comprised of children who are consistently “middle income” (though still with a high probability of economic disadvantage), two groups of FFS experience early and late exposure to economic disadvantage, respectively. About 7% of children experience early economic disadvantage, with a declining probability after age 1, and about 13% experience an increase in the probability of economic disadvantage around age 3.

Finally, examining trajectories of maternal depression reveals two fairly stable classes in each sample. The majority of children in both samples (88.2% in FFS, 90.5% in MCS) have mothers who consistently have a very low probability of depression, while a smaller group (11.8% in FFS, 9.4% in MCS) lives with mothers who are consistently more likely to be depressed. In both samples, the probability of depression among consistently depressed mothers increases around age three and then gradually declines again by age five.

Descriptive LCA results suggest that there are pronounced differences in children’s duration of exposure to economic disadvantage, single motherhood and maternal depression in both countries, as well as variation in the timing of that exposure. While variation in timing produces some instability in children’s trajectories, particularly in the case of economic disadvantage in the United States, we do not observe a great deal of instability across early childhood, perhaps because of the relatively long spacing between observed time points.

Educational Variation in Family Trajectories

Table 3 shows the weighted distribution of family trajectories by maternal education. In both samples, there is striking educational variation in children’s duration of exposure to disadvantaged family circumstances. Children of the most highly educated mothers—those with at least a college degree—are substantially more likely to live continuously with their biological father throughout early childhood. 90% of FFS children and 78% of MCS children with the highest-educated mothers are in the “always with biological father” category, compared to 53% of FFS children and 40% of MCS children with the lowest-educated mothers. Conversely, 27% of FFS children and 30% of MCS children with poorly educated mothers are in the “always without biological father” category, compared to 2% of

FFS and 5% of MCS children in the highest-educated group. While there is marked educational variation in family structure trajectories, there is less pronounced variation in the degree to which children experience transitions into and away from their biological father, though children with highly-educated mothers are less likely to experience instability and transitions away from or to the biological father.

Examining income trajectories reveals similarly large educational variation in the duration of children's exposure to economic disadvantage. Among children in highly-educated families, 81% of FFS and 61% of MCS children live in consistently higher income families, compared to 6% (FFS) and 3% (MCS) of children the lowest-educated families. As is the case with family structure trajectories, there is less educational variation among the economically unstable groups in the FFS, with children in middle-educated families (high school and some college) slightly more likely to experience increasing or decreasing income than children in the extreme categories. Finally, in both samples there is a small educational gradient in trajectories of maternal depression, whereby higher-educated mothers the least likely to be depressed.

Do family trajectories explain the educational gradient in children's cognitive development?

Tables 4 and 5 present results from OLS regressions of cognitive development on maternal education and family trajectories. Tables 4 and 5 show the findings for the FFS and MCS samples, respectively. The first column in each panel presents results that control for sociodemographic variables, but not for trajectories of income, family structure and maternal depression. In both countries, the first column in panel A reveals a strong gradient in cognitive development, consistent with previous research. Controlling for sociodemographic variables, the difference between children in the highest and lowest-educated groups is almost 1 standard deviation in both countries—0.760 in FFS and 0.798 in MCS.

Including family trajectories in the models (second column of Panels A–C) demonstrates how each family trajectory is related to children's development, and considers their role in mediating the educational gradient. With respect to economic disadvantage, there is evidence in both countries that children who experience a consistent and long duration in low-income households have significantly lower cognitive development than their peers living in consistently higher-income households. FFS children who live in consistently low-income households from birth through age five score almost 0.5 standard deviations below their peers in consistently higher-income households on the cognitive assessment, on average. In the MCS, this difference is almost one-third of a standard deviation (−0.285), with a smaller but still sizeable difference (−0.177) between children in “middle” income households and their higher-income peers. FFS children who experience economic instability also perform worse than their stably advantaged peers, including children who experience both decreasing (−0.247) and increasing (−0.232) income during early childhood. Because children who experience increasing income live in or near poverty in the first few years of life (Figure 1B), this finding is consistent with evidence linking exposure to economic disadvantage in very early childhood to poorer development.

With respect to the association between trajectories of family structure and children's skill development, the findings in the U.K. reveal that a long duration of residence without the biological father is associated with lower cognitive skill development. Transitioning away from the biological father (which, as shown in Figure 2A, also indicates exposure to single motherhood closer to age 5) is also associated with poorer outcomes as compared to children in stable biological father family structures, as is transitioning to a biological father structure (early childhood exposure to single motherhood). In the FFS, family structure coefficients work in a similar direction, but do not reach statistical significance after controlling for income trajectories. The lack of a significant difference between stable, biological-parent families and other families is inconsistent with prior research, including research using these data (e.g., Waldfogel, Craigie and Brooks-Gunn 2010). One possible explanation for the different pattern of findings here is that we combine cohabiting parents with married parents, focusing instead on the presence of the biological father, whereas Waldfogel et al (2010) treated cohabiting parent families as a separate group and found that children living in stable, cohabiting-parent families score lower on cognitive tests than children in stable, married-parent families. Before controlling for income trajectories, family structure trajectories are significantly negatively related to children's cognitive development in both FFS and MCS, with coefficients of a similar magnitude in both countries.

Finally, there is a significantly negative association between maternal depression—specifically, a long duration of maternal depression—and cognitive skill development in the MCS but not the FFS.

Considering the contribution of family trajectories to the magnitude and significance of the educational gradient in children's cognitive development reveals a modest explanatory role in both countries. For cognitive development, family trajectories reduce the gap between children in the highest and lowest-educated families by about one third (0.760 vs. 0.477) in the FFS, and by about 20% in the MCS (0.798 vs. 0.635). The vast majority of mediation of the educational gradient is driven by income trajectories, suggesting that the strong relationship between education and income throughout early childhood, and between income and child development, is particularly important in explaining the advantages of children in highly-educated families. In addition, because income, family structure and maternal mental health have reciprocal effects at each age (e.g., Lee and McLanahan 2015), it is possible that the large mediating role of income across age partially reflects prior effects of family structure and maternal depression on income.

Conclusions

While the resources and content of family life are speculated to provide a central explanation for the striking degree of educational inequality in children's early development, as well as the persistence of that inequality as children age, we know very little about the degree to which children's family environments remain stable or unstable as they age, and how educational variation in the timing, duration and stability of particular resources contributes to the educational gradient. In this paper we use high-quality, population-based data to move beyond a cross-sectional and unidimensional account of children's family environments and to provide a complex description of family income, family structure and maternal depression

that accounts for the timing, duration and stability of family circumstances, evaluates the association between these trajectories and children's development, and evaluates the contribution of cumulative family circumstances to the educational gradient in children's cognitive development.

Cross-national analysis of two rich national and longitudinal data sources yields several important findings. First, we find a good deal of similarity between the U.S. and U.K. in patterns of family life during early childhood, and in the degree to which those patterns contribute to educational inequality in children's skill development. Both samples of children experience similar patterns of timing, duration and stability of exposure to their biological fathers. Second, the majority of children in both samples experience stability in their family circumstances over time, living consistently with or without their biological father, with mothers who are consistently depressed or not, and in families that are consistently high or low income. While there is striking educational variation in which stable trajectory children fall into, there is less educational variation in the instability of family structure, family income and maternal depression. Third, there is consistent evidence across both countries that cumulative family trajectories account for some, but not all, of the educational gradient in children's cognitive skill at the end of early childhood. Finally, these analyses demonstrate a strong negative impact of long durations of exposure to disadvantaged family circumstances on children's outcomes, consistent with the importance of cumulative exposure processes for children's development.

It is important to weigh the merits of this research against some limitations and caveats that will be useful to pursue in future research. First, while we examine the sensitivity of our findings to more refined measures of family structure and family economic status, in final analyses we condense these complex constructs into simpler measures that can be safely compared over time and countries. Maternal depression, for example, can be consistently measured across ages and samples, unlike some correlated parenting behaviors that vary in content and meaning with age. It will be valuable in future research to further examine differences and synergies among various dimensions of family financial and social capital (e.g., Harding, Morris and Hughes 2014). It is also important to note that the research presented here is descriptive by design; we do not claim that the relationships we observe among maternal education, family circumstances and child outcomes are causal. Rather, we hope to provide a more complex description of the dynamics of children's family arrangements than in previous research, and to understand the associations between these trajectories and children's development. Certainly, family income, family structure and maternal depression are highly correlated, and the associations we observe between any one trajectory and child well-being may, in part, reflect reciprocal effects of each family circumstance at each age.

That we observe largely similar relationships among maternal education, cumulative family circumstances and children's development across the U.S. and U.K. is striking. Important differences in the two countries' health care and social welfare systems create varying landscapes of government support for children and families, suggesting that socioeconomic differences in children's development might be weaker and less persistent in the U.K., and that associations between family resources and child outcomes might be less pronounced. In

contrast, maternal education is strongly associated with children's cognitive development and health in the U.K., as are trajectories of income, family structure and maternal depression throughout early childhood—in fact, maternal education remains a strong predictor of children's outcomes even after accounting for variation in family trajectories across educational groups. These findings are not consistent with the argument that government investments in health and family services, while vital for affording access to care and resources, offset the role of parental resources in impacting children's development. Of course, the large number of differences in population composition and policy across the U.S. and U.K. does not allow us to attribute cross-national variation to a particular source. However, the largely similar findings across the two countries point to parental circumstances as a fundamental determinant of children's well-being. Moreover, while the three dimensions of family life examined here act as an important pathway linking maternal education to children's development, there are still important associations unexplained by the factors observed here. It will be useful in future research to examine the larger set of circumstances that become relevant as children age, including not only their family environments, but their child care, school and peer interactions.

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Figure 1.

Figure 1A. Trajectories of Exposure to Biological Father, FFS 0–5

Figure 1B. Trajectories of Exposure to Economic Disadvantage, FFS 0–5

Figure 1C. Trajectories of Exposure to Maternal Depression, FFS 1–5

Figure 2.

Figure 2A. Trajectories of Exposure to Marriage, MCS 1–5

Figure 2B. Trajectories of Exposure to Economic Disadvantage, MCS 1–5

Figure 2C. Trajectories of Exposure to Maternal Depression, MCS 1–5

Table 1

Weighted Descriptive Statistics, FFS and MCS

FFS	MCS	
<i>Maternal Education</i>	<i>Maternal Education</i>	
Less than High School	29 No Qualifications	16
HS	32 O-Levels	39
Some College	19 A-Levels	20
College or More	20 Higher Education	25
Non-Hispanic White	29 White	84
Non-Hispanic Black	35 South Asian	9
Hispanic	29 Black	4
Other	7 Other	3
Child Male	54 Child Male	50
Mother Mean Age at Birth	27.1 Mother Mean Age at Birth	28.4
Mean Number of Kids in Household, Wave 1	1.1 Mean Number of Kids in Household, Wave 1	1.1
Mean Child Health, Age 5 (1–4)	3.4 Mean Child Health, Age 5 (1–5)	4.3
Mean PPVT Z-Score, Age 5	0 Mean Naming Ability Z-Score, Age 5	0

Columns include percentages unless otherwise specified.

Table 2

Latent Class Model Selection for Family Trajectories, FFS and MCS

Number of Latent Classes	BIC	Entropy	Vuong-Lo-Mendell-Rubin Likelihood Ratio Test	Lo-Mendell-Rubin Adjusted LRT Test
FFS				
<i>Family Structure</i>				
2	18244.299	0.736	0.0000	0.0000
3	18049.989	0.694	0.0000	0.0000
4	17855.152	0.701	0.0000	0.0000
5	18019.634	0.694	0.0100	0.0100
<i>Economic Disadvantage</i>				
2	18003.820	0.821	0.0000	0.0000
3	17884.420	0.623	0.0000	0.0000
4	17896.078	0.663	0.0000	0.0000
5	17938.560	0.673	0.5000	0.5000
<i>Maternal Depression</i>				
2	10982.960	0.69	0.0000	0.0000
3	11016.761	0.649	0.5000	0.5000
4	11050.562	0.454	0.0000	0.0000
5	11084.362	0.396	0.2879	0.2879
MCS				
<i>Family Structure</i>				
2	73398.743	0.92	0.0000	0.0000
3	68684.451	0.92	0.0000	0.0000
4	67411.057	0.92	0.0000	0.0000
5	67460.452	0.704	0.0984	0.0984
<i>Economic Disadvantage</i>				
2	53200.733	0.733	0.0000	0.0000
3	52240.250	0.744	0.0000	0.0000
4	53279.760	0.541	0.0000	0.0000
5	53319.281	0.351	0.1271	0.1330
<i>Maternal Depression</i>				
2	26771.050	0.883	0.0000	0.0000
3	26810.569	0.509	0.4050	0.4050
4	26850.080	0.492	0.0000	0.0000
5	26889.590	0.568	0.0000	0.0000

Table 3

Educational Variation in Weighted Family Trajectories, FFS and MCS (%)

FFS	Less than HS	HS	Some College	College +
<i>Family Structure Trajectories</i>				
Always with Biological Father	53	59	70	90
Always without Bio Father	27	17	11	2
Transitions away from Bio Father	14	19	13	8
Transitions to Biological Father	6	5	5	0
<i>Income Trajectories</i>				
Consistently High Income	6	23	53	81
Consistently Low Income	83	50	22	7
Decreasing Income	6	17	19	11
Increasing Income	6	11	7	2
<i>Depression Trajectories</i>				
Consistently Depressed	16	11	10	9
Generally Not Depressed	84	89	90	91
MCS	No Qualifications	O-Levels	A-Levels	Higher Ed.
<i>Family Structure Trajectories</i>				
Always with Biological Father	40	55	65	78
Always without Bio Father	30	20	13	5
Transitions away from Bio Father	22	20	18	15
Transitions to Biological Father	8	6	4	2
<i>Income Trajectories</i>				
Consistently High Income	3	16	29	61
Consistently Low Income	49	44	34	14
Consistently Middle Income	48	40	37	24
<i>Depression Trajectories</i>				
Consistently Depressed	9	8	6	4
Generally Not Depressed	91	92	94	96

Table 4
OLS Regressions of Age 5 Outcomes on Maternal Education and Family Circumstances, FFS

	A: PPVT Z-Score	B: Child Health	C: Externalizing Z-Score
HS	0.186** (0.05)	0.133** (0.04)	0.086** (0.03)
Some College	0.560** (0.05)	0.421** (0.06)	0.172** (0.03)
College or More	0.760** (0.08)	0.477** (0.08)	0.328** (0.04)
<i>Income Trajectories</i>			
Consistently Low Income	-0.488** (0.06)	-0.203** (0.04)	-0.071 (0.04)
Decreasing Income	-0.247** (0.06)	-0.061* (0.03)	-0.169** (0.04)
Increasing Income	-0.232** (0.08)	-0.131* (0.05)	-0.334** (0.06)
<i>Family Structure Trajectories</i>			
Always without biological Father	0.015 (0.05)	-0.030 (0.03)	0.201** (0.04)
Transitions away from bio father	-0.015 (0.05)	-0.069* (0.03)	0.142** (0.04)
Transitions to bio father	0.023 (0.06)	-0.032 (0.05)	0.095 (0.06)
<i>Depression Trajectories</i>			
Consistently Depressed	-0.034 (0.05)	-0.198** (0.04)	0.388** (0.05)
Intercept	0.771** (0.09)	0.396** (0.00)	3.99** (0.07)
			0.338** (0.09)

Note: Robust standard errors in parentheses. Controls included.

(s) test (two-tailed) $p > 0.0001$ ***
; $p > 0.01$ **
; $p > 0.05$ *
; $p > 0.10$ +

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OLS Regressions of Age 5 Outcomes on Maternal Education and Family Circumstances, MCS

Table 5

	A: Naming Vocabulary Z-Score (N=14,562)	B: Child Health (N=14,759)	C: Externalizing Z-Score (N=14,562)
O-Levels	0.386** (0.02)	0.341** (0.02)	0.125** (0.02)
A-Levels	0.570** (0.03)	0.480** (0.03)	0.190** (0.03)
Higher Education	0.798** (0.03)	0.635** (0.03)	0.208** (0.03)
<i>Income Trajectories</i>			
Consistently Low Income	-0.285** (0.02)	-0.136** (0.02)	-0.242** (0.02)
Always Medium Income	-0.177** (0.02)	-0.090** (0.02)	0.086** (0.02)
<i>Family Structure Trajectories</i>			
Always without biological Father	-0.101** (0.02)	-0.109** (0.02)	0.256** (0.03)
Transitions away from bio father	-0.125** (0.02)	-0.073** (0.02)	0.147** (0.03)
Transitions to bio father	-0.121** (0.03)	-0.081** (0.03)	0.189** (0.04)
<i>Depression Trajectories</i>			
Consistently Depressed	-0.082** (0.03)	-0.229** (0.03)	0.275** (0.03)
Intercept	-0.740** (0.05)	-0.326** (0.06)	1.336** (0.05)

Note: Robust standard errors in parentheses. Controls included.

* $p < 0.10$;

** $p < 0.05$;

, two-tailed tests).

$d > 0.10$;

**

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