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INTRODUCTION

PAPERS

RESEARCH NOTE

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9 - 11 July 2018

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KEYNOTE SPEAKERS

Prof. Manuela Naldini, University of Turin, Italy

Prof. Ross Macmillan, Bocconi University, Italy

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VENTESIMO ANNIVERSARIO

Editorial: Contexts and controversy

Heather Joshi

The research reported in this issue of the journal deals with a range of aspects of the life course, sometimes controversial. The topics concern moving home in childhood, having a child as a teenager and how life transitions vary by disability in adolescence and by sexuality reported in later life. Taken together, these contributions bring out the need to appreciate their contrasting contexts.

The first two papers add to a debate about the consequences of residential mobility for children's educational achievements. Sergei Vidal and Janeen Baxter look at outcomes in children around age 12 in 2010, the older cohort in the Longitudinal Study of Australian Children. The authors conclude that having moved home in the preceding years is not necessarily disadvantageous in itself, although some moves do accompany or reflect adverse events or circumstances. A similar conclusion was reached for pre-school children in the UK Millennium Cohort and US Fragile Families and Child Wellbeing Study in the early years of the present century, in the special issue of Longitudinal and Life Course Studies, July 2016. However the second paper in the current issue, by Juli Simon Thomas, puts childhood residential mobility more squarely in the category of disruptive events, along with family break-up and parental job loss, as leading to poorer educational outcomes. Her evidence covers a longer period, 1968 to 2011, from the Panel Study of Income Dynamics (PSID) in the USA, and focuses on the educational transitions at later stages: finishing high school, starting college and completing college. There are several explanations for the apparent contradiction, which readers may like to explore: consequences of mobility may vary by age of assessment, or age at mobility, outcomes of moves may be affected by the nature of their destinations, and, most importantly, by the policy context of cash and housing support for families and for the financing of college education. The debate is not closed.

The study by Gina Erickson and Ross Macmillan in the third article focuses on disability as a possible determinant of transitions in early adulthood. There is no evidence about disability in the first two papers, but it was a major focus of the US National Longitudinal Study of Adolescent Health (AdHealth) used here. Parents reported sufficient information to classify young people by disabilities in childhood as physical, cognitive (abnormally low vocabulary score) and (diagnosed) learning difficulties. The authors invest effort in characterising early adult transitions through education, employment, partnership and parenthood. They use latent class analysis to identify seven pathways for males and females separately, which are of interest in themselves. Physical disability was, unexpectedly, not found to be particularly predictive of taking a slow track through these milestones, but low cognitive functioning impeded educational, and consequently other, progress. In other studies where disability information is not available (such as Simon Thomas, this issue), low cognitive ability may underlie low educational attainment.

Two contributions deal with the transition to parenthood as a teenager, where opinion divides as to whether adverse outcomes for parent and child are due to premature childbearing itself or selection into it on pre-existing disadvantages. Both use whole population register data from Scandinavia, a region known for particularly low teen parenthood, but where there is nevertheless concern about its consequences. Sara Kalucza draws her evidence from people born over a five-year period in Sweden (1989–94), reaching 20 in 2009–2014. The inclusion of men as well as women who become parents before age 20 is novel. The study asks how far the record of mental ill-health in childhood is merely a facet of the social disadvantage associated with teen parenthood. Mental health problems, in girls and boys, were found to play an independent role. This suggests interventions to raise confidence in alternative opportunities to parenthood among young people with mental problems. The indicator of mental ill-health was derived from the register on prescription of psychotropic drugs. These are likely to overlap with the 'learning disabilities' used in the AdHealth study (Erickson and Macmillan, this issue), but these parent-reported diagnoses did not predict early parenthood in the US study. This international comparison should be made cautiously, if only because of the different contexts in which child mental health is treated. Heini Väisänen's Research Note on teenage pregnancy in

Finland relates it to what follows in educational attainment by age 30. This study is confined to women, but here the novelty is that the register offers important evidence on teenage pregnancies that end in abortion, not easily collected in surveys. The women with abortions had intermediate educational outcomes between the teen mothers and those who were not pregnant as teenagers. This suggests some social selectivity into teenage pregnancy. The cohort studied was born 1975–79, and thus passed through teenage years in the 1990s. The author notes that the picture may have changed in Finland since then, and suggests that the social selectivity of teenage motherhood may be greater in less accommodating welfare states such as the USA. Although not directly comparable, the estimated covariates of the school-to-family trajectory for women in Erickson and Macmillan's table 3 provides some evidence consistent with this, in the inverse association of a young woman's entry to early motherhood with her own parents' educational level.

The paper by Dylan Kneale and Robert French extends to a larger life course canvas up to retirement and old age. The information comes from people who were at least 50 years old in 2006, reporting their life histories to the English Longitudinal Study of Ageing (ELSA). It covers people living in England who had been born up to 1946, mainly cohorts experiencing early adulthood in the 1950s and early 1960s. The novelty here is that the respondents are classified by sexuality on the basis of responses given to ELSA (in 2012), on whether they had ever (onset unspecified) practised or desired same-sex relations. From a range of possible definitions, 4% of respondents (n 159) were estimated to be either Lesbian, Gay or Bisexual (LGB). The life transitions and health of these survivors were on the whole not dissimilar to those of heterosexual informants. They were neither more nor less likely to enter a parental role early, but less likely to do so eventually (71% versus 91%). Using event history techniques, a few other lifetime turning points (among those measured) stood out as differentiating LBG histories. They were more likely to have taken on a caring role for a friend or family member, or experienced sexual assault and at an earlier point than the heterosexual respondents. Much of the time recoded here spanned the period when male homosexual practices were illegal. It also covered the period of mortality from AIDS, and stops before gay marriage became a possibility. Here too conclusions need to be tempered by context. Nevertheless this pioneering effort, along with the other papers in this issue, points to questions that still need to be asked.

Residential relocations and academic performance of Australian children: A longitudinal analysis

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Abstract

The family and residential environments are critical to children's wellbeing and, hence, residential change can affect children's developmental outcomes. In this research, we study the associations between residential relocations and academic performance in the Australian context using panel regression methods on longitudinal data of a representative sample of 3,481 children born in the late 1990s from the Longitudinal Study of Australian Children (LSAC). We examine the impact of residential relocations from infancy to middle childhood and pay special attention to the distance, frequency and developmental age-stage of relocations on academic test scores from the National Assessment Program – Literacy and Numeracy (NAPLAN) of third, fifth and seventh graders. Consistent with previous research, we find that the associations between childhood relocations and school performance are generally small. Frequent relocations during childhood relate to poor academic performance, but the association vanishes after controlling for family and home circumstances. In contrast, moderate levels of residential mobility, particularly relocations towards a different local area, are associated with improvements in academic performance. Relocations around the time of school entry are associated with poorer academic performance in grade 3, but are not associated with performance in grades 5 and 7. Our findings suggest that while moving home is not *per se* a major determinant of academic performance, the contexts and environments where children are embedded matter. We conclude that further research is needed on what and how intersections between relocation biographies and contexts matter for children's development.

Keywords

Residential relocations; academic performance; longitudinal data; LSAC; Australia

Introduction

In recent years, there has been an increasing interest in understanding developmental outcomes of children's residential relocations. An underlying concern is that the home and residential environments are critical for children's functioning and hence, residential relocations may affect their development and have impacts on outcomes later in life (Ackerman, Kogos, Youngstrom, Schoff, & Izard 1999; Adam & Chase-Lansdale, 2002; Rumbold et al., 2012; Anderson, Leventhal, Newman & Dupéré, 2014; Lennon, Clark & Joshi, 2016). Regarding cognitive functioning, research results concurred in finding moderate and weak associations, with children who moved homes

displaying worse outcomes before and during school, and lower educational attainment (Pribesh & Downey, 1999; Pettit & McLanahan, 2003; Rumberger & Lim, 2008; Evans & Wachs, 2010). Despite consistency in findings across studies, empirical evidence is ambiguous about *how* and *when* relocations have larger impacts on children's cognitive functioning. It remains unclear whether these associations are due to direct impacts of relocations, or due to pre-existing poor cognitive development among children who relocate. Moreover, we know little about whether the potential impacts of age-specific relocations are short-lived or persist in further developmental stages.

We argue here that home relocations, which are standard experiences in childhood, are complex processes with important intersections between individual biographies (i.e. how often, how far, during what developmental stages, and why children moved) and the family and social contexts in which children are embedded. Recently, there have been efforts to investigate more thoroughly the processes that influence the potential adverse (and also beneficial) impacts of relocations on cognitive development (Gasper, DeLuca & Estacion, 2010; Voight, Shinn & Nation, 2012; Anderson et al., 2014; Gambaro & Joshi, 2016; Schmitt & Lipscomb, 2016). Largely focused on the US context, studies have capitalised on recent collections of longitudinal data rich in information on the contexts and circumstances of childhood relocations and the use of adequate methods to make better causal assessments of the associations.

In this article, we investigate the implications of residential relocations from infancy to middle childhood for school performance in the Australian context using longitudinal data and methods. Despite similarities with the US in some economic and cultural aspects, Australia's institutional setting provides greater equality of opportunity through education. For example, access to high-quality early education and care in Australia is less dependent on family income than in the US (Coley, Leventhal, Lynch & Kull, 2013). As far as we know, no longitudinal analysis has been published for the Australian case, despite two in three Australian children having moved by age 10 (Maguire, Edwards & Soloff, 2012).

The study brings new insights on the ways in which relocations are related to children's school performance by investigating relevant aspects of relocations (i.e. distance, frequency and age-stage at relocation), and those of the family, residential and school environments. We examine representative data for Australian children born in the late 1990s on lifetime residential relocations and academic test scores of third, fifth and seventh graders from Growing Up in Australia: The Longitudinal Study of Australian Children (LSAC). We deploy methods for panel data analysis, which acknowledge the nested structure of the data, to examine the impacts of relocation lifetime frequency and relocation distance on children's performance and to assess the importance of the developmental age-stage of relocations in shaping school performance trajectories.

Residential relocations and children's educational outcomes

Residential mobility is a common experience during childhood. The family and residential environments are key factors shaping children's cognitive development (Bronfenbrenner & Morris, 2006), and, hence, moving the home can affect children's outcomes. Previous studies revealed moderate negative associations, with home relocations entailing poor school performance (Haveman, Wolfe & Spaulding, 1991; Ingersoll, Scamman & Eckerling, 1989; Pribesh & Downey, 1999; Wood, Halfon, Scarlata, Newacheck & Nessim, 1993), repeating a school grade (Wood et al., 1993), school drop-out (Crowder & South, 2003; Crowder & Teachman, 2004; Rumberger & Lim, 2008) and lower educational attainment (Astone & McLanahan, 1994; Haveman et al., 1991).

Common mechanisms proposed to explain these associations emphasised the downsides of relocations, such as changes in social relationships and support networks, lack of engagement with the school, as well as changes in household routines of parents and children that produce stress and directly impact school performance (Astone & McLanahan, 1994; Evans & Wachs, 2010; South & Haynie, 2004). Concurrently, other research evidence revealed that children in relocation-prone families were already performing poorly in school before the relocation (Pribesh & Downey, 1999). These were often children from low-income families who moved house frequently or who reported unfavourable relocation motivations (e.g. eviction, divorce). Thus, the direct effects of residential

relocations on academic performance might be rather weak or non-existent once accounting for family structures, particularly those that concentrate multiple sources of disadvantage such as lone parents often do (Adam & Chase-Lansdale, 2002; Anderson et al., 2014; Ersing, Sutphen & Loeffler, 2009; Gambaro & Joshi, 2016; Herbers et al., 2012; Pettit & McLanahan, 2003; Scanlon & Devine, 2001).

Although the importance of previous research for understanding and potentially supporting children's life chances is indisputable, we believe that *whether* and *how* relocations affect cognitive development remain unclear. One major drawback is that the bulk of the existing evidence derives from studies that deployed cross-sectional designs. These studies relied on the examination of one single observation of cognitive ability at a given age stage, and treated residential mobility as a cumulative measure of all prior life relocations. In our view, such research designs cast little light on whether relocations induce or reproduce school performance because the studied associations conflate the immediate impacts of contemporary relocations, the cumulative impacts of past relocations, and pre-existing differences in school performance. The lack of repeated observations of children also hampers ability to compare and contrast the stages when relocations have more relevant impacts on academic performance, or whether these impacts accumulate over time. Developmental psychologists posit that exposure age is not trivial in relation to an impacting event, particularly at stages of noteworthy developmental expansion such as early childhood (Bradley & Corwyn, 2002). Additionally, life course theory posits that the effects of events earlier in life accumulate and shape later development (Moen, Elder & Lüscher 1995).

Leveraging growing sources of longitudinal data, recent research investigated the impacts of relocations occurring at different developmental stages on academic performance, and whether these impacts persist over time (Anderson et al., 2014). Analyses deployed a range of multivariate models to assess children's cognitive evolution and showed that developmental stage matters, though there is no agreement on when relocation impacts are stronger. Typically, families with pre-school children move more often than families with school children, because moves during school age are believed to have negative impacts on schooling (Mehana & Reynolds, 2004). Along these lines, Lawrence, Root & Mollborn (2015) also found that infants and pre-school age children often move to better neighbourhoods than children who move at later stages. Schmitt and Lipscomb (2016) examined cognitive abilities of low-income pre-school children and found that residential mobility by age four had only modest negative impacts on cognitive abilities by the end of pre-kindergarten. No cumulative effects were observed since the negative impacts of early relocations levelled off by kindergarten and first grade. Voight et al. (2012) found negative effects of early childhood relocation on reading and math skills in third grade, which persisted for reading in later grades. In contrast, Coley & Kull (2016) found that pre-kindergarten mobility had no effect on cognitive skills during fifth and eighth grade, but school-age mobility had negative effects, though these were moderate and short-lived.

We note that inconsistencies in findings across studies can be due to the uneven interests in the aspects of relocations that were examined. For example, the focus of much research has been limited to the negative impact of highly frequent mobility on cognitive development, often using samples of low-income families. Using a nationally representative sample for the US context, Coley & Kull (2016) found only a modest negative linear relationship between relocation frequency since birth and children's cognitive ability in fifth grade. A few recent studies have revealed that, under certain conditions, moving had no negative consequences for children's cognitive development (Joshi et al., 2015). Similarly, Ziol-Guest and McKenna (2014) found that children from middle-income families were not susceptible to negative cognitive development if they moved house.

In addition, other aspects of relocations such as the distance moved have received little attention, despite the potential disrupting impacts of long-distance relocations with regards to relevant contexts such as friends, support networks and changing school. Among non-intact families, children's long-distance relocations can potentially reduce the amount of physical contact with the parent who stays behind. However, research is inconclusive on the associations between cognitive development and contact with non-resident parents (Rasmussen & Stratton, 2012). Moreover, long-distance moves are often motivated by

positive triggers such as parents' career progress (Huinink, Vidal & Kley, 2014). Such moves are often accompanied by improvements in household living standards and neighbourhood quality (Clark & Maas, 2016), which could benefit children, cancelling out the negative consequences of relocating to a new context.

Finally, prior studies often neglected that substandard performance among children who relocate can be due to selective factors or traits. If omitted factors are relevant to cognitive development, the estimated associations are likely to be biased, leading to inaccurate causal interpretations. For instance, certain personality traits of parents leading to instability that are difficult to measure might limit parental provision of cognitive stimulation to children. Such personality traits might enhance household relocation propensities as well. While it is methodologically complex to account for selectivity in cross-sectional analyses, panel regression methods for longitudinal data reduces these potential biases. Based on the exploitation of within-individual variation from repeated observations, some research has improved the causal assessments of the associations under investigation using longitudinal data. Coley et al. (2013) used hierarchical models with a three-level structure and assessed between- and within-individual effects of housing features and house relocations on children's functioning measures. Coley & Kull (2016) and Gasper et al. (2010) examined similar associations using, respectively, fixed-effects regression models and a hybrid regression model, which combines virtues of random- and fixed-effects models. These studies modelled within-individual estimators to predict children's development over time, assessing the impacts of changes in covariates and controlling for time-constant unobserved heterogeneity.

The current research makes an original contribution by investigating the associations between residential relocations and children's academic performance in the Australian context. Compared to the US, Australia provides more financial support to families (including self-care of infants and access to high-quality early education). Australian children are also less likely to suffer poverty. The 2011–12 Australian Bureau of Statistics (ABS) Survey of Income and Housing (SIH) showed that 17.7% of children (under 15) were living under the poverty line, defined as 50% of median income, in 2012 (Australian Council of Social Service, 2014). Using the same income threshold, only 13% of children (under 18) were under the poverty line according to OECD calculations (OECD, 2017). Lower poverty levels and better early support for children in Australia may have a protective effect from possible detrimental changes in proximal contexts among children. Lower poverty levels may be associated with a lower risk of relocations due to adversity (e.g. eviction, parents' separations) and thus children moving in Australia may be less likely to suffer distress and to potentially benefit from upgrades in home or residential contexts. Additionally, the Australian education system is better equipped to address early identification of learning difficulties that may support children's resilience after relocations, even among those suffering adverse situations. Since previous studies in the US using longitudinal data have found a few negative effects, we expect associations in Australia to be smaller or non-substantive.

We set several research objectives. First, we examine patterns in the associations between age-specific relocations (since infancy until middle school) and school performance. We look into two types of age-related associations: contemporaneous association – which responds to the question: *does the association between school performance and relocations vary by age stage?* – and cumulative association – which responds to the question: *are age-specific relocations associated with school performance at later age-stages?* Second, we analyse two other relevant aspects of relocations, frequency and distance. Third, we assess whether relocations induce changes in academic performance or reproduce pre-existing performance levels. To this end we exploit the longitudinal aspect of the data to assess between-subject effects – i.e. *differences in school performance between children who relocate and those who do not relocate* – and within-subject effects – i.e. *differences in individual school performance over time (e.g. before and after relocation)*. Finally, we identify factors that influence average differences and alterations in school performance of children who relocate.

Method

To gather adequate evidence of children's residential trajectories and academic performance

over time, we rely on data from the study *Growing Up in Australia: The Longitudinal Study of Australian Children* (LSAC). The LSAC is an on-going longitudinal study with a biannual panel design that started in 2004 and is administered by the Australian Federal Department of Social Services (Gray & Sanson, 2005). The study collects data on parenting, family relationships, childhood education, non-parental childcare, and health of children born in the late 1990s and early 2000s. In 2004, 10,090 families were interviewed, being representative of Australian children aged 0–1 (cohort 'B') and 4–5 (cohort 'K') living in non-remote areas.

We use longitudinal information from the LSAC cohort 'K' study (LSAC-K) between 2004 and 2010 (waves 1 to 4), which enables the study of academic performance through the pre-adolescence stage, up to seventh grade. We disregard respondents from cohort 'B' from our analyses since academic tests scores were only available in one wave at the time the analyses were done.

To assess complete histories of residence and academic performance in middle childhood, we restrict the analytical sample to respondents who participated in the first four survey waves. The original sample size (wave 1) of LSAC-K was n=4,983 children, and by 2010 (wave 4) the sample of respondents who provided a response was n= 4,163. Sample attrition after four waves of the study involved less than 20% of original respondents; hence attrition rates in LSAC-K are not higher than those of comparable national household panel studies. Regarding sources of attrition, Sipthorp and Misson (2009) found that sample attrition is related to length of residence, but these and other variables associated with residential mobility have been integrated for the computation of longitudinal weights in LSAC that we use in the bivariate analysis.

To assess longitudinal associations, we additionally restrict the sample to children who participated in more than one survey wave, and to children's observations with non-missing information on academic performance items collected in third, fifth, and seventh grade. Missing data in academic performance involves 29% of third graders, and about 10% of fifth and seventh graders. Since the administration of academic performance tests available in LSAC (see more detail below) started in 2008, approximately 23% of respondents of LSAC-K who did third grade in 2007 have no available information on academic performance because no test was administered to them. Remaining sources of missingness are test absences related to illness or other accepted reasons, non-consent of parents to access the data, or lack of data match by the state/territory jurisdiction. Following standard practice, missing values of the dependent variable were not imputed and cases with missing information on academic performance were deleted. In sensitivity analyses (available under request) of multivariate models, we contrasted results of the analysis presented in the results section with an alternative analysis that included only children with no missing observations. We did not find substantively different results. The analytical sample contains 3,481 children and 8,609 observations.

The inspection of model covariates (i.e. independent variables in regression analyses) revealed trivial levels of missing data. Less than 10% of cases had a missing value in a model covariate, and less than 5% had more than one missing value in a model covariate. To minimise observation loss we imputed missing information of model covariates applying multiple imputations for chained equations (MICE) and using information of all model covariates for the imputations, to create 20 imputed datasets using the MICE command in Stata 14.0 (Royston & White, 2011). The imputation procedure resulted in successful imputations for all cases with missing values.

Measures

Academic test scores

To assess school performance we use measures of academic skills in literacy and numeracy for children of different ages. This includes tests scores from The National Assessment Program – Literacy and Numeracy (NAPLAN), which is a national test conducted annually since 2008 and administered to nearly all Australian students in school grades 3, 5, 7 and 9 in reading, writing, spelling, grammar and punctuation, and numeracy (Daraganova, Edwards, & Sipthorp, 2013). Students with significant intellectual disabilities and those with a language background other than English who arrived in Australia less than one year ago may be exempted from testing. NAPLAN test scores are reported using single scales to enable comparisons of results across year levels and over time. Test scores in each of the five domains of NAPLAN range from 0 to 1000 with

a mean score of 500, but results are not comparable across domains.

For the analysis we use information on school grade 3, 5 and 7 NAPLAN tests. The modal age is 8, 10, and 12 years for children taking NAPLAN tests in school grades 3, 5 and 7 respectively. Since predictors must be measured prior to responses, we note some limitations in the analysis of linked NAPLAN data in LSAC. First, while NAPLAN tests are administered nationwide, every year, in the second full week in May, LSAC main interviews take place from March to December every two years. Second, LSAC respondents of the same study cohort may sit the same school grade NAPLAN test in different calendar years. For instance, LSAC-K respondents may sit in school grade 5 NAPLAN tests in 2009, 2010 and 2011, while LSAC data collection takes place in 2008, 2010 and 2012.

To enable the longitudinal analysis of the determinants of school performance, information on the time of testing, test repeating, and age at time of testing are available in the linked NAPLAN data files. To ensure that predictors are measured prior to NAPLAN testing, we have assigned NAPLAN test scores to predictors of the most immediate survey wave prior to the test. As a result, test scores in year 2008 have been matched to predictors of wave 2 (2006), tests scores in years 2008, 2009 and 2010 have been matched to predictors of wave 3 (2008), and test scores in year 2010, 2011 and 2012 have been matched to predictors of wave 4 (2010). The time gap in months between the LSAC main survey time and the NAPLAN test ranges from 1 month to 25 months. In the analyses, NAPLAN tests scores of school grades 3, 5 and 7 are assigned to information collected in LSAC-K that correspond to children around average ages 6/7, 8/9 and 10/11, respectively. To assess the effect of different time gaps, we included in preliminary multivariate models a control variable for the calendar year of administration of NAPLAN test, but results remained unchanged.

We reduce the number of outcomes by means of factor analysis because scores on the five NAPLAN tests display high common correlation (overall Cronbach alpha = .936). The results of the factor analysis with varimax rotation indicate that only one factor captures common variation among the five scores (eigenvalue = 3.708). The standardised factor – NAPLAN score – ranges from -3.33 to 3.01 and has a mean value approximate to 0 and a standard deviation approximate to 1. Thus, the NAPLAN score takes negative values for scores below the grand mean and positive values for scores above the grand mean across grade 3, 5 and 7 NAPLAN tests[1].

Residential relocations

LSAC collects relevant measures for building detailed residential histories of children at each wave, with information since last interview (or since birth in wave 1) on relocation occurrence, region of residence, recency of latest relocation before interview date, and number of lifetime relocations. Unfortunately, reason for move is not available.

To address the impact of frequent mobility, we construct two indicators of cumulative frequency of lifetime relocations at each survey wave for moderate frequency (coded 1 if child did 1 or 2 relocations, coded 0 otherwise) and high frequency (coded 1 if child did 3 or more relocations, coded 0 otherwise). Research cited above showed that 1 or 2 relocations over children's life course has negligible impacts on children's cognitive abilities. We combine three and higher order moves in one category because this is how research has often defined frequent mobility (Jelleyman & Spencer, 2008) and very few children in our sample move more than four or five times. Relocation distance is measured in two cumulative indicators for [i]short-distance relocations (coded 1 if moved within Local Government Areas coded 0 otherwise) and for long-distance relocations (coded 1 if moved across Local Government Areas[2], coded 0 otherwise). If both short-distance and long-distance relocations occurred since the last interview (or before first interview), then both indicators take a value 1.

Relocation age-stage can be coded for four age groups: before school age (i.e. before age 4/5), by school start (i.e. between age 4/5 and age 6/7), between age 6/7 and age 8/9, and between age 8/9 and age 10/11. We disregard moves that occur between age 10/11 and age 12/13 because we do not know with certainty if a move has occurred before NAPLAN test administration for seventh graders, the last observation of school performance we observe. To address contemporaneous associations, capturing associations where relocations occurred in the most immediate age-specific stage before taking the test, we construct three indicators: the first is coded 1 if relocation occurred between age 4/5 and age 6/7 for observations of grade 3, the second is coded 1 if

relocation occurred between age 6/7 and age 8/9 for observations of grade 5, and the third is coded 1 if relocation occurred between age 8/9 and age 10/11 for observations of grade 7. To address cumulative associations, we construct three indicators: the first is coded 1 if relocation occurred before age 4/5 for all observations, the second is coded 1 if relocation occurred between age 4/5 and age 6/7 for observation of grades 5 and 7, and the third is coded 1 if relocation occurred between age 6/7 and age 8/9 for observation of grade 7.

It is worth noting that most children in our sample moved by age 10/11. About 26% did not move, 31% moved before reaching school age and 43% moved during school age.

Covariates

We include a number of covariates measured prior to NAPLAN testing that are known correlates of residential relocations and academic performance. We divide them among those that stem from the family and home environments, those from the residential environment, and those from the school context. Family covariates include two family structure indicators for one biological parent structure and for step-parent structure (*ref.* two biological parents), number of under-age children in household (for two or three children, and four or more children; *ref.* only one child), maternal age in years, maternal education indicator (coded 1 if completed secondary education by the first interview, coded 0 otherwise), and maternal non-employment (coded 1 if the mother is non-employed[3], coded 0 otherwise). Additionally, a tight financial situation has been found to affect children's school performance. For this reason we include a poor household indicator (coded 1 if household income is less than 50% of median household income, coded 0 otherwise). An unclean and crowded home restricts cognitive development and for that reason home environment covariates include an indicator of household crowding (number of residents divided by number of bedrooms in the dwelling), the interviewer observations of the internal condition of the dwelling (coded 1 if all visible rooms of the household were not reasonably uncluttered, coded 0 otherwise). To address the impacts of the residential environment, we include as covariates the Socio-Economic Index For Areas (SEIFA) advantage/disadvantage score divided by 100, an indicator for perceived bad neighbourhoods (i.e. the respondent parent's perception of whether the neighbourhood is a good place to bring up children: coded 1 if yes, coded 0 if no), and an indicator of residence in an urban area (coded 1 if yes, coded 0 if no). Characteristics of the school environment include an indicator of whether the child has attended more than one school (coded 1 if yes, coded 0 if no), an indicator of teacher's response on child's frequent school absences (coded 1 if yes, coded 0 if no), and an indicator of teacher's opinion about whether parents are involved with the school (coded 1 if yes, coded 0 if no). We also include additional demographic and (pre-school) child characteristics. These covariates included child's birth weight percentile, age in months, gender, country of birth (indicator coded 1 if non-Australian born, coded 0 otherwise), indigenous background (indicator coded 1 if indigenous background, coded 0 otherwise). Table A1 in the online appendix presents summary statistics for all model covariates.

Analytical strategy

After the description of NAPLAN test score averages by school grade and relocation circumstance (table 1), our analytical strategy combines two types of panel data methods to address longitudinal, multivariate associations: hybrid regression and random coefficient regression models.

First we estimate hybrid panel regression models (Allison, 2009) to address the question of whether relocations (i.e. occurrence, distance, and frequency) *impact* children's school performance (table 2). The hybrid panel model is an extension of multivariate regression models that leverage the longitudinal structure of the data by partitioning the overall variation of the association under study in between- and within-subject variation. The method consists of the estimation of random-effects regression models adding group-mean deviated variables of time-varying covariates in the models. By adding group-mean deviated variables of the covariates in the model, the assumption in random-effects models that the random term is uncorrelated with the covariates is relaxed. Additionally, the coefficients of the group-mean deviated variables can be interpreted as within-subject variation, and the coefficients of the original variables can be interpreted as between-subject variation. By between-subject variation we refer to *average differences* in school performance across

children. The between-subject analysis enables conclusions on whether school performance is associated with group-differences in the family home and residential environments of those who move and those who stay. By within-subject variation we refer to *changes within* children in school performance before and after the relocation. The within-subject analysis allows conclusions about the *impacts* of relocations by comparing the average school performance in periods before and after relocations. An additional advantage of hybrid panel regression models is that time-invariant selective factors or traits of children are cancelled out in the model specification, as in fixed-effects models.

Second, we estimate random coefficient regression models to address the question of the contemporaneous and cumulative impacts of age-specific relocations on progress in school performance (table 3). Random coefficients models are extensions of multivariate regression models that, leveraging the longitudinal structure of the data, relax the assumption that all study subjects follow the same average trajectory, e.g. a steady increase in academic performance (Bliese & Ployhart, 2002). To relax this assumption, we define a model with a random intercept and a random coefficient for age. This model resembles a basic growth model, where each child's school performance may start at a different level and depart from the average progress. Measures for age-specific relocations representing contemporaneous effects of relocations, as described in the measures section, were included in the model. Significant associations of the contemporaneous age-specific indicators will shed light on the relocation ages with immediate impacts on academic progress. The cumulative impact of age-specific relocation is captured by three indicators noted in the measures section. Significant associations of the cumulative age-specific indicators will shed light on the relocation ages that have sustained or later impacts in academic progress.

To identify factors that influence the above-mentioned associations, we estimate several models where we add other covariates to model specifications in a sequential fashion. In a first model specification, we only control for demographic variables and children's infancy indicators. In the second model we add to the first model specification controls for family structure and socio-economic status. In the third model we add to the first model specification controls for the residential environments, including characteristics of the peer, neighbourhood, and school context. In the fourth model we include all sets of control variables. Variations in the significance and the strength of the relocation coefficients can be used as an indication of the type of factors that more likely *affect* the association between relocations and school performance.

Results

Table 1 presents weighted means of standardised NAPLAN test scores by school grade and a number of characteristics of children's lifetime relocation experiences – children's age, distance and frequency. Detailed mean test scores for subject-specific tests can be consulted in table A2 in the online appendices. We show results for school grades 3, 5, and 7 as well as the progression between school grade 3 and 7. Note that the average standardised test score increases across school grades because test results are reported using a single scale for all students in grades 3, 5 and 7.

Results according to relocation characteristics in table 1 suggest certain association patterns that repeat across school grades. First, we find that children with early relocation experiences, since infancy up to pre-school (i.e. before age 4/5), have statistically significant worse average scores in all school grades than children who do not move in early stages. The consistent pattern across school grades hints at a possible sustainability of the impact of children's early experiences in later cognitive development. Test scores are also under the average for children who move at later stages, between ages 4/5 to 8/9, but the statistical significance of the association is largely marginal for school grade 5 and 7. Second, no substantively or statistically significant differences in test scores by relocation distance are found. Third, the largest mean differences in school performance observed in table 1 are those related to the frequency of relocation. Compared to grade-specific average test performance, children who relocate once or twice perform better, while children who relocate three or more times perform much worse. Mean differences are particularly significant, substantively

Table 1. Means of standardised NAPLAN test scores by school grade and relocation characteristics

	Grade 3		Grade 5		Grade 7		Grade 7-Grade 3	
Average	-0.85		0.05		0.63		1.50	
Age at relocation								
before 4/5	-0.89	**	0.03	**	0.61	*	1.50	
4/5 to 6/7	-0.92	**	0.02	(*)	0.60	(*)	1.51	
6/7 to 8/9			0.01		0.59	(*)	1.50	
8/9 to 10/11					0.60		1.52	
Relocation distance								
short distance	-0.87		0.06		0.64		1.51	
long distance	-0.89		0.03		0.62		1.52	
Relocation frequency								
1 to 2 relocations	-0.84		0.08	(*)	0.68	**	1.52	(*)
3 or more relocations	-0.98	***	-0.01	*	0.55	***	1.49	

Source: LSAC-K (2004–2012). Significance tests for mean differences between relocation characteristics and their absence. (*) = p<0.1; * = p<0.05; ** = p<0.01; *** = p<0.001

and statistically, for the children who relocate three or more times, and suggest a non-linear association between relocation frequency and school performance.

Regarding performance progress in NAPLAN tests from grades 3 to 7, we find very small and largely insignificant differences in table 1. This result is a preliminary indication that school performance trajectories are not importantly altered by relocation events. If the performance growth rate is the same despite differences in initial levels, then relocations might be leading towards neither convergence nor divergence in school performance. Our next step is to test whether these associations remain in a multivariate setting.

Relocation distance and frequency

Table 2 displays selected results (and table A3 in the online appendix displays full results) of the hybrid regression models that address the multivariate associations of relocation distance and frequency with differences in school performance across children who move and who stay (*between-subject effects*) and changes in school performance before and after a relocation (*within-subject effects*). Model 1 in table 2 included relocation variables (i.e. frequency and distance) and, additionally, controlled for age and other characteristics of children. Results from model 1 indicate that some relocation characteristics are only related to average performance differences between children, only related to changes in school performance after relocations, or unrelated with school performance. More specifically, we find a statistically significant between-effect of relocation frequency (*b= -.155, p>.001*) where children moving three or more times perform worse than children who do not move. We also find a positive within-effect of long-distance relocations (*b= .089, p>.01*), where children do slightly improve their academic performance after moving across regional boundaries. We find no significant between- or within-effect for moderate relocation levels on school performance. Overall, the size of the effects in model 1 is modest, below .2 standard deviations. In contrast, other model variables such as age or indigenous origin have larger effects that exceed .2 or .5 standard deviations, respectively.

In models 2, 3 and 4 of table 2, we add to model 1 characteristics of the family and home environment, the residential environment, and the school environment, respectively. Comparing results of these models to those of model 1, we observe a few changes in coefficients' size and statistical significance. First, the significant negative between-effect of relocation frequency vanishes

Table 2. Between- and within-subject differences in school performance (selected results)

	Model 1 Baseline controls	Model 2 Family/home controls	Model 3 Residential controls	Model 4 School controls	Model 5 All controls
Differences across children (between-subject differences)					
No relocation	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*
1 or 2 relocations	0.024	0.064*	0.007	0.048	0.055*
	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]
3 or more relocations	-0.155**	0.022	-0.131**	-0.078	0.022
	[0.05]	[0.05]	[0.05]	[0.05]	[0.05]
Long-distance relocation	-0.027	-0.018	-0.002	-0.012	0.009
	[0.04]	[0.04]	[0.04]	[0.04]	[0.04]
Changes in children overtime (within-subject differences)					
No relocation	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*
1 or 2 relocations	0.035	0.034	0.038	0.033	0.034
	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]
3 or more relocations	0.037	0.036	0.038	0.034	0.035
	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]
Long-distance relocation	0.089**	0.086*	0.094**	0.088*	0.089*
	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]
Subjects	3,481	3,481	3,481	3,481	3,481
Subject-observations	8,609	8,609	8,609	8,609	8,609

Notes: **Hybrid panel regression models**. Coefficients can be interpreted as standard deviation change. Standard errors in square brackets under coefficients. Control variables (measured prior to NAPLAN testing) – All models include children's gender, age in months, age-squared, indigenous background, non-Australian born, birth weight percentile. Model 2 includes one biological parent, step-family, two or three/four or more under-age children in household, maternal age, mother completed secondary education, mother is non-employed, and poor household. Model 3 includes a house crowding indicator, cluttered house, SEIFA index, negative neighborhood perception, and urban area. Model 4 includes school change, absenteeism, and parents' school involvement. Model 5 includes all covariates mentioned before. (*) = p<0.1; * = p<0.05; ** = p<0.01; *** = p<0.001

after controlling for characteristics of the family and home environment, and for those of school environments. This change might have been induced by the inclusion of characteristics associated with relocations and school performance – particularly those with relevant size effects such as absenteeism, parents' school involvement, and household structure – which are negatively correlated with school performance but positively correlated with frequent relocations. Second, we find marginal positive statistical significance for a between-effect of moderate relocation levels after controlling for characteristics of the family and home environments. The inclusion of characteristics associated with relocations and school performance – particularly those with relevant size effects such as poor household, lone parent or step-family – might suggest that average performance of children is better among those who relocate, but not frequently, compared to those who do not relocate.

In model 5 of table 2, we add to model 1 all additional covariates of models 2, 3 and 4, and thus, it is a fully specified model. Results of model 5 are similar to those of prior models, and thus,

interpretations of the associations between relocations and school performance remain unchanged. We note that other coefficients in model 5 for covariates on situations and contexts in the family, place of residence and school matter for children's school performance more than relocations *per se* (see table A3 in appendix). Factors associated with more than one standard deviation difference in school performance include pre-exiting situations (between-effects) such as non-intact families, school absenteeism, and indigenous background – for negative associations – as well as mother's education, relative socioeconomic advantage of the area of residence, parents' school involvement, female child, and non-Australian background – for positive associations.

Age-specific relocations

Selected results of the random coefficients models are presented in table 3 (full results are available in table A4 in the online appendix). These models include variables that address the impacts of age-specific relocations before tests in grades 3, 5 and 7 took place (contemporaneous associations) as well as the persistence of the effect of age-specific relocations in later school stages (cumulative associations). The pattern of results was very similar across model specifications, and for that reason we only show model 1, with the baseline specification, and model 5, the fully specified model. Overall, we find neither substantive nor statistically significant effects of the age stage when relocations occur on school performance trajectories. In model 1, which additionally controls for children's characteristics, an individual random effect, and a random coefficient for age, coefficients of age-specific relocations were close to 0 and mostly statistically insignificant. Only relocations occurring at the time of school entry (i.e. between age 4/5 and age 6/7) have marginally significant and small contemporaneous impacts during grade 3 (*b= -.083, p>.01*). Further, persistence of negative effects of early relocations on school performance in later stages that could be interpreted from the bivariate associations in table 1 do not hold in the multivariate models, since the coefficients for cumulative associations of age-specific relocations are largely insignificant. In the fully specified model 5, the modest immediate impact of relocations occurring at the time of school entry remains statistically significant at the margin, though. We note that controlling for age and age squared in the model renders insignificant and small coefficients not only for age-specific relocation variables, but also for the random coefficient of age, which suggests that children follow similar patterns of growth in NAPLAN test performance overtime. Coefficients for other model covariates are similar to those described before. Overall, these results suggest that developmental stage at relocation has little effect on school performance trajectories measured as repeated participations in NAPLAN tests in grades 3, 5 and 7.

Discussion

In this study, we have examined the associations between relocations, from infancy to middle childhood, and school performance in school grades 3, 5 and 7 using recent data from the Longitudinal Study of Australian Children. We argued that the associations between childhood relocations and school performance are complex and highly dependent on the intersections between relocation biographies (i.e. relocation lifetime frequency, distance, and developmental age-stage) and the proximal contexts where children are embedded (i.e. family, home, and school).

Some key findings arise from our study. First, our analyses confirm for the Australian case that, under certain conditions, residential relocations are associated with school performance. In line with studies from the US context, the associations we find can be considered *modest*, since the largest differences we found are around 0.2 standard deviations between those who relocate and those who do not. To put this in perspective, we find that differences among children who experience changes in family structure across survey waves are around 0.6 standard deviations.

Second, we have some evidence of a non-linear association between relocation frequency and school performance. We find that children who relocate often (3 or more times) display worse school performance, while children who relocate moderately (1-2 times) display better school performance. Using hybrid panel regression models, we further examined these associations as differences in school performance between subjects (between-effects) and changes in school

Table 3. Effects of age-specific relocations on school performance trajectories (selected results)

	Model 1	Model 5
Contemporaneous association		
Move between ages 4/5 to 6/7 (on grade 3)	-0.036**	-0.034*
	[0.02]	*[0.03]*
Move between ages 6/7 to 8/9 (on grade 5)	-0.014	0.011
	[0.02]	*[0.02]*
Move between ages 8/9 to 10/11 (on grade 7)	-0.002	-0.002
	[0.02]	*[0.02]*
Cumulative association		
Before age 4/5	-0.038	-0.007
	[0.03]	*[0.02]*
Ages 4/5 to 6/7	-0.048	0.009
	[0.03]	*[0.03]*
Ages 6/7 to 8/9	-0.014	0.004
	[0.02]	*[0.02]*
Subjects	3,481	3,481
Subject-observations	8,609	8,609

Notes: **Random-coefficient regression models**. Coefficients can be interpreted as standard deviation change. Standard errors in square brackets under coefficients. Control variables (measured prior to NAPLAN testing) – All models include children's gender, age in months, age-squared, indigenous background, non-Australian born, birth weight percentile. Model 5 additionally includes one biological parent, step-family, two or three/four or more under-age children in household, maternal age, mother completed secondary education, mother is non-employed, poor household, house crowding indicator, cluttered house, SEIFA index, negative neighborhood perception, urban area, school change, frequent absenteeism, and parents' school involvement. (*) = p<0.1; * = p<0.05; ** = p<0.01; *** = p<0.001

performance within subjects (within-effects). We found that the significant associations related only to differences between children who moved and who stay put, and not to changes in school performance before and after the relocation. This suggests that these associations are rather more likely to be due to pre-existing differences among children who relocate than due to direct impacts of relocations. On the one hand, children who relocate moderately may be found in family and home contexts that provide opportunities. On the other hand, children who relocate frequently may be found in contexts with high concentrations of disadvantage, with residential insecurity one possible source. In support of this thesis, we find that after controlling for detrimental family and home characteristics for children's school performance, the negative *effects* of frequent relocations vanish, and the positive *effects* of moderate relocation levels increase. It is worth noting that children's frequent relocation levels in our sample were associated with parents' employment status change and, particularly, with changes in parental partnership status (i.e. separation and re-partnering) that often have negative impacts on children. Third, our multivariate results show that long-distance relocations were modestly associated with improvements in school performance after relocations. The result contradicts the idea that relocations over longer distances break proximal environments and preclude children from the benefits of enduring connections with peers, the community, and the school environment. However, long-distance relocations are often motivated by positive changes, such as parental careers or neighbourhood improvements that indicate better conditions for children's cognitive development. In fact, children who relocate over long distances in our sample are likely to move to better

neighbourhoods and have continuously employed fathers.

Last, we examined the associations between the relocation age-patterns and school performance trajectories. Bivariate analyses showed that early childhood moves are associated with slightly but persistently lower school performances across school grades. However, we did not find evidence of a sustained negative effect of early-age relocations throughout primary school performance in the multivariate random coefficient models that captured typical developmental growth curves.

In conclusion, our findings suggest that the associations of relocations with cognitive ability and development are imbued in the biographical and social context of childhood relocations. These findings are consistent with those of recent studies grounded on life course theory and methods, but resting on less sophisticated sets of analyses (e.g. Gambaro & Joshi 2016; Beck, Buttaro & Lennon, 2016). While changing residence is not per se a major determinant of academic performance, the contexts and environment where children are embedded matter. Since relocations that are detrimental for academic performance are embedded in contexts of disadvantage, policies aimed at supporting disadvantaged families may widely benefit children's cognitive development. Recent research on factors that mitigate the observed negative outcomes among frequent movers also finds that skills and competencies linked to children's resilience work better when only a few risk factors are present at a time (McLeod, Heriot, & Hunt, 2008).

Although we addressed a number of relevant measures of children's relocation histories, several questions about the underlying associations remain unanswered. Particularly, our study has emphasised the role of accumulation of relocation experience at the expense of attention to the continuity or change in contexts of disadvantage upon relocation. Recent literature underscored the importance of processes such as segregation and concentration of disadvantage as drivers of persisting inequalities among children (e.g. Hamnett, Ramsden & Butler, 2007; Clark & Maas 2012). Our models only adjusted for a number of socio-economic context features that significantly affected children's academic performance, such as the SEIFA indicator for area disadvantage as well as an indicator of the parent's perception about the neighbourhood. An initial exploration of changes in SEIFA values upon relocation showed that when children move, they often move to better socio-economic contexts. Only 10 % relocate to more disadvantaged areas, often these being children who moved three or more times. We do not find significant associations between changes in SEIFA and academic performance, though. However, we believe that further research needs to address whether and how persistence (more than change) in (dis)advantaged areas impacts children's wellbeing and development.

Another question that arises from our research is whether the weak associations between relocations and school performance could be inferred as a population pattern, or whether these associations are moderated by socio-economic strata. An initial exploration showed neither substantive nor statistically significant associations of interaction terms between relocation indicators and household economic status. Further research is required to address other potential interaction effects. We also note that despite the number of sensitivity tests we performed, our results may not be completely accurate due to analytical limitations, such as the different calendars of data collection of LSAC (every two years, from March to December) and NAPLAN tests (each year, May), as well as a somewhat biased sample towards less disadvantaged families. Last, as with most prior studies on the topic, we did not have information on the motivations for household relocations, the assessment of which can provide additional, nuanced evidence to inform effective policy intervention in the field (Lennon et al., 2016). However, this is not necessarily an issue since our models adjust for variables that capture situations of disadvantage often associated with negative reasons for relocation so as to provide adequate estimates of typical relocation impacts.

Despite the limitations, this study makes substantive and methodological contributions to the literature. Our study contributes to an emerging body of research, largely focused on the US context, by examining longitudinal associations between residential moves and academic performance in the Australian context. We did not find the associations to differ much to those of US-based research, despite the relatively more equal opportunity to access high-quality early education and lower poverty levels among Australian children. Our study

also makes a contribution by furthering the diachronic assessment of the associations between academic performance and residential histories, using analytical models and measures that acknowledge the biographical aspects of the association, as well as potential sources of time-constant unobserved heterogeneity. Ours is one of the few studies that leverages longitudinal data to disentangle whether any observed associations are the result of relocations, or are due to pre-existing characteristics of children who relocate. We call for further research along these lines.

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Endnotes

1. Only selected results of domain specific tests scores are presented in the text. Full results are available upon request.
2. Local government in Australia (LGA) is the lowest tier of government in Australia administered under the states and territories, which in turn are beneath the federal tier. There are currently 565 LGAs in Australia.
3. We note that most situations of non-employment in the household are mothers outside the labour force. Households with unemployed fathers are less than 2% of the sample.

Appendix

Table A1. Univariate summary statistics

	Mean	SD	Min.	Max.
NAPLAN Test score: Reading	504.312	94.177	0	842
NAPLAN Test score: Writing	492.548	83.73	89	807.2
NAPLAN Test score: Spelling	494.501	88.003	180	751.9
NAPLAN Test score: Grammar	509.891	97.267	62	839
NAPLAN Test score: Numeracy	499.606	90.211	0	848.4
NAPLAN Standardized score	0.073	0.948	-3.332	3.01
Short-distance relocations	0.619	0.486	0	1
Long-distance relocations	0.177	0.381	0	1
1 or 2 relocations	0.507	0.5	0	1
3 or more relocations	0.193	0.395	0	1
Relocated before age 4/5	0.589	0.492	0	1
Relocated ages 4/5 to 6/7	0.257	0.437	0	1
Relocated ages 6/7 to 8/9	0.145	0.352	0	1
Relocated ages 8/9 to 10/11	0.064	0.245	0	1
Female	0.493	0.5	0	1
Age	8.807	1.655	6.25	11.667
Non-Australian born	0.035	0.185	0	1
Indigenous	0.024	0.154	0	1
Birth weight	49.897	28.739	0.001	100
Two biological parents	0.816	0.388	0	1
Lone parent	0.129	0.335	0	1
Step family	0.056	0.229	0	1
One child	0.107	0.31	0	1
2–3 children	0.783	0.413	0	1
4 or more children	0.11	0.313	0	1
Poor household	0.165	0.371	0	1
Maternal education	0.82	0.384	0	1
Maternal non-employment	0.243	0.429	0	1
Maternal age	39.004	5.214	22	58
House crowding	1.287	0.392	0.4	5
House cluttered	0.053	0.225	0	1
SEIFA index	10.128	0.746	5.9	12.1
Bad neighbourhood	0.092	0.289	0	1
Urban area	0.852	0.355	0	1
Absenteeism	0.041	0.198	0	1
School change	0.123	0.329	0	1
Parent' school involvement	0.89	0.312	0	1

Source: LSAC-K (2004–2010). Predictors are measured prior to NAPLAN testing (see methods section)

Table A2. Means of standardised NAPLAN test scores and subject-specific test scores by school grade and relocation characteristics

	SD score		Reading		Writing		Spelling		Grammar		Numeracy	
Grade 3												
Average	-0.85		419.72		427.15		417.61		426.68		415.83	
Age at relocation												
before 4/5	-0.89	**	415.44	**	424.57	*	413.42	**	422.53	**	413.17	*
4/5 to 6/7	-0.92	**	413.55	*	422.86	(*)	408.86	***	418.80	**	411.57	(*)
6/7 to 8/9	-1.02		415.16		401.44	*	404.20		409.84		397.39	(*)
Relocation distance												
short distance	-0.87		417.58		426.22		415.42		425.27		414.52	
long distance	-0.89		418.98		423.23		412.42		421.52		414.81	
Relocation frequency												
1 to 2	-0.84		420.37		427.33		418.69		427.05		417.02	
3 or more	-0.98	***	408.09	**	418.33	*	403.09	***	414.94	**	405.73	**
Grade 5												
Average	0.05		500.97		491.39		492.41		510.27		497.36	
Age at relocation												
before 4/5	0.03	**	498.56	*	488.22	**	491.07		506.67	**	494.55	**
4/5 to 6/7	0.02	(*)	498.75		486.83	*	488.48	(*)	509.17		492.99	*
6/7 to 8/9	0.01		498.51		487.73		489.11		505.10	(*)	490.55	**
8/9 to 10/11	0.03		511.45		473.58		486.98		502.46		506.63	
Relocation distance												
short distance	0.06		501.53		490.89		493.46		511.08		497.82	
long distance	0.03		500.81		490.26		488.70		507.74		492.23	(*)
Relocation frequency												
1 to 2	0.08	(*)	502.92		493.37	*	495.06	*	512.27		498.58	
3 or more	-0.01	*	497.28		483.43	***	486.47	*	504.31	*	491.76	*
Grade 7												
Average	0.63		553.51		531.23		548.39		555.13		550.72	

Table A2. Continued.

Age at relocation											
before 4/5	0.61	*	551.85		528.58	*	546.90		552.51	*	547.50	**
4/5 to 6/7	0.60	(*)	550.87		523.74		547.10		551.93	(*)	546.91	(*)
6/7 to 8/9	0.59	(*)	550.81		529.98		544.86		550.08	*	543.77	**
8/9 to 10/11	0.60		551.86		530.82		547.74		549.77	(*)	544.19	*
Relocation distance											
short distance	0.64		554.21		530.71		549.35		555.27		549.5	
long distance	0.62		553.36		529.32		544.98		552.93		549.97	
Relocation frequency											
1 to 2	0.68	**	557.18	**	533.74	*	551.86	**	559.65	**	553.21	(*)
3 or more	0.55	***	547.54	**	524.67	**	543.38	*	546.83	***	542.57	***
Grade 7 – Grade 3											
Average	1.50		136.04		102.39		133.01		133.40		134.88	
Age at relocation											
before 4/5	1.50		137.29		100.78		133.92		132.98		132.98	(*)
4/5 to 6/7	1.51		137.72		94.43	**	136.58	*	134.79		134.77	
6/7 to 8/9	1.50		137.59		104.95		133.24		129.16		132.9	
8/9 to 10/11	1.52		140.57	(*)	104.21		135.48		131.64		133.6	
Relocation distance											
short distance	1.51		138.04	*	101		135.25	**	133.48		134.54	
long distance	1.52		137.16		102.28		131.87		135.86		136.58	
Relocation frequency											
1 to 2	1.52	(*)	137.49		104.22		134.61		135.69		135.14	
3 or more	1.49		137.69		96.88	*	135.06		130.5		132.34	

Source: LSAC-K (2004-2010). Significance tests for mean differences between relocation characteristics and their absence.
(*) = p<0.1; * = p<0.05; ** = p<0.01; *** = p<0.001

Table A3. Between- and within-subject differences in school performance (full models)

	Model 1	Model 2	Model 3	Model 4	Model 5
Differences *between* individuals					
No relocation	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*
Frequency: 1 or 2 relocations	0.024	0.064*	0.007	0.048	0.055*
	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]
Frequency: 3 or more relocations	-0.155**	0.022	-0.131**	-0.078	0.022
	[0.05]	[0.05]	[0.05]	[0.05]	[0.05]
Long-distance relocation	-0.027	-0.018	-0.002	-0.012	0.009
	[0.04]	[0.04]	[0.04]	[0.04]	[0.04]
Differences *within* individuals					
No relocation	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*
Frequency: 1 or 2 relocations	0.035	0.034	0.038	0.033	0.034
	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]
Frequency: 3 or more relocations	0.037	0.036	0.038	0.034	0.035
	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]
Long-distance relocation	0.089**	0.086*	0.094**	0.088*	0.089*
	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]
Other model covariates					
Female (between-effect)	0.198***	0.207***	0.204***	0.196***	0.207***
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Age (between-effect)	2.873***	2.365***	2.118***	2.691***	1.820**
	[0.65]	[0.63]	[0.63]	[0.64]	[0.61]
Age (squared) (between-effect)	-0.163***	-0.132***	-0.116**	-0.152***	-0.097*
	[0.04]	[0.04]	[0.04]	[0.04]	[0.04]
Non-Australian born (between-effect)	0.397***	0.326***	0.323***	0.403***	0.291***
	[0.07]	[0.06]	[0.06]	[0.06]	[0.06]
Indigenous (between-effect)	-0.640***	-0.460***	-0.516***	-0.540***	-0.369***
	[0.08]	[0.08]	[0.08]	[0.08]	[0.07]
Birth weight (between-effect)	0.001	0	0	0	0
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Age (within-effect)	1.135***	1.051***	1.135***	1.129***	1.045***
	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]
Age (squared) (within-effect)	-0.043***	-0.042***	-0.043***	-0.043***	-0.042***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Lone parent (between-effect)		-0.185***			-0.132**
		[0.05]			[0.05]
Step family (between-effect)		-0.182**			-0.156*
		[0.07]			[0.07]
2–3 children (between-effect)		-0.061			-0.067(*)
		[0.04]			[0.04]
4 or more children (between-effect)		-0.224***			-0.149**
		[0.05]			[0.05]

Table A3. Continued.

	Model 1	Model 2	Model 3	Model 4	Model 5
Lone parent (within-effect)		-0.015			-0.016
		[0.03]			[0.03]
Step family (within-effect)		0.026			0.023
		[0.04]			[0.04]
Poor household (between-effect)		-0.163**			-0.082
		[0.05]			[0.05]
Maternal education (between-effect)		0.267***			0.195***
		[0.03]			[0.03]
Maternal non-employment (between-effect)		0.027			0.043
		[0.04]			[0.04]
Maternal age (between-effect)		0.018***			0.010***
		[0.00]			[0.00]
Poor household (within-effect)		-0.003			-0.001
		[0.02]			[0.02]
Maternal non-employment (within-effect)		0.016			0.015
		[0.01]			[0.01]
Maternal age (within-effect)		0.069***			0.071***
		[0.02]			[0.02]
House crowding (between-effect)		-0.021			-0.010
		[0.02]			[0.02]
House cluttered (between-effect)		-0.016			-0.012
		[0.02]			[0.02]
SEIFA index (between-effect)			0.260***		0.193***
			[0.02]		[0.02]
Bad neighbourhood (between-effect)			-0.118**		-0.069(*)
			[0.04]		[0.04]
Urban area (between-effect)			0.054		0.066(*)
			[0.04]		[0.04]
SEIFA index (within-effect)			-0.019		-0.020
			[0.02]		[0.02]
Urban area (within-effect)			0.064*		0.066*
			[0.03]		[0.03]
Absenteeism (between-effect)				-0.480***	-0.330**
				[0.11]	[0.11]
School change (between-effect)				-0.056	-0.060
				[0.08]	[0.08]
Parent' school involvement (between-effect)				0.702***	0.467***
				[0.06]	[0.06]
Absenteeism (within-effect)				-0.025	-0.027
				[0.03]	[0.03]
School change (within-effect)				0.010	0.008
				[0.01]	[0.01]
Parent' school involvement (within-effect)				-0.001	-0.005

Table A3. Continued.

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Constant term	-12.29***	-11.27***	-12.19***	-11.98***	-11.21***
	[2.44]	[2.36]	[2.35]	[2.38]	[2.28]
Subjects	3,481	3,481	3,481	3,481	3,481
Subject-observations	8,609	8,609	8,609	8,609	8,609

Notes: **Hybrid panel regression models**. Predictors are measured prior to NAPLAN testing (see methods section). Coefficients can be interpreted as standard deviation change. Standard errors in square brackets under coefficients. (*) = p<0.1; * = p<0.05; ** = p<0.01; *** = p<0.001

Table A4. Effects of age-specific relocations on school performance trajectories (full models)

	Model 1	Model 2	Model 3	Model 4	Model 5
Relocation age-stage (contemporaneous)					
Ages 4/5 to 6/7	-0.036**	-0.032(*)	-0.035*	-0.039*	-0.034*
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Ages 6/7 to 8/9	0.014	0.016	0.013	0.009	0.011
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Ages 8/9 to 10/11	-0.002	0.006	-0.008	-0.004	-0.002
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Relocation age-stage (cumulative)					
Before age 4/5	-0.038	0.004	-0.042(*)	-0.036	-0.007
	[0.03]	[0.02]	[0.02]	[0.03]	[0.02]
Ages 4/5 to 6/7	-0.048	0.006	-0.034	-0.047(*)	0.009
	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]
Ages 6/7 to 8/9	-0.014	-0.004	-0.004	-0.013	0.004
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Other model covariates					
Female	0.201***	0.208***	0.203***	0.201***	0.209***
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Age (in months)	1.117***	1.092***	1.114***	1.113***	1.092***
	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]
Age (squared)	-0.042***	-0.042***	-0.042***	-0.042***	-0.042***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Non-Australian born	0.396***	0.336***	0.354***	0.394***	0.309***
	[0.07]	[0.06]	[0.06]	[0.07]	[0.06]
Indigenous	-0.644***	-0.494***	-0.562***	-0.636***	-0.448***
	[0.08]	[0.08]	[0.08]	[0.08]	[0.08]
Birth weight	0.001	0	0	0.001	0
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Lone parent		-0.085***			-0.082***
		[0.02]			[0.02]
Step family		-0.076*			-0.070*
		[0.03]			[0.03]
2–3 children		-0.027			-0.035
		[0.04]			[0.04]
4 or more children		-0.200***			-0.178***
		[0.05]			[0.05]
Poor household		-0.023			-0.020
		[0.01]			[0.01]
Maternal age		0.289***			0.259***
		[0.03]			[0.03]
Maternal non-employment		0.017			0.018
		[0.01]			[0.01]

Table A4 , continued.

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Maternal age		0.021***			0.017***
		[0.00]			[0.00]
House crowding		-0.023			-0.017
		[0.02]			[0.02]
House cluttered		-0.014			-0.015
		[0.02]			[0.02]
SEIFA index			0.134***		0.103***
			[0.01]		[0.01]
Bad neighbourhood			-0.145***		-0.109**
			[0.04]		[0.04]
Urban area			0.078***		0.078***
			[0.02]		[0.02]
Absenteeism				-0.049*	-0.042(*)
				[0.02]	[0.02]
School change				0.014	0.013
				[0.01]	[0.01]
Parent' school involvement				0.030*	0.018
				[0.01]	[0.01]
Intercept	-6.567***	-7.383***	-7.965***	-6.575***	-8.331***
	[0.15]	[0.18]	[0.20]	[0.15]	[0.21]
Random part (var)					
Age	0.001	0.001	0.001	0.001	0.001
Intercept	0.688***	0.664***	0.668***	0.687***	0.651***
Subjects	3,481	3,481	3,481	3,481	3,481
Subject-observations	8,609	8,609	8,609	8,609	8,609

Notes: **Random-coefficients regression models**. Predictors are measured prior to NAPLAN testing (see methods section). Coefficients can be interpreted as standard deviation change. Standard errors in square brackets under coefficients. (*) = p<0.1; * = p<0.05; ** = p<0.01; *** = p<0.001

Dimensions of family disruption: Coincidence, interactions, and impacts on children's educational attainment

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Abstract

Household composition, economic resources, and residence are not necessarily stable across childhood. Changes in parental relationship status, parental employment, and residence have been shown to affect children's educational attainment. Less studied is the fact that these events can occur in combination: families could experience more than one of these disruptive events within the same time period (e.g. year); from a life course perspective, families could experience multiple events throughout their lives. Using linear regression models to analyse data from the Panel Study of Income Dynamics, a longitudinal study of U.S. individuals, I confirmed that the children of parents who experienced employment loss or gain, or partner loss or gain demonstrated lowered odds of high school completion, college attendance, and college completion. Residential moves increased the odds of high school completion but decreased chances of college completion. I then found that experiencing two disruptive events within a given two-year period led to an increased negative effect compared to experiencing only one event. These findings robustly applied to different comparison group specifications. Finally, I showed that, generally, increasing the number of disruptive events decreased the probability of attaining the educational outcomes considered.

Keywords

Education; family; life course

Introduction

Household composition, economic resources, and residence are not necessarily stable across childhood. Changes in parental relationship status, parental employment, and residence have been shown to affect children's educational attainment. Research usually focuses on one life event, such as divorce, a move, or job loss; such studies give insights into the dynamics and consequences of isolated events. Less studied is the fact that these events may occur in combination. The possibility that events cascade, triggering subsequent disruption and reinforcement—in which one disruption magnifies the impacts of other disruptions experienced simultaneously—means that family disruption might have second-order effects on children's educational attainment. There are indeed events that prompt another event, such as a residential move following a divorce (Clark, 2016; South, Crowder, & Trent, 1998; Weitzman, 1985), or a job loss leading to a divorce (Charles & Stephens, 2004; Sayer, Allison, England, & Kangas, 2011). Events could also occur independently but successively within a given two-year timeframe. Disruptive events could interact to form their own dynamic relationship, in which consequences can be attributed to both events or to a complex interplay of events. As Werner and Smith (1992) point out, "the intercorrelations among a number of concurrent stressors in children's lives and possible common antecedents…are often overlooked in…investigations" (154). The aim of this study was to examine these potential event combinations and their prevalence and assess the second-order effects of combined disruptions above and beyond the better-known first-order impacts of singular events on children's educational outcomes.

Treating each event separately allows research to focus and delve more deeply into each event's impact on the life course. However, a focus on singular events only gives a decontextualised view of each event. A central tenet of life course theory holds that any event occurs in the life course as part of a series of events (Elder, 1999; Mayer, 2009) or an age-graded pattern (Elder, Johnson, & Crosnoe, 2004). Some events are considered part of normative life course stages (e.g. completion of schooling, first marriage, retirement (Riley & Riley, 1994; Uhlenberg & Mueller, 2004)), but people additionally experience events that disrupt the life course in some way and create an off-time and sometimes unexpected transition (e.g. from employed to unemployed (McLeod & Almazan, 2004)) or turning point (Wheaton & Gotlib, 1997). Disruptive events can be, and often are, coupled together. If each event matters, the interaction between or combination of events may matter as well: for example, if a divorce seemingly prompts a negative outcome, it could be that a residential move coinciding with the divorce is partially causative in the fallout. Prior research has not yet addressed this question, leaving a potentially large gap in the literature. Some studies have focused on co-occurrence of events that mark the transition to adulthood, the increasing individualisation of the life course, and how event sequence patterns are affected (Buchmann, 1989; Rindfuss, Swicegood, & Rosenfeld, 1987; Shanahan 2000). However, these conversations about event combinations focus on normative life course events, or role transitions, as shaping a transition into adulthood (or parenthood), not disruptive events that occur within the adult life course. Some literature in social psychology has investigated how clusters of adversities or traumas differ from single events (Kessler, Gillis-Light, Magee, Kendler, & Eaves, 1997) and how families might bear this burden as a collective entity (Malia, 2006), though this work focuses primarily on mental health outcomes.

This paper focuses on the probability of high school graduation, college attendance, and college completion for the children of parents who experienced disruptive life events. Of course, many educational outcomes occurring between birth and high school graduation could be measured, such as grades, disciplinary actions or grade retention. I chose to focus on high school graduation, college attendance and college completion as educational markers that impact a child's likelihood of experiencing the same disruptive events in their subsequent life trajectories. High school diplomas are necessary for the vast majority of jobs in the U.S., and college degrees lead to significantly increased incomes, especially over a lifetime of employment (Borgen & Rumbaut, 2011). These crucial milestones also provide a protective effect against job loss (Brand & Simon Thomas, 2014; Kogan, Unt & Saar,

2007 and marital instability (Furstenberg, 1995). Indeed, I show the impact of parents' educational milestones on their own likelihood to experience disruptive events as well. If disruptive events in the parents' lives create situations in which children are more likely to experience the same events owing to the children missing educational milestones, this provides strong evidence for an intergenerational pathway of disadvantage.

Background

Previous research shows that disruptive events indeed matter for children's educational attainment; usually effects are negative, though income can be protective (Mortimer, Zhang, Husseman & Wu, 2014; Ryan, Claessens & Markowitz, 2013). Parental divorce or dissolution of a cohabiting relationship (Amato, 2000; Amato & Keith, 1991; Brown, 2010; Cooper, Osborne, Beck, & McLanahan, 2011; Fomby & Sennott, 2013; Garfinkel & McLanahan, 1986; Mitchell et al., 2015; Rhodes & Hoey, 1994; Seltzer, 1994; Sweeney, 2011; Thomas & Högnäs, 2015; Werner & Smith, 1992), remarriage or the start of a cohabiting relationship (Brown, 2010; Fomby & Sennott, 2013; Jaffee, Moffitt, Caspi & Taylor, 2003; Mitchell et al. 2015; Sweeney, 2011), residential moves (Burdick-Will et al., 2011; DeWit, 1998; Ingersoll, Scamman & Eckerling, 1989; Jelleyman & Spencer, 2008 Pettit & McLanahan, 2003; South, Haynie & Bose, 2007) and job loss (Brand & Simon Thomas, 2014; Parsons, Schoon & Vignoles, 2014) can negatively affect children educationally, socially, and emotionally. Combinations of events are probable: divorce or ending cohabitation has been shown to lead to residential moves (Swartz, Hartmann & Mortimer, 2011; Weitzman, 1985), similar to remarriage or the start of a new cohabiting relationship.

There are various pathways by which children's educational attainment can be affected by disruptive events. One is purely economic: divorce and job loss specifically negatively affect family income (Davis & von Wachter, 2011; Tach & Eads, 2014; Tach & Eads, 2015), and fluctuations in income have been shown to have negative consequences for children's education (Gennetian, Wolf, Hill, & Morris, 2015). Single mothers' job losses have been shown to lead to lower rates of high school and college completion for their children, and the authors (Brand & Simon Thomas, 2014) suggest that relative deprivation plays a role in these effects. Amato and Booth (1991) refer to this as an "economic deprivation" model. This economic argument would imply that marriage (or remarriage) and job gain would lead to positive results, given the likely increase in financial resources (Hao, 1996). Importantly, family income could also act as a buffer to the consequences of marital instability (Ryan, Claessens & Markowitz, 2013.

An alternative argument is that parental life disruptions could harm children by affecting their daily lives, such as partner status changes that lead to changes in childcare, which is disruptive for young children (Crosnoe, Chambers Prickett, Smith, & Cavanagh, 2014).[1] Corak (2004) argues directly that income is not the driving factor of disruptions' effects: "The decisive kinds of parental investments are not the monetary kind. The inheritance of education, occupation, and income is influenced in the first instance by the impact parents have on a child's cognitive performance" (Corak, 2004:33). By Corak's logic, changes in income, or even in overall socioeconomic status (e.g. occupational change and income change), should not change children's educational choices because these disruptive events do not change parents' cognitive influences. The parents remain the same (though divorce will alter exposure and stepfamily formation adds new people to the household), regardless of different employment situations, different relationships and/or living in a different home. However, I believe that parental disruptions necessarily impact children in that they can add stress and change income.

Disruptive events, such as partner exits and entrances (Amato & Booth, 1991; Amato & Keith, 1991; Mitchell et al., 2015) or job losses (Paul & Moser, 2009; Young, 2012), are also stressful for parents and their children, and this stress can affect behaviour and mental health. Pearlin, Menaghan, Lieberman, and Mullan (1981) argue that "unscheduled or undesired life events" (343), or "eventful experiences" (338) lead to role strain, or problems in the roles one is expected to play socially and personally, which in turn affects self-esteem and feelings of mastery. Pearlin more recently suggests that agency is diminished by life course disruptions, with potential negative effects (Pearlin, 2010). Both

mastery and agency mean that individuals feel in control over possible transition points in their lives and their consequences, and disruptive events impinge upon these feelings of control. When parents experience stress, it is likely to affect their children: "the actions, fortunes, and misfortunes of one person are likely to affect those with whom the person has close social relationships" (Pearlin 2010: 212). The family stress model underscores the idea that stressful life events take time to churn through each family member, potentially creating a complex interaction of emotions and reactions, or "upset in the steady state of the family" (Malia, 2006: 143). When children's mental health and behaviour (particularly classroom behaviour) suffers, this can affect their educational attainment, among other factors.

More generally, recent research likewise shows that instability in families is detrimental to children's educational performance (Cavanagh & Fomby, 2011), college completion (Fomby, 2013), behaviour (Cavanagh & Huston, 2006; Fomby & Sennott, 2013; Mitchell et al., 2015; Ryan, Claessens & Markowitz, 2014), and other outcomes related to the transition to adulthood, such as union formation, childbearing and entry into the labour force (Fomby & Bosick, 2013). The experience of multiple disruptive events within close time proximity is akin to instability. Research on families suggests that instability and change might be more to blame for negative effects on children rather than the family statuses themselves (Osborne & McLanahan, 2007; Sweeney, 2010; Wu & Martinson, 1993), over and above the negative effects of income changes (Wu, 1996). Indeed, the negative effects of family instability affect children across all levels of income (Ryan, Claessens & Markowitz, 2014).

However, a recent report by the Urban Institute (2014) points out that though instability is negative, there could be changes that create a form of instability but ultimately lead to better outcomes, such as a residential move when a parent gets a better job. Importantly, they also state that "the frequency or repetition of the experience of instability for children is an important consideration; a single experience of instability seems likely to have a different effect on children than repeated incidences of instability" (2). In an overview of related research, they refer to such repeated instances as a "cascade of instability," in which one event prompts another event. This is akin to the idea of a chain reaction within a life trajectory (Wheaton & Gotlib, 1997) or a cluster of adversities (Kessler et al., 1997).

There is already ample support for the hypothesis that parental disruptions negatively affect children's educational attainment. But whether and how combinations of events, as compared to single events, affect children's educational attainment remains unclear, though we can build the inference from existing research on single events that the effects of event combinations should be negative. If research on independent events is used as a guide, we could think of the consequences of multiple events as being additive. That is, a child whose parents divorce and then move experiences the negative consequences of the divorce plus the negative consequences of the residential change. I refer to this possible combination of event effects as the *additive hypothesis*.

Another possibility is that the effects of disruptions are not independent but rather interact to form increasingly exacerbated circumstances. Time proximity could lead to effects worsening beyond a simply additive process: in other words, there is the effect of each event as well as an additional increase in effects that can be attributed to event or effect interaction. Conversely, event effects could overlap, resulting in a total effect that is less than a simple addition of effects from separate events. I call this potentially multiplicative combination of event effects the *amplification hypothesis*, in which the multiplicative factor could be greater or less than 1.

To test these two hypotheses, I first asked: *How often are events found in combination with one another?* I also evaluated *which combinations were most common (i.e. which events were often experienced in the same family within a two-year time frame).* These questions focused on the parents' experiences with events to see how normative these event combination experiences might be. To focus on the effects specifically, I asked: *Do certain event combinations lead to lower educational outcomes for children than others?* Relatedly, *do any of these combinations of events lead to positive educational outcomes for children?*

A final hypothesis I considered stems from the idea of instability becoming normative in some households: it is possible that there is a point at which the effects of disruptive events are diminished by their combination and repetition. This means the outcomes are less about the exact events that occur and more about the quantity of them; the life course becomes defined in part by these disruptions. This is a more qualitative view of the simultaneity of events, which I refer to as the *cumulation hypothesis*. To test this final hypothesis, I asked: *Is a higher count of events worse (in terms of children's educational outcomes) than a lower count?* I was specifically interested in a possible non-linear trend as event count increased.

Data

I used data from the Panel Study of Income Dynamics (PSID) for this analysis. The PSID began in 1968 as an annual survey, and since 1997 it has continued to add data every two years. The study began with a sample of 18,000 individuals in 5,000 families (these participants are said to have the "PSID gene" or be "gened participants"), and the study is still growing as family members are added, creating a sample by 2011 of over 80,000 individuals. The PSID contains detailed information about job changes, partnership status, and residential location. It also contains, at a detailed level, a rich set of covariates for this analysis.

Initially, my sample included 22,104 children matched with parents. I removed respondents who were not at least 19 years old by 2011 (n=6,461), as those respondents had not reached the cut-off age of high school completion. (Changing this cut-off to 21 or 25 did not change results, so I used the dataset with a larger number of respondents, which used the cut-off of being at least 19 years old in 2011.) I only analysed events that occurred when the child was between 1 and 17 years of age. I removed respondents for whom data on any disruptive event for mothers or fathers, for all years, was missing (n=4,261), as leaving those cases in the dataset would have required substantial imputation across many years on my main predictive variables. Finally, across mothers and fathers with employment, relationship, and residential move data available, I retained 11,382 children in my sample.

I used a subset of the trigger events that DiPrete and McManus (2000) used. Though these authors looked at different outcomes, I believe these events captured instability and change in socioeconomic status for parents and hence their dependent children, which was appropriate for this analysis. The employment events were: (1) employment to no employment, (2) no employment to employment, and the relationship events were: (1) add partner, and (2) lose partner. It is important to note that the PSID classifies respondents as "married" if they have been cohabiting for more than a year; therefore, I used this variable indicating being "married" in my analyses. Thus, I focused on unions that dissolved or were entered into whether they were married or cohabiting, following the PSID definition of relationship length. I did not consider girlfriends and boyfriends in the household, as I believe that marriage or long-term cohabitation dissolution provides a greater shock to the household, and it was such large shocks in which I was interested. Though cohabitation and marriage have become increasingly similar in behaviour and effects on children (Goldberg & Carlson, 2014; Tach & Eads, 2014; Tach & Eads, 2015), I acknowledge that this is a generalisation and there could be differences for children whose parents have cohabiting versus married relationships. I also included a third event category: moving to a new residence, which made use of a question in the PSID in which respondents were asked if they had moved in the previous year. This gave me a total of five events to analyse,[2] which I only coded as occurring if there was a child in the household between the ages of 1 and 17 years. This list was by no means exhaustive; many more events could have been considered disruptive to families. This analysis was meant to provide a starting point with some of the most important trigger events for families. This line of research can be extended to other events, such as health-related changes (e.g. severe illnesses or death in families).

I measured educational outcomes for children following Brand and Simon Thomas (2014) as high school completion by age 19, college attendance by age 21, and college completion by age 25. Notably, results for each educational outcome could be quite different, because college usually requires a financial investment and attendance is not mandatory at any

age; persistence to college completion might also vary from attendance since it requires attending for multiple years and completing a set of requirements.

I primarily focused on event occurrence for either parent. However, following arguments that both parents' class origins matter for children and must be taken into account when analysing intergenerational mobility (Beller, 2009), I also analysed mothers' and fathers' events separately for comparison. The PSID's unique design uses a "head of household" designation, which in the early years of the survey meant the male adult respondent in the household. However, in households where the adult present was female, for example in the aftermath of a divorce, the female adult respondent became the head of household. Conversely, a marriage meant that head of household shifted to the male respondent. Due to these potential shifts, I placed heavier emphasis on the outcomes for parents generally to draw conclusions.

Finally, as is the case in most longitudinal surveys, attrition must be addressed. In the earlier half of the PSID, 2–3% of the sample was lost per year due to attrition (Falaris & Peters, 1998). Attrition could have occurred due to mortality. Additionally, if non-sample members left the household, they were no longer followed beyond that point in time; this means that relationship dissolution could have led to survey follow-up loss. More generally, an ended relationship could mean that survey participants were lost even if they were gened participants, because they moved and could not be located or they refused continued participation. Between 1968 and 1996, 5–13% of PSID fathers became non-resident, depending on the decade (Gupta, Smock & Manning, 2004). If attrition is selective – which evidence suggests it is, based on education, income, and health (Fitzgerald, 2011; Hofferth, 2006; Schoeni & Wiemers, 2015) – then this could lead to systematic variation and bias results. Because I removed respondents for whom data on disruptive events was missing, those respondents who did not have this event data for fathers were removed from the sample. Thus, because some of the less stable families could ultimately be missing from the sample, and these might be the families showing stronger effects of disruption, it is possible that results were slightly underestimated. However, Fitzgerald (2011) finds no evidence of the impact of attrition on outcomes in intergenerational models.

Methods

To code events, I created dichotomous variables. Prior to 1996, every year was included; post-1996, data were available for every other year. For the "employment to no employment" variable, I looked at employment in two adjacent years to see if there was a change from employed to not employed; if this was the case, the "employment to no employment" variable was coded as 1 rather than 0. Those who did not experience the event for any reason (including possibly being already not employed) are coded as zero. This comparison group is intentionally left to be general and inclusive, in order to allow for aggregation over the years included, to emphasise the "event-ness" rather than the specific nature of the particular change, and to include all respondents in the possible selection group when events are combined. (If one year's variable relevant to the event variable was missing, the event variable itself was coded as missing for that individual.) The other events were coded in a similar way. Thus, the events variables were coded as ever having experienced the event, with the boundaries being the time of the survey (1968–2011) and the child's age (1–17 years old).

I remained agnostic as to the underlying reasons for the responses (e.g. employed) and thus was looking at people whose employment or marital statuses changed for any reason, so long as I could view a change across years. (I did not capture those people who switched jobs in the middle of a year, for example – i.e. those people would lose and gain a job within the same two-year period considered.) Again, given the switch to biannual data collection post-1997, I considered events and event combinations across every two years rather than annually; this means that pre-1997 data was condensed to two-year intervals. In doing this, I found that event occurrences were balanced across two-year time spans, indicating that data collection efforts post-1997 reflected coverage of two years rather than one year.

To code events combinations, I created a variable for two events occurring in the same two years. I did not analyse the reasons or ordering for combinations

but rather looked to see if events occurred within the same two years. Occurring within such close time proximity meant children were exposed to more than one event within a short time frame, and the impact of that combination was of interest. It was possible that one event prompted another event, although their close proximity in time could also be coincidental; I could not determine which event occurred first when they occurred in the same survey year (where survey years are every two years) nor the exact reasons for their time proximity. Regardless of reason or order of coincidence, the fact remains that parents, and hence their children, were subject to the effects of both events within the same two-year time period. I defined this as a set of combined disruptive events.

I limited my sample to children who were at least 19 years old by the latest survey date (in 2011). I also looked only at parental events that occurred when their surveyed child was between 1 and 17 years old; events that occurred prior to that child's birth and once the child was at least 18 years old were not included in my analysis. There is a chance that some children were also parents with surveyed children in the sample; I did not exclude these cases. (These cases could be examined as a separate study in future work, though sample sizes would likely be quite limited, even using data from a study as large as the PSID.) There was some censoring of children who were born prior to 1968; they were included in the analysis (unless they turned 18 prior to 1968), although I only observed events that occurred in the years of their childhood that were included in the survey. Approximately 32% of children included in the survey were born prior to 1968, and thus, their childhood years are somewhat truncated. This means that my sample of children was slightly skewed toward older child ages as compared to a sample in which all childhood years would be included for all children; ages ranged from 19 to 61 years old in 2011 for the final sample. For children born prior to 1968, variables coded as a status at birth (e.g. mother's marital status) used this status in 1969 instead. (Variables in 1969 had fewer missing cases than 1968. For the non-missing cases, there was little difference between values in 1968 and 1969, so I opted to use the variables with fewer missing cases.)

I used linear regression models to see which covariates significantly predicted incidences of disruptive events in mothers' and fathers' lives. (These models were also run as logistic regression models and as Poisson models, and I found no differences in effects in terms of which covariates significantly affect the events examined. Thus, I used linear regression models for simplicity.) Linear regression models took the form of:

$$y = \beta_0 + \beta_1 * x_1 + \beta_2 * x_2 + ... + \beta_n * x_n$$

where *y* was the probability of the disruptive event, x_n was the set of covariates being examined in this model, β_0 was the constant, and the other β_n's signified the set of coefficients for each variable. I examined the β_n coefficients to see which covariates significantly predicted events.

I used logistic regression models to estimate effects of parental events on child educational outcomes. Logistic models took the form of:

$$\log(\frac{p}{1-p}) = \beta_0 + \beta_1 * x_1 + \beta_2 * x_2 + ... + \beta_n * x_n$$

where *p* was the probability of reaching an educational milestone (completing high school by age 19, attending college by age 21, or completing college by age 25), x_n was the set of covariates being examined in this model, β_0 was the constant, and the other β_n's signified the set of coefficients for each variable. Each educational outcome was a separate model; each event was considered in a separate model as well. I analysed mothers' and fathers' events in separate models to be able to examine potential differences in parental influence. Covariates for all models included the child's sex and race, whether the child was born in the U.S. South, mother's and father's high school completion, mother's and father's college completion; I also included covariates signifying if the mother or father was married when their child was born, and covariates signifying if the mother or father worked in manufacturing when their child was born. Earlier models included a control variable for parental age at child's birth; this variable was not significant and did

not change the results at all, and was therefore removed to maintain simpler models.

Descriptive statistics are shown in table 1 for events for parents. Children did appear to have lower educational attainment, on average, when one of their parents experienced an event. Educational attainment for both mothers and fathers was also lower among those who experienced events, as was the chance of being married when the child was born. Working in manufacturing did not show a pattern, though there were, on average, differences within each event. Descriptive statistics for mothers and fathers, shown in summary form in table 2 and in full in appendices A and B, showed similar patterns except for an important distinction: high school completion for children was largely the same whether or not mothers experienced disruptive employment events, whereas when fathers experienced employment events, the chance of any of the children's educational outcomes was lower, as might be expected. Whereas the presence of partnership change events meant a lower chance of any educational outcomes, moving actually led to slightly higher means of children's high school completion and college attendance, though lower means of college completion; these patterns held true for both mothers' and fathers' events. Education also appeared protective for fathers only: higher educational attainment was protective against experiencing events, whereas higher educational attainment did not afford mothers the same protection. Because of these interesting differences, I looked at mothers and fathers separately again in other analyses to see what this may have meant for children.

Finally, in other work I showed that both the age of children and the time placement of the event(s) in calendar years could affect outcomes (Simon Thomas, n.d.) In this manuscript, however, I was interested in the overall effects; breaking down the analysis by these two factors is addressed in additional work.

Results

Analysis of events

I first focused on exploratory analyses to overcome the lack of coverage in the literature on how these life events might combine. These initial analyses involved determining how often events occurred and then how often events occurred in close temporal proximity. To start, I looked at the frequency of event occurrence in respondents' lives. Disruptive event occurrence, generally, was not rare. As shown in table 3, the frequency of respondents experiencing single events for parents was 34% and 33% for employment loss and gain, respectively, and 28% and 24% for partner loss and gain, respectively. Over 70% of respondents experienced a residential move of some kind during the time period considered. Single events for mothers and fathers alone were only slightly less in number. With a sample size of 11,382, this gave a more than adequate number of event occurrences for analysis; it also made it likely that respondents would experience more than one event during their children's childhood years, particularly in combination with residential moves, given their frequency.

Indeed, between 15% and 21% of respondents experienced employment and marital events combined with residential moves in the same two-year period at some point during their childhood. For mothers and fathers, between 9% and 19% experienced these event combinations. Employment events combined with marital events in the same time period were less frequent, at 4–5% for parents and 2–3% for mothers and fathers. This shows that event combinations were not uncommon; many families experienced two events in close temporal proximity.

Next, I investigated demographic characteristics that might impact the likelihood of experiencing a disruptive event. Initial linear regression models revealed the covariates that had significant bearing on disruptive event occurrence; results for parents and children are shown in table 4. Non-white parents were more likely to experience all events. Children born earlier in the sample were less likely to have

Table 1: Descriptive Statistics (events for parents)

	All children	Employment loss		Employment gain		Partner loss		Partner gain		Moved	
		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
	Mean (SD)	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*
Child variables											
High school completion	0.484	0.477	0.487	0.476	0.488	0.460	0.493	0.466	0.489	0.507	0.429
by age 19	(0.500)	(0.500)	(0.500)	(0.499)	(0.500)	(0.498)	(0.500)	(0.499)	(0.500)	(0.500)	(0.495)
College attendance	0.259	0.239	0.269	0.240	0.268	0.214	0.277	0.215	0.272	0.270	0.233
by age 21	(0.438)	(0.427)	(0.443)	(0.427)	(0.443)	(0.410)	(0.447)	(0.411)	(0.445)	(0.444)	(0.423)
College completion	0.130	0.095	0.148	0.098	0.146	0.079	0.150	0.078	0.146	0.121	0.152
by age 25	(0.336)	(0.293)	(0.355)	(0.298)	(0.353)	(0.270)	(0.357)	(0.268)	(0.353)	(0.326)	(0.359)
Male (0/1)	0.512	0.516	0.510	0.515	0.511	0.510	0.513	0.517	0.510	0.514	0.506
	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)
Black (0/1)	0.331	0.415	0.287	0.421	0.287	0.440	0.287	0.458	0.291	0.359	0.262
	(0.471)	(0.493)	(0.453)	(0.494)	(0.452)	(0.496)	(0.453)	(0.498)	(0.454)	(0.480)	(0.440)
Other race (0/1)	0.083	0.086	0.081	0.092	0.079	0.095	0.078	0.098	0.078	0.086	0.075
	(0.276)	(0.281)	(0.273)	(0.289)	(0.269)	(0.294)	(0.268)	(0.297)	(0.269)	(0.281)	(0.263)
Age in 2011	36.090	31.779	38.316	31.236	38.461	32.173	37.629	31.645	37.462	33.898	41.420
	(11.755)	(8.585)	(12.527)	(8.358)	(12.427)	(9.594)	(12.163)	(8.856)	(12.192)	(10.178)	(13.498)
Born in South	0.389	0.418	0.375	0.425	0.372	0.464	0.360	0.461	0.367	0.421	0.312
	(0.488)	(0.493)	(0.484)	(0.494)	(0.483)	(0.499)	(0.480)	(0.499)	(0.482)	(0.494)	(0.463)
Mother variables											
High school completion	0.170	0.187	0.161	0.186	0.162	0.166	0.175	0.178	0.167	0.177	0.153
	(0.375)	(0.390)	(0.367)	(0.389)	(0.368)	(0.363)	(0.380)	(0.383)	(0.373)	(0.381)	(0.360)
Some college	0.104	0.132	0.089	0.140	0.085	0.128	0.094	0.135	0.094	0.120	0.064
	(0.305)	(0.338)	(0.285)	(0.348)	(0.280)	(0.334)	(0.292)	(0.342)	(0.291)	(0.325)	(0.244)
College completion	0.092	0.079	0.099	0.086	0.095	0.063	0.104	0.066	0.100	0.103	0.067
	(0.290)	(0.270)	(0.299)	(0.280)	(0.294)	(0.242)	(0.305)	(0.249)	(0.300)	(0.303)	(0.251)
Married @ child born	0.918	0.869	0.945	0.864	0.946	0.837	0.953	0.716	0.987	0.894	0.986
	(0.274)	(0.338)	(0.228)	(0.343)	(0.226)	(0.369)	(0.213)	(0.451)	(0.112)	(0.308)	(0.118)
Work in manufacturing	0.043	0.041	0.044	0.041	0.044	0.037	0.046	0.034	0.046	0.040	0.052

@ child born	(0.203)	(0.200)	(0.205)	(0.199)	(0.205)	(0.188)	(0.209)	(0.181)	(0.209)	(0.195)	(0.222)

Table 1: Continued.

Father variables											
High school completion	0.125	0.154	0.111	0.156	0.111	0.113	0.130	0.139	0.121	0.135	0.102
	(0.331)	(0.361)	(0.314)	(0.363)	(0.314)	(0.317)	(0.337)	(0.346)	(0.326)	(0.342)	(0.303)
Some college	0.071	0.073	0.069	0.078	0.067	0.066	0.073	0.082	0.067	0.078	0.053
	(0.257)	(0.261)	(0.254)	(0.268)	(0.251)	(0.249)	(0.259)	(0.274)	(0.251)	(0.269)	(0.223)
College completion	0.099	0.071	0.114	0.077	0.110	0.057	0.116	0.061	0.111	0.111	0.070
	(0.299)	(0.257)	(0.318)	(0.266)	(0.314)	(0.232)	(0.320)	(0.239)	(0.314)	(0.314)	(0.256)
Married @ child born	0.919	0.870	0.946	0.866	0.947	0.841	0.953	0.719	0.988	0.896	0.987
	(0.272)	(0.336)	(0.225)	(0.341)	(0.223)	(0.366)	(0.211)	(0.449)	(0.109)	(0.306)	(0.114)
Work in manufacturing	0.157	0.126	0.173	0.119	0.176	0.126	0.169	0.099	0.175	0.131	0.220
@ child born	(0.364)	(0.332)	(0.378)	(0.324)	(0.381)	(0.332)	(0.375)	(0.299)	(0.380)	(0.337)	(0.415)
N	11,382	3,876	7,506	3,736	7,646	3,211	8,171	2,685	8,697	8,065	3,317

Note: Children who were at least 19 years old in 2011 were included in the sample.

Table 2: Summary Descriptive Statistics (events for mothers and fathers, separately)

	Employment loss		Employment gain		Partner loss		Partner gain		Moved	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
	Mean (SD)	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*
Mother's events										
Child variables										
High school completion by age 19	0.489 (0.500)	0.483 (0.500)	0.488 (0.500)	0.483 (0.500)	0.460 (0.498)	0.493 (0.500)	0.458 (0.498)	0.490 (0.500)	0.507 (0.500)	0.432 (0.495)
Mother variables										
High school completion	0.188 (0.391)	0.165 (0.371)	0.185 (0.389)	0.165 (0.372)	0.156 (0.363)	0.175 (0.380)	0.199 (0.399)	0.162 (0.369)	0.178 (0.382)	0.150 (0.357)
Some college	0.138 (0.345)	0.094 (0.292)	0.154 (0.361)	0.090 (0.287)	0.129 (0.335)	0.094 (0.292)	0.142 (0.349)	0.094 (0.292)	0.120 (0.325)	0.065 (0.246)
College completion	0.085 (0.280)	0.094 (0.292)	0.096 (0.295)	0.091 (0.288)	0.062 (0.242)	0.104 (0.305)	0.071 (0.257)	0.098 (0.297)	0.103 (0.304)	0.068 (0.246)
Married @ child born	0.864 (0.343)	0.934 (0.248)	0.858 (0.349)	0.935 (0.247)	0.838 (0.369)	0.951 (0.215)	0.674 (0.469)	0.984 (0.125)	0.894 (0.308)	0.983 (0.128)
Work in manufacturing @ child born	0.053 (0.225)	0.040 (0.197)	0.050 (0.218)	0.041 (0.199)	0.037 (0.190)	0.045 (0.208)	0.038 (0.191)	0.044 (0.206)	0.039 (0.195)	0.051 (0.221)
N	2,420	8,962	2,357	9,025	3,153	8,229	2,241	9,141	7,935	3,447

Table 2: Continued.

Father's events										
Child variables										
High school completion by age 19	0.470 (0.499)	0.488 (0.500)	0.470 (0.499)	0.488 (0.500)	0.460 (0.498)	0.493 (0.500)	0.453 (0.498)	0.491 (0.500)	0.505 (0.500)	0.105 (0.306)
Father variables										
High school completion	0.166 (0.372)	0.113 (0.317)	0.177 (0.382)	0.111 (0.314)	0.112 (0.315)	0.131 (0.337)	0.154 (0.361)	0.118 (0.323)	0.136 (0.342)	0.102 (0.303)
Some college	0.064 (0.245)	0.073 (0.260)	0.065 (0.247)	0.072 (0.259)	0.067 (0.250)	0.072 (0.259)	0.096 (0.295)	0.065 (0.246)	0.079 (0.270)	0.052 (0.222)
College completion	0.052 (0.222)	0.114 (0.317)	0.056 (0.230)	0.111 (0.315)	0.058 (0.233)	0.115 (0.319)	0.065 (0.247)	0.107 (0.310)	0.112 (0.315)	0.070 (0.256)
Married @ child born	0.867 (0.340)	0.936 (0.244)	0.860 (0.347)	0.937 (0.242)	0.841 (0.365)	0.952 (0.214)	0.674 (0.469)	0.985 (0.121)	0.897 (0.304)	0.980 (0.141)
Work in manufacturing @ child born	0.149 (0.356)	0.160 (0.366)	0.143 (0.350)	0.161 (0.367)	0.125 (0.331)	0.169 (0.375)	0.095 (0.294)	0.171 (0.377)	0.131 (0.337)	0.216 (0.412)
N	2,645	8,737	2,497	8,885	3,137	8,245	2,213	9,169	7,913	3,469

Note: Children who were at least 19 years old in 2011 were included in the sample.

Table 3: Prevalence of events (parents/mothers/fathers)

	Either/Both Parents	Mother	Father
Single events			
Lost employment	34.05%	21.26%	23.24%
Gained employment	32.82%	20.71%	21.94%
Lost partner	28.21%	27.70%	27.56%
Gained partner	23.59%	19.69%	19.44%
Moved	70.86%	69.72%	69.52%
Event combinations			
Lost employment + Moved	16.89%	9.59%	11.09%
Gained employment + Moved	15.85%	9.01%	10.34%
Lost partner + Moved	21.26%	17.98%	18.83%
Gained partner + Moved	18.49%	14.58%	14.63%
Gained employment + Gained partner	4.31%	2.13%	2.50%
Gained employment + Lost partner	3.98%	2.06%	2.49%
Lost employment + Lost partner	5.17%	2.46%	3.29%
Lost employment + Gained partner	3.81%	1.70%	2.25%

Notes: Variables only included events that occurred when child was 1–17 years old. Children who were at least 19 years old in 2011 were included in the sample. (N=11,382)

Table 4: Regression results, covariates on events

	Employment loss		Employment gain		Partner loss		Partner gain		Moved	
Child variables										
Male (0/1)	0.003		0.004		-0.001		0.004		0.004	
Black (0/1)	0.107	***	0.103	***	0.080	***	0.036	***	0.053	***
Other race (0/1)	0.047	**	0.066	***	0.062	***	0.065	***	0.084	***
Age in 2011	-0.013	***	-0.014	***	-0.011	***	-0.008	***	-0.013	***
Born in South	-0.031	**	-0.022	*	0.011		0.003		0.030	**
Mother variables										
High school completion	0.034	*	0.031	*	-0.026	*	-0.008		0.006	
Some college	0.048	**	0.067	***	0.026	†	0.016		0.028	*
College completion	-0.035	†	-0.018		-0.087	***	-0.067	***	-0.018	
Married @ child born	0.073		-0.033		-0.425	**	-0.374	**	-0.252	*
Work in manu. @ child born	0.051	*	0.060	**	-0.014		-0.013		0.014	
Father variables										
High school completion	-0.021		-0.012		-0.118	***	-0.046	***	-0.021	
Some college	-0.072	***	-0.061	**	-0.097	***	-0.016		0.016	
College completion	-0.133	***	-0.123	***	-0.153	***	-0.092	***	0.051	**
Married @ child born	-0.187		-0.088		0.208		-0.243	*	0.113	
Work in manu. @ child born	0.029	*	0.022	†	0.023	†	-0.009		-0.041	***
Constant	0.933	***	0.945	***	0.916	***	1.146	***	1.322	***
F-test	100.37		115.13		100.37		213.7		131.59	
$P > \chi^2$	0.000		0.000		0.000		0.000		0.000	
Adjusted R^2	0.132		0.147		0.132		0.243		0.165	
n	9,936									

Notes: Variables only included events that occurred when child was 1–17 years old. Children who were at least 19 years old in 2011 were included in the sample. Results are log-odds.
† p<.10 * p <.05 ** p < .01 *** p < .001 (two-tailed tests)

parents who experienced events; this result underscores growth trends in employment and marital instability over time. Respondents born in the South were slightly less likely to have parents who experienced employment events and slightly more likely to experience residential moves during childhood. Running separate models for mothers' and fathers' events (results available upon request) indicated that higher levels of parental educational attainment appeared protective against employment and marital events for both fathers and mothers, whereas completing college increased the odds of experiencing a residential move. Working in manufacturing increased the chances of experiencing an employment or marital disruption for both mothers and fathers; evidence was mixed on its effect on marital change. Fathers who worked in manufacturing had a lower chance of residential moves. Though none of these results were surprising, it was important to consider these factors as a backdrop when thinking about children's educational outcomes. Accordingly, subsequent analyses of disruptive events controlled for covariates such as child's race, child's age in 2011, child born in the South, mother's and father's education, mother's and father's marital status at child's birth, and mother's and father's job in manufacturing.

Analysis of events, event combinations and child outcomes

The next step was to investigate how single events were related to child outcomes. Log-odds outcomes of logistic regression models testing the effects of parental disruptive events on children's educational outcomes are shown in table 5. Single events did not have much impact on children's chances of high school completion, except for losing a partner, before parents' covariates were added to the model. However, all events led to lowered odds of college attendance and completion with the exception of the effect of moving on college attendance, which was null when controlled for child and parent characteristics. Appendices C and D break out these results for mother and father events, instead of a combined parental event variable. An interesting difference to note here is that employment events for mothers did not appear to significantly affect the odds of any educational outcome for children once child, mother, and father factors are controlled, with the exception of a slight negative effect of employment gain on college attendance, whereas employment events for fathers showed significant negative effects on child college attendance and completion.

Combining events within a short timeframe led to worse educational outcomes. Almost all event combinations led to lowered chances of high school completion, college attendance and college completion; for parents' events, the exceptions were losing or gaining a partner with moving (and high school completion) and gaining employment with losing a partner (and college completion), for which results were insignificant. Notable again here is that event combinations with employment events led to worse outcomes when events occurred for fathers rather than mothers (see appendices C and D).

In all cases, experiencing two events in the same two-year period was worse than experiencing one event. However, the degree of impact did not appear to fit the additive hypothesis. It is important to note that among those who experienced a single event could be those who experienced any number of events; among those who did not experience two events were those who experienced one event or perhaps the same two events but not within the same time period. In other words, comparison groups may not have been mutually exclusive, so comparing outcomes for single versus combined events was a complex undertaking.

Analysis of events, event counts and child outcomes

To look more simply at the number of events experienced and the interaction of their impacts in relation to the additive, amplification, and cumulation hypotheses, I created a variable for count of events, in which occurrences of all five events during childhood years were added together to create a simple index of instability. Few respondents experienced more than 20 events, therefore any count above 20 was coded as 20 events. Table 6 shows that events were largely detrimental to children's educational outcomes. For high school completion and college attendance, a model including a squared term for event counts was the best fit; once the event count surpassed three events, effects

Table 5: Effects of single and combined events on children's educational outcomes, events for parents

	Completed high school by age 19				Attended college by age 21				College completion by age 25			
	With child covariates		With child, mother & father covariates		With child covariates		With child, mother & father covariates		With child covariates		With child, mother & father covariates	
Single events												
Lost employment	0.042		0.052		-0.200	***	-0.145	**	-0.324	***	-0.149	*
Gained employment	0.044		0.006		-0.199	***	-0.193	**	-0.243	***	-0.118	
Lost partner	-0.104	*	0.031		-0.399	***	-0.203	***	-0.565	***	-0.256	**
Gained partner	-0.056		0.016		-0.370	***	-0.247	***	-0.530	***	-0.289	**
Moved	0.445	***	0.445	***	0.176	**	0.097		-0.071		-0.251	**
Event combinations												
Lost employment + Moved	-0.254	***	-0.266	***	-0.370	***	-0.302	***	-0.539	***	-0.364	***
Gained employment + Moved	-0.204	***	-0.216	***	-0.464	***	-0.434	***	-0.551	***	-0.421	***
Lost partner + Moved	-0.141	**	-0.061		-0.430	***	-0.294	***	-0.605	***	-0.364	***
Gained partner + Moved	-0.071		-0.001		-0.383	***	-0.272	***	-0.490	***	-0.274	**
Gained employment + Gained partner	-0.274	**	-0.186	†	-0.423	***	-0.229	†	-0.839	***	-0.485	*
Gained employment + Lost partner	-0.276	**	-0.224	*	-0.706	***	-0.534	***	-0.474	*	-0.089	
Lost employment + Lost partner	-0.487	***	-0.392	***	-0.780	***	-0.585	***	-0.715	***	-0.375	*
Lost employment + Gained partner	-0.304	**	-0.239	*	-0.443	***	-0.226	†	-0.774	***	-0.394	†

Notes: Each coefficient represents a separate model; coefficients are reported as log-odds. Only events that occurred when the child was between 1 and 17 years old were included. Children must be at least 19 years old by 2011 to be included in the sample (N=11,382). For event combinations, the order of events was unknown, and the two events occurred within the same two-year period. All models included controls for child's sex, child's race, child's age in 2011, child born in the South, mother's and father's education, mother's and father's marital status at child's birth, and mother's and father's job in manufacturing.

† p<.10 * p <.05 ** p < .01 *** p < .001 (two-tailed tests)

Table 6: Effects of event count on children's educational outcomes

	High school completion by age 19		College attendance by age 21		College completion by age 25	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Count of events	0.010 †	0.137 ***	-0.034 ***	0.033 †	-0.055 ***	-0.027
Count of events^2		-0.009 ***		-0.005 ***		-0.002
Child variables						
Male (0/1)	-0.162 ***	-0.162 ***	-0.343 ***	-0.344 ***	-0.434 ***	-0.434 ***
Black (0/1)	-0.051	-0.063	-0.019	-0.023	-0.418 ***	-0.419 ***
Other race (0/1)	-0.023	-0.032	0.103	0.099	-0.250 †	-0.253 †
Age in 2011	0.018 ***	0.023 ***	0.000	0.002	0.032 ***	0.033 ***
Born in South	-0.029	-0.051	-0.224 ***	-0.236 ***	-0.108	-0.113
Mother variables						
High school completion only	0.826 ***	0.841 ***	0.661 ***	0.665 ***	0.488 ***	0.488 ***
Some college	1.107 ***	1.124 ***	1.213 ***	1.218 ***	1.061 ***	1.061 ***
College completion	0.986 ***	1.003 ***	1.320 ***	1.325 ***	1.596 ***	1.597 ***
Married @ child born	1.250 †	1.418 *	1.116	1.175	1.242	1.265
Work in manufacturing @ child born	0.458 ***	0.456 ***	0.175	0.172	-0.008	-0.010
Father variables						
High school completion only	0.612 ***	0.619 ***	0.310 ***	0.310 ***	0.262 *	0.261 *
Some college	0.717 ***	0.695 **	0.722 ***	0.711 ***	0.782 ***	0.778 ***
College completion	0.795 ***	0.781 ***	0.815 ***	0.803 ***	1.266 ***	1.260 ***
Married @ child born	-1.014	-1.174 †	-0.822	-0.879	-1.006	-1.026
Work in manufacturing @ child born	0.231 ***	0.242 ***	-0.123 †	-0.118 †	-0.106	-0.104
Constant	-1.404 ***	-1.808 ***	-1.517 ***	-1.705 ***	-3.497 ***	-3.567 ***
LR $\chi 2$	1105.49	1183.09	1226.41	1241.99	1278.43	1279.79
P > χ^2	0.000	0.000	0.000	0.000	0.000	0.000
Pseudo R^2	0.080	0.086	0.105	0.107	0.158	0.158
n	9,936					

† p<.10 * p <.05 ** p < .01 *** p < .001 (two-tailed tests)

were increasingly negative. For college completion, the squared term was unnecessary and insignificant, and rather any number of events had a negative effect on child outcomes, with each additional event decreasing the odds of completing college. Though this was an admittedly general way of approaching the question of instability, it did illustrate that these events functioned disruptively in terms of their effects on children. It also underscored the finding that experiencing a larger number of events was worse than experiencing a single event.

Managing overlapping event experiences

One complication when comparing outcomes between single and combined events was that the comparison groups overlap. In other words, those who experienced a single event in one two-year period may also have experienced additional events in a different time; also, those who did *not* experience a combination of events could either have experienced no events or a single event. To test the outcomes for mutually exclusive categories, it was necessary to look within each two-year period separately and to analyse mothers' and fathers' events separately as well. A categorical variable was created with the categories being no events (reference indicator), both events A and B both occurred, only event A occurred, and only event B occurred. I limited this analysis to event combinations including a residential move, as these categories had large enough samples within each category to use biannual categorical indicators. Then, the average outcome across all years could be examined to see if event combinations generally led to worse outcomes.

Table 7 shows results from models using these categorical variables. Since these were biannual variables, the results were an average across all years. Models included year fixed effects. For all combinations, experiencing both events significantly negatively affected educational outcomes; with the slight exception of gaining a partner and moving for fathers, in all other cases the combination of events was a lot worse for children compared to single events. It was clear from the results that, on average, event combinations led to worse log-odds of attaining the outcome compared to single events. This mirrored earlier findings; having mutually exclusive comparison groups did not alter these conclusions.

Discussion

I conducted this analysis by investigating if and to what extent parental disruptions are associated with negative impacts on children's educational attainment. I began by asking the question: *How often are events found in combination with one another?* Combinations of disruptive events were surprisingly frequent, particularly when considering the proportion of parents who experienced additional events given that they already experienced one disruptive event. This meant that looking at the impacts of just one event may have masked additional negative associations or incorrectly assigned negative impacts to one disruptive event rather than another. I also asked: *Which combinations are most common (i.e. which events are often experienced in the same family within a short time frame?* It was clearly most common to combine a residential move with either an employment or a partnership change. Relationship and employment status changes did not combine as often.

I next asked the question: *Do certain event combinations lead to lower educational outcomes for children than others?* It was difficult to compare across sets of events, and combinations of events seemed generally within the same range of effect size. Combinations clearly mattered, however, and across model specifications, parents' experience of two contemporaneous events led to a lower probability of their children attaining all considered educational outcomes compared to parents' experience of single events.

Do any of these combinations of events lead to positive educational outcomes for children? The educational outcomes following disruptive events were overwhelmingly negative, if not insignificant. Combinations of events were negative for all outcomes as well, whereas single events had little effect on high school completion.

Is a higher count of events worse (in terms of children's educational outcomes) than a lower count? My results showed that this was indeed the case. Each disruptive event came at an incrementally negative cost to children's educational attainment when events occurred in combination generally across childhood. A caveat on this finding was that the number of events parents experienced while their

Table 7: Effects of single and combined events on children's educational attainment

	High school completion by age 19				College attendance by age 21				College completion by age 25			
	Mothers		Fathers		Mothers		Fathers		Mothers		Fathers	
Employment lost & Move	-0.289	***	-0.304	***	-0.320	***	-0.287	***	-0.581	***	-0.616	***
Move	0.185	***	0.105	***	0.017		0.004		-0.248	***	-0.214	***
Employment lost	0.162	**	0.119	*	0.008		-0.059		-0.066		-0.251	**
Employment gain & Move	-0.169	**	-0.324	***	-0.337	***	-0.349	***	-0.589	***	-0.551	***
Move	0.171	***	0.104	***	0.015		0.006		-0.250	***	-0.219	***
Employment gain	0.037		0.046		-0.093		-0.102	†	-0.134	†	-0.248	**
Lost partner & Move	-0.232	***	-0.168	***	-0.377	***	-0.299	***	-0.579	***	-0.552	***
Move	0.081	***	0.065	***	-0.037	†	-0.009		-0.269	***	-0.230	**
Lost partner	0.265	***	0.175	*	0.131	†	0.071		-0.268	*	-0.145	
Gain partner & Move	-0.118	*	-0.145	**	-0.317	***	-0.272	***	-0.519	***	-0.422	***
Move	0.057	**	0.053	**	-0.052	**	-0.022		-0.280	***	-0.249	***
Gain partner	-0.064		-0.017		-0.146		-0.136		-0.490	**	-0.495	**

Notes: Coefficients are reported as log-odds. Only events that occurred when the child was between 1 and 17 years old were included. Children must be at least 19 years old by 2011 to be included in the sample (N=11,382). For event combinations, the order of events was unknown, and the two events occurred within the same two-year period. All models included controls for year, child's sex, child's race, child's age in 2011, child born in the South, mother's and father's education, mother's and father's marital status at child's birth, and mother's and father's job in manufacturing.

† p<.10 * p <.05 ** p < .01 *** p < .001 (two-tailed tests)

children were between the ages of 1 and 17 years varied between 0 and 20, though the models controlled for likely factors (race, education, married when child was born, etc.) to address relevant selection. While 50% of children had parents who experienced one or two events during their childhood, an additional 40% of children had parents who experienced between three and ten events during their childhood. So, though experiencing 15 or more events was less likely, the majority of the sample experienced a high count of disruptions.

The data showed that experiencing multiple events was not rare across the life course. Therefore, the fact that additional events were associated with increasingly negative outcomes is worrying for children's educational attainment. It also points to a potential group of increasingly disadvantaged families. There was no consistent additive pattern to support an additive hypothesis; however, the outcomes of combined events were consistently worse than single events, indicating that the amplification hypothesis provided a solid explanation. In other words, associations of single events could not be simply added together to provide the association for multiple events, but the outcome of two events combined was more strongly negative than the effect of one of those events alone. For example, residential moves were indeed associated with poorer educational outcomes. When a move in residence was combined with an event such as a parent's divorce, the educational outcomes were worse than for the move by itself. These outcomes suggested that the effects of single events in fact overlap, in which some part of the association of a divorce looked at in isolation was actually the association of a divorce combined with a residential move, and vice versa.

The cumulation hypothesis focused on the count of events more generally to see if effects tapered off. Looking at a count of all events found that, for high school completion and college attendance, effects were indeed non-linear. For college completion, a linear model was a better choice. Rather than associations tapering off, however, they worsened as the count increased. Even when including controls for child and parent characteristics, more instability owing to the increase in disruptive events led to worse educational outcomes for children.

I offer several cautions on these findings. It is possible that events occurring the same year were not linked in a "cascade"; I had no way of determining reasons for events occurring within close timing of each other in the PSID. Future work should delve further into the reasons that these events might combine. Additionally, there were other disruptive events that could easily combine with the events on which these analyses focused (e.g. health-related events); those other disruptive events should be analysed in the future.

When thinking about the consequences for policy specifically relating to families and children, it is important to remember how different the processes, decisions and costs of attaining a high school diploma are compared to college attendance and college graduation. High school is free and compulsory, whereas college can be quite expensive and is more choice-based. Therefore, the differences in effects on the probability of high school graduation as compared to college attendance and especially college completion were not surprising. Both single events and event combinations seemed to matter more for college outcomes compared to high school completion, with event combinations leading to an even lower probability of attaining college outcomes.

There are several interesting immediate policy implications here. First, because disruptive events often combine, and because the experience of these combinations led to lower educational attainment (compared to the experience of single disruptive events), perhaps policies should first focus on stopping the cascade of disruptive events and then work on mending the consequences of events that have already occurred. Policies that allow people to remain living in their rented or mortgaged homes following a job loss are a great example of this sort of policy intervention. Second, there were some differences between mothers' and fathers' experiences of disruptive events, but largely the effects on children looked quite similar, and policies should address this. Third, residential moves and partner losses showed the largest effects on children's educational attainment. Educational policy makers should be aware of the negative consequences that children face when they move.

Additionally, partner losses and gains figured heavily in college graduation, findings of which financial aid officers as well as academic mentors should be aware.

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Endnotes

1. I underscored the idea of disruption or shocks in children's lives here rather than the notion of parents both working or single mothers working. Recent research shows that it is not the amount but rather the quality of time spent with children that affects their wellbeing (Hsin & Feife, 2014).
2. DiPrete and McManus (2000) include changing jobs with the same employer, changing employers but keeping a similar job, and changing partners as events. I eliminated these events because I believe that the shock of those events was likely to be more nuanced and more complex to disentangle for the effects on children. Those authors also include entry into self-employment, which I eliminated from my analysis due to low sample size (1.59% for mothers and 1.33% for fathers across all survey years).

Appendix

Appendix A: Full Descriptive Statistics (events for mothers)

	Employment loss		Employment gain		Partner loss		Partner gain		Moved	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
	Mean (SD)	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*
Child variables										
High school completion by age 19	0.489 (0.500)	0.483 (0.500)	0.488 (0.500)	0.483 (0.500)	0.460 (0.498)	0.493 (0.500)	0.458 (0.498)	0.490 (0.500)	0.507 (0.500)	0.432 (0.495)
College attendance by age 21	0.249 (0.433)	0.261 (0.439)	0.242 (0.428)	0.263 (0.440)	0.214 (0.410)	0.276 (0.447)	0.211 (0.408)	0.271 (0.444)	0.269 (0.444)	0.235 (0.424)
College completion by age 25	0.104 (0.300)	0.137 (0.344)	0.106 (0.307)	0.136 (0.343)	0.079 (0.270)	0.150 (0.357)	0.071 (0.257)	0.144 (0.351)	0.121 (0.326)	0.152 (0.359)
Male (0/1)	0.516 (0.500)	0.511 (0.500)	0.515 (0.500)	0.511 (0.500)	0.511 (0.500)	0.513 (0.500)	0.515 (0.500)	0.511 (0.500)	0.514 (0.500)	0.507 (0.500)
Black (0/1)	0.439 (0.496)	0.302 (0.459)	0.438 (0.496)	0.303 (0.460)	0.442 (0.497)	0.287 (0.453)	0.492 (0.500)	0.290 (0.454)	0.359 (0.480)	0.267 (0.442)
Other race (0/1)	0.078 (0.268)	0.084 (0.278)	0.091 (0.287)	0.081 (0.273)	0.095 (0.294)	0.078 (0.268)	0.104 (0.305)	0.078 (0.268)	0.086 (0.281)	0.075 (0.264)
Age in 2011[1]	32.487 (9.262)	37.063 (12.161)	31.852 (9.102)	37.197 (12.113)	32.208 (9.593)	37.577 (12.161)	31.341 (8.794)	37.254 (12.092)	33.842 (10.127)	41.263 (13.484)
Born in South	0.437 (0.496)	0.376 (0.484)	0.449 (0.497)	0.374 (0.484)	0.465 (0.499)	0.360 (0.480)	0.468 (0.499)	0.370 (0.483)	0.422 (0.494)	0.314 (0.464)
Mother variables										
High school completion	0.188 (0.391)	0.165 (0.371)	0.185 (0.389)	0.165 (0.372)	0.156 (0.363)	0.175 (0.380)	0.199 (0.399)	0.162 (0.369)	0.178 (0.382)	0.150 (0.357)
Some college	0.138 (0.345)	0.094 (0.292)	0.154 (0.361)	0.090 (0.287)	0.129 (0.335)	0.094 (0.292)	0.142 (0.349)	0.094 (0.292)	0.120 (0.325)	0.065 (0.246)
College completion	0.085 (0.280)	0.094 (0.292)	0.096 (0.295)	0.091 (0.288)	0.062 (0.242)	0.104 (0.305)	0.071 (0.257)	0.098 (0.297)	0.103 (0.304)	0.068 (0.246)

Appendix A: Continued										
Married @ child born	0.864	0.934	0.858	0.935	0.838	0.951	0.674	0.984	0.894	0.983
	(0.343)	(0.248)	(0.349)	(0.247)	(0.369)	(0.215)	(0.469)	(0.125)	(0.308)	(0.128)
Work in manufacturing @ child born	0.053	0.040	0.050	0.041	0.037	0.045	0.038	0.044	0.039	0.051
	(0.225)	(0.197)	(0.218)	(0.199)	(0.190)	(0.208)	(0.191)	(0.206)	(0.195)	(0.221)
Father variables										
High school completion	0.129	0.124	0.128	0.125	0.111	0.131	0.137	0.123	0.134	0.105
	(0.336)	(0.330)	(0.334)	(0.331)	(0.314)	(0.337)	(0.344)	(0.328)	(0.341)	(0.306)
Some college	0.074	0.070	0.081	0.068	0.064	0.073	0.070	0.071	0.079	0.052
	(0.263)	(0.255)	(0.273)	(0.251)	(0.246)	(0.261)	(0.254)	(0.257)	(0.270)	(0.222)
College completion	0.077	0.105	0.081	0.104	0.056	0.116	0.050	0.111	0.112	0.070
	(0.267)	(0.307)	(0.273)	(0.305)	(0.231)	(0.320)	(0.218)	(0.315)	(0.315)	(0.256)
Married @ child born	0.867	0.935	0.861	0.936	0.841	0.952	0.679	0.984	0.895	0.984
	(0.339)	(0.247)	(0.346)	(0.245)	(0.365)	(0.214)	(0.467)	(0.124)	(0.306)	(0.127)
Work in manufacturing @ child born	0.127	0.165	0.119	0.167	0.126	0.169	0.079	0.176	0.129	0.222
	(0.333)	(0.371)	(0.324)	(0.373)	(0.332)	(0.375)	(0.270)	(0.381)	(0.335)	(0.416)
N	2,420	8,962	2,357	9,025	3,153	8,229	2,241	9,141	7,935	3,447

Note: Children who were at least 19 years old in 2011 were included in the sample.

Appendix B: Full Descriptive Statistics (events for fathers)

	Employment loss		Employment gain		Partner loss		Partner gain		Moved	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
	Mean (SD)	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*
Child variables										
High school completion by age 19	0.470 (0.499)	0.488 (0.500)	0.470 (0.499)	0.488 (0.500)	0.460 (0.498)	0.493 (0.500)	0.453 (0.498)	0.491 (0.500)	0.505 (0.500)	0.436 (0.496)
College attendance by age 21	0.225 (0.417)	0.269 (0.444)	0.221 (0.415)	0.269 (0.444)	0.214 (0.411)	0.276 (0.447)	0.206 (0.405)	0.272 (0.445)	0.271 (0.444)	0.232 (0.422)
College completion by age 25	0.079 (0.270)	0.146 (0.353)	0.084 (0.278)	0.143 (0.350)	0.079 (0.270)	0.149 (0.356)	0.077 (0.266)	0.143 (0.350)	0.122 (0.328)	0.148 (0.355)
Male (0/1)	0.521 (0.500)	0.509 (0.500)	0.514 (0.500)	0.511 (0.500)	0.510 (0.500)	0.513 (0.500)	0.521 (0.500)	0.510 (0.500)	0.515 (0.500)	0.505 (0.500)
Black (0/1)	0.419 (0.493)	0.304 (0.460)	0.427 (0.495)	0.304 (0.460)	0.443 (0.497)	0.287 (0.453)	0.484 (0.500)	0.293 (0.455)	0.357 (0.479)	0.270 (0.444)
Other race (0/1)	0.099 (0.299)	0.078 (0.268)	0.103 (0.304)	0.077 (0.267)	0.095 (0.293)	0.078 (0.269)	0.090 (0.287)	0.081 (0.273)	0.086 (0.281)	0.075 (0.263)
Age in 2011	32.882 (8.773)	37.061 (12.356)	32.656 (8.643)	37.055 (12.320)	32.152 (9.560)	37.588 (12.159)	31.640 (8.822)	37.164 (12.117)	33.913 (10.141)	41.055 (13.540)
Born in South	0.403 (0.490)	0.385 (0.487)	0.404 (0.491)	0.385 (0.487)	0.461 (0.499)	0.362 (0.481)	0.461 (0.499)	0.372 (0.483)	0.420 (0.494)	0.319 (0.466)
Mother variables										
High school completion	0.190 (0.392)	0.163 (0.370)	0.193 (0.394)	0.163 (0.369)	0.156 (0.363)	0.175 (0.380)	0.170 (0.375)	0.169 (0.375)	0.176 (0.381)	0.154 (0.361)
Some college	0.128 (0.335)	0.096 (0.295)	0.129 (0.336)	0.096 (0.295)	0.127 (0.334)	0.094 (0.292)	0.122 (0.328)	0.099 (0.299)	0.120 (0.324)	0.067 (0.250)
College completion	0.053 (0.225)	0.104 (0.305)	0.052 (0.222)	0.104 (0.305)	0.063 (0.242)	0.104 (0.305)	0.059 (0.236)	0.100 (0.300)	0.104 (0.305)	0.067 (0.250)
Married @ child born	0.866 (0.341)	0.935 (0.247)	0.860 (0.346)	0.935 (0.246)	0.838 (0.368)	0.951 (0.215)	0.673 (0.469)	0.983 (0.128)	0.895 (0.306)	0.978 (0.147)
Work in manufacturing @ child born	0.041 (0.198)	0.044 (0.205)	0.042 (0.202)	0.043 (0.204)	0.037 (0.187)	0.045 (0.208)	0.027 (0.162)	0.047 (0.212)	0.039 (0.195)	0.052 (0.221)

Appendix B: Continued

Father variables										
High school completion	0.166	0.113	0.177	0.111	0.112	0.131	0.154	0.118	0.136	0.102
	(0.372)	(0.317)	(0.382)	(0.314)	(0.315)	(0.337)	(0.361)	(0.323)	(0.342)	(0.303)
Some college	0.064	0.073	0.065	0.072	0.067	0.072	0.096	0.065	0.079	0.052
	(0.245)	(0.260)	(0.247)	(0.259)	(0.250)	(0.259)	(0.295)	(0.246)	(0.270)	(0.222)
College completion	0.052	0.114	0.056	0.111	0.058	0.115	0.065	0.107	0.112	0.070
	(0.222)	(0.317)	(0.230)	(0.315)	(0.233)	(0.319)	(0.247)	(0.310)	(0.315)	(0.256)
Married @ child born	0.867	0.936	0.860	0.937	0.841	0.952	0.674	0.985	0.897	0.980
	(0.340)	(0.244)	(0.347)	(0.242)	(0.365)	(0.214)	(0.469)	(0.121)	(0.304)	(0.141)
Work in manufacturing	0.149	0.160	0.143	0.161	0.125	0.169	0.095	0.171	0.131	0.216
@ child born	(0.356)	(0.366)	(0.350)	(0.367)	(0.331)	(0.375)	(0.294)	(0.377)	(0.337)	(0.412)
N	2,645	8,737	2,497	8,885	3,137	8,245	2,213	9,169	7,913	3,469

Note: Children who were at least 19 years old in 2011 were included from the sample.

Appendix C: Effects of single and combined events on children's educational outcomes, events for mothers

	Completed high school by age 19				Attended college by age 21				College completion by age 25			
	With child covariates		With child, mother & father covariates		With child covariates		With child, mother & father covariates		With child covariates		With child, mother & father covariates	
Single events												
Lost employment	0.087	†	0.057		-0.075		-0.073		-0.133	†	-0.067	
Gained employment	0.101	*	0.033		-0.120	*	-0.181	**	-0.095		-0.082	
Lost partner	-0.106	*	0.030		-0.388	***	-0.188	**	-0.556	***	-0.243	**
Gained partner	-0.088	†	-0.048		-0.376	***	-0.287	***	-0.580	***	-0.336	**
Moved	0.432	***	0.418	***	0.161	**	0.066		-0.078		-0.269	***
Event combinations												
Lost employment + Moved	-0.192	**	-0.228	**	-0.316	***	-0.305	***	-0.466	***	-0.370	**
Gained employment + Moved	-0.068		-0.130	†	-0.296	***	-0.335	***	-0.427	***	-0.415	**
Lost partner + Moved	-0.238	***	-0.155	**	-0.503	***	-0.365	***	-0.663	***	-0.378	***
Gained partner + Moved	-0.127	*	-0.086		-0.402	***	-0.312	***	-0.566	***	-0.344	**
Gained employment + Gained partner	-0.233	†	-0.150		-0.578	**	-0.406	*	-1.027	**	-0.650	†
Gained employment + Lost partner	-0.309	*	-0.348	*	-0.650	***	-0.556	**	-0.324		-0.003	
Lost employment + Lost partner	-0.492	***	-0.407	**	-0.904	***	-0.725	***	-0.639	*	-0.256	
Lost employment + Gained partner	-0.361	*	-0.261		-0.283		-0.090		-0.912	**	-0.604	†

Notes: Each coefficient represents a separate model; coefficients are reported as log-odds. Only events that occurred when the child was between 1 and 17 years old were included. Children must be at least 19 years old by 2011 to be included in the sample (N=11,382). For event combinations, the order of events was unknown, and the two events occurred within the same two-year period. All models included controls for child's sex, child's race, child's age in 2011, child born in the South, mother's and father's education, mother's and father's marital status at child's birth, and mother's and father's job in manufacturing.

† p<.10 * p <.05 ** p < .01 *** p < .001 (two-tailed tests)

Appendix D: Effects of single and combined events on children's educational outcomes, events for fathers

	Completed high school by age 19				Attended college by age 21				College completion by age 25			
	With child covariates		With child, mother & father covariates		With child covariates		With child, mother & father covariates		With child covariates		With child, mother & father covariates	
Single events												
Lost employment	-0.025		0.021		-0.263	***	-0.142	*	-0.550	***	-0.288	**
Gained employment	-0.032		-0.010		-0.296	***	-0.189	**	-0.448	***	-0.190	*
Lost partner	-0.100	*	0.042		-0.388	***	-0.188	**	-0.552	***	-0.248	**
Gained partner	-0.119	*	-0.043		-0.405	***	-0.280	***	-0.501	***	-0.273	**
Moved	0.400	***	0.383	***	0.186	***	0.107	†	-0.032		-0.218	**
Event combinations												
Lost employment + Moved	-0.278	***	-0.236	**	-0.406	***	-0.260	**	-0.753	***	-0.511	***
Gained employment + Moved	-0.284	***	-0.224	**	-0.421	***	-0.289	**	-0.657	***	-0.408	**
Lost partner + Moved	-0.175	***	-0.094	†	-0.460	***	-0.317	***	-0.620	***	-0.375	***
Gained partner + Moved	-0.175	**	-0.077		-0.437	***	-0.292	***	-0.486	***	-0.260	*
Gained employment + Gained partner	-0.350	**	-0.159		-0.314	*	0.017		-0.562	*	-0.023	
Gained employment + Lost partner	-0.187		-0.074		-0.799	***	-0.571	**	-0.447	†	-0.050	
Lost employment + Lost partner	-0.472	***	-0.364	**	-0.680	***	-0.477	**	-0.685	**	-0.378	
Lost employment + Gained partner	-0.355	**	-0.249	†	-0.582	**	-0.270		-0.616	*	-0.096	

Notes: Each coefficient represents a separate model; coefficients are reported as log-odds. Only events that occurred when the child was between 1 and 17 years old were included. Children must be at least 19 years old by 2011 to be included in the sample (N=11,382). For event combinations, the order of events was unknown, and the two events occurred within the same two-year period. All models included controls for child's sex, child's race, child's age in 2011, child born in the South, mother's and father's education, mother's and father's marital status at child's birth, and mother's and father's job in manufacturing.

† p<.10 * p <.05 ** p < .01 *** p < .001 (two-tailed tests)

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Disability and the transition to early adulthood: A life course contingency perspective

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Abstract

Building on research on the social nature of health, we view disability as a life course contingency wherein effects are differentially consequential during the transition to adulthood based on interactions between disability type and institutional characteristics of life course pathways. Using data from the United States National Longitudinal Study of Adolescent Health (n=2299 females and 2197 males, respectively), we utilise logit-link latent class analyses to model pathways to early adulthood and assess the effects of disability on these pathways. Results show that disability is variably connected to the transition to adulthood. Specifically, cognitive rather than physical disability is strongly connected to disadvantaged pathways, largely because it disrupts educational attainments that are the fundamental building blocks of the more advantageous pathways into adulthood and has effects consistently larger than several key sociodemographic indicators. Results are discussed with reference to life course capitalisation processes and a conceptualisation of disability in relation to the institutional logics and contexts that are the backdrop to contemporary role transitions.

Keywords

Disability; life course; methodology; transition to adulthood

Introduction

Sociologists have long-standing interests in factors that shape life chances and inequality over the life course. While issues of economic stratification and family traditionally dominated discussions, recent work has considered the roles of childhood health in structuring the life course (Palloni, 2006; Willson, Shuey, & Elder, 2007). Such work shifts the focus to health as a determinant, rather than consequence, of life fortunes and thus advances general theories of the life course and stratification (Carter, Austin, & Trainor, 2012; Palloni, 2006; Ross & Mirowsky, 2001; Williams & Collins, 1995). We extend such work by examining the role of disability in shaping pathways to adulthood, focusing on the interplay between different types of disability and role expectations of the various social institutions that frame the transition to adulthood.

Disability is particularly worthy of analysis for several reasons. First, it is estimated that 15% of the world's population, almost one billion people, has some form of disability (World Health Organization, 2016). Second, there is increased awareness of the impact of environmental hazards, accidents and their consequences for physical and psychological

wellbeing (Barker, Power, & Roberts, 1996; Vles et al., 2005). Disability has also become institutionalised, wherein legislation requires particular standards and practices to accommodate those with disabilities in certain institutions (e.g. the Americans with Disabilities Act (ADA)), though we know little about the efficacy of such laws and their implications for social life (Percy, 2001). Fourth, research increasingly recognises disability as a structuring factor in the transition to adulthood (Carter et al., 2012; Janus, 2009; Lindstrom, Harwick, Poppen & Doren, 2012; Osgood, Foster, Flanagan, & Ruth, 2005; Priestley, 2003; Sanford et al., 2011; Shandra, 2011; Stewart et al., 2014; Van Naarden Braun, Yeargin-Allsopp, & Lollar, 2006; Wagner, Newman, Cameto, Garza & Levine, 2005; Wells, Sandefur & Hogan, 2003), yet such work is largely descriptive.

Against this backdrop, this paper articulates a life course perspective on disability during the early transition to adulthood that emphasises how disability connects to institutional contexts in the life course. We assess the efficacy of this perspective using longitudinal data to empirically map pathways into adulthood and then examine adolescent disability as a structuring factor of these pathways. We focus on the early portion of the transition to adulthood, given the multiple and complex arrays for institutional contexts that are especially salient as youths age out of childhood roles and institutions and into adult settings. Finally, we compare the effects of disability type – physical, cognitive, and learning – against several well-recognised determinants of life chances.

Conceptualising disability and its effects in the transition to adulthood

We view disability as a sociomedical condition dependent on personal and environmental factors that influence the experience or expression of physical and cognitive embodied disablement. Consistent with this, the U.S. National Institute on Disability and Rehabilitation Research defines disability as the "interaction between characteristics (e.g. conditions or impairments, functional status, or personal and social qualities) of an individual and characteristics of the natural, built, cultural, and social environments" (U.S. Department of Education, 2015). While physical and cognitive capabilities vary greatly, disability is designated when functioning falls below socially recognised and institutionally defined thresholds (Zola, 1993). In the current research, we measure three primary types of disability: physical (bodily impairments including visual and hearing difficulties), learning disabilities (diagnosis and enrolment in special education programming), and cognitive disabilities (low cognitive functioning)' these are described in detail below.

Life course pathways

It is generally accepted that the life course unfolds in institutionally and culturally prescribed ways (Hogan & Astone, 1986; Shanahan, 2000) with the transition to adulthood comprised of completion of schooling, entry into full-time, career-type work, marriage or cohabitation, and parenthood (Furstenberg et al., 2004). Key questions for demographers and life course researchers surround the inter-connection of transitions, their order and timing, and how these reveal distinct pathways through the life course (Furstenberg, 2010; Macmillan, 2005). Given this, disability may be particularly significant if it undermines one's ability to make particular transitions that then have implications for subsequent transitions (Tisdall, 2001).

Prior work on disability and the life course is largely descriptive and focuses either on discrete transitions or assumes temporality (Janus, 2009; Wells et al., 2003). Such work ultimately ignores the life course as a dynamic, social structure. In general, the life course can be understood in terms of multiple role pathways that involve the simultaneous or sequential negotiation of different social institutions (Elder, 1985; Macmillan & Copher, 2005; Macmillan & Eliason, 2003). A person must adopt the role-specific behaviours of a given institution, exit that role (if necessary), enter new roles and adopt corresponding behaviours associated with new social institutions. While youth generally enact solely a student role, school completion introduces possibilities for movement into various roles and institutions (e.g. education, employment, family, or military). Simply moving into full-time work after school completion requires adoption of the role of worker and its corresponding expectations and responsibilities. Adding family roles requires another set of role-specific behaviours and further demands a

balancing of multiple roles sequentially and simultaneously. Ultimately, how roles are combined, timed, and sequenced defines specific and differentiated pathways over the life course.

The institutionalised nature of social life makes some pathways more or less difficult to navigate and thus more or less common in the population. Prior empirical work suggests several common pathways in the contemporary transition to adulthood, including a *school-to-work* pathway (with or without post-secondary education), a *school-to-family* pathway, a multidimensional *school-to-work-to-family* pathway (with or without post-secondary education), a *drop out-to-work/family* pathway, a *prolonged* pathway involving extended education but slower school completion and movement into other roles, and finally a *limited transition* pathway with low probabilities of any role or role transition (Macmillan & Copher, 2005; Macmillan & Eliason, 2003; Osgood et. al., 2008; Ross, Schoon, Martin, & Sacker, 2009). We use these below as a heuristic for formulating hypotheses.

Disability as life course contingency

Given the socially structured yet variable pathways into adulthood, disability should be seen as a life course contingency, the consequences of which depend on the nature of impairment and the institutional structure of different pathways into adulthood. As such, disability is likely to affect life course pathways when it intersects with institutional logics and role requirements/expectations. Indeed, work by Janus (2009) shows evidence of the varied effects of disability types on young adult outcomes but does not empirically explain why such variation exists. Below, we extend such work by offering several hypotheses on the nature of the contingency between disability and life course pathways.

Consider first a *school-to-work* pathway, involving completion of secondary or post-secondary education followed by movement into the labour force. While both schools and workplaces are subject to disability-related legislation, we focus on the primacy of disability in educational settings given that schooling typically precedes work and that educational success is a key determinant of labour market achievements (Kerckhoff, 2000). Here, we anticipate different effects by disability type. As most disability legislation (e.g. ADA) mandates architectural and technological accommodations, it likely mitigates detriments associated with physical disabilities. Also, disability-related law in K-12 (primary and secondary) public education (e.g. American Individuals with Disabilities Education Act - IDEA) emphasises the provision of "free appropriate public education" (FAPE) to each child with a disability. In contrast, post-secondary schools (and employers) are held to a lower standard of ensuring non-discrimination on the basis of disability (under the ADA) and thus do not modify essential requirements or fundamentally alter the nature of a service, program, or activity (U.S. Department of Education, 2010). Given this, we expect cognitive disabilities to be particularly detrimental for transitions into higher education. This yields two related hypotheses. First, H1:

> Learning disability and cognitive impairment, rather than physical disability, should decrease the likelihood of *school-to-work* pathways, particularly those involving post-secondary education.

Still, if institutional supports in K-12 schools are not realised, we would expect those with cognitive impairments to have a high risk of dropping out of school altogether. Thus, H2:

> Cognitive impairments should increase the likelihood of *dropout* pathways.

A *prolonged* transition involves education past the teenage years but slower transitions out of school and into full-time work and family roles (Furstenberg et al., 2004). Because prolonged pathways typically involve some post-secondary schooling, we expect that physical and learning disability would increase the likelihood of this pathway (vis-à-vis an on-time college-to-work transition) due to the lower institutionalisation of disability services in post-secondary settings. Further, we expect that cognitive impairment should decrease the likelihood of this pathway given that it limits entry into post-secondary education and hence eliminates the possibility of delayed exits. Specifically, H3:

> Physical impairment and learning disability should increase, while cognitive impairment should decrease, the likelihood of a *prolonged* pathway.

School-to-family or *college-to-family* pathways are characterised by direct movement into family roles

without intervening work. As these pathways are likely more prevalent among females, we only hypothesise about the effects for women. Because marriage markets for women are more diverse and less dependent on occupational fortunes than for males (Oppenheimer, 1988), we expect physical disability to be more consequential for this pathway given its effects on perceived physical attractiveness and the salience of attractiveness in the evaluation of female partners (Feingold, 1990; Rojahn, Komelasky & Man, 2008; Stevens, Owens, & Schaffer, 1990). Moreover, family institutions are not regulated with respect to discrimination; there are no legal constraints to mitigate discrimination in family contexts. Thus, H4:

> Physical impairment should decrease the likelihood of *school-to-family* pathways among women.

Finally, the principle of cumulative advantage and disadvantage suggests that disabilities that undermine the fundamental building blocks of the life course would undermine subsequent life course transitions (Willson et al., 2007). Life course pathways are more efficacious when they involve roles that are sequenced in a particular order: school (particularly college completion) followed by work followed by family, especially marriage followed by parenthood (Hogan, 1978; Marini, 1984). We expect impairments that undermine educational attainment would also undermine multifaceted pathways such as a *school-to-work-to-family* pathway. Thus, H5:

> Cognitive impairments should decrease the likelihood of a *school-to-work-to-family* pathway, particularly *college-to-work-to-family*.

We also expect disability may undermine any and all role enactments and ultimately produce a *limited transition* pathway, indicating multifaceted problems making institutional role-based transitions over time. We expect this pathway to be particularly prevalent for those with cognitive impairments. Thus, H6:

> Cognitive impairment should increase the likelihood of a *limited transition* pathway.

Assessment of these hypotheses requires both data and an analytic strategy that allows for the consideration of roles over time in a multidimensional manner and associates them with impairment types to understand the nature of disability, as well as other potential determinants, in understanding pathways into adulthood. We describe such data and strategy below.

Data and measures

The National Longitudinal Study of Adolescent Health (Add Health) is a nationally representative, longitudinal study of American adolescents in grades 7–12 during the 1994–1995 school year. Drawing from school rosters, 20,745 students completed in-home interviews at wave 1. Interviews were conducted in-person, generally in respondents' homes. In most cases, a parent completed a separate interview at this time. Follow-up interviews were completed one year later and a third follow-up (wave 3) included 15,197 young adults roughly 18 to 26 years old in 2001–2002. Our sample consists of those who are in waves 1 and 3. In order to maximise both the number of respondents and the duration of observation over the early transition to adulthood, we include those age 16 or older in wave 1 with the consequence that the average age at wave 3 is 23. Our age range parallels the samples used by others in similar analyses of disability in the transition to adulthood (Janus, 2009; Sanford et al., 2011; Wells et al., 2003) and includes the period during which the most complex transitions across multiple institutional contexts occurs, particularly the ageing-out of adolescent-limited institutions (generally by age 18 or 21).[1] We stratify by sex to allow differences in pathways and the effects of disability on such pathways. After accounting for sample attrition and missing data, our analytic samples include 2299 females and 2197 males.

Respondents are considered to have a physical disability if: 1) adolescents indicate any activity limitations, need assistance in daily activities, use assistive technology, or have self-perceived disability; 2) parents indicate their child has difficulty using his/her hands, arms, feet or legs; or 3) the interviewer reports the respondent is blind or deaf. Our measure indexes physical disability of a relatively high threshold given the nature of the items used. Individuals with *cognitive disability* score two standard deviations or more below the mean on the Peabody Picture Vocabulary Test (PPVT). This is a standard measurement of mental retardation found in, for example, the American Psychiatric

Association's DSM-IV. As such, it should be regarded a indicator of general cognitive disability. *Learning disability* is based on parent reports of their child's diagnosis with a learning disability and enrolment in special education programs (Svetaz, Ireland, & Blum, 2000). By requiring both diagnosis and enrolment, this measure capitalises on the institutionalisation of learning disabilities as a way of increasing validity. Only a handful of respondents reported more than one type of disability and in almost all cases, cognitive disabilities co-occurred with physical or learning disabilities. Because we expect cognitive disabilities to be more restrictive in the transition to adulthood, those with multiple disabilities are coded as cognitively disabled. While not exhaustive, three broad and widely recognised categories of disability are reasonably captured in our measures.[2]

We consider several background variables as both controls and as a means of comparing the magnitude of disability effects with other fundamental indicators of social stratification. For purposes of consistency, we scale each of our independent measures as dummy variables to standardise metrics. *Race/ethnicity* indexes non-Hispanic blacks and Hispanics and compares them with all other (predominantly white) respondents. We measure family structure by contrasting *single-parent* and *step-parent* households with households including both parents (reference). *Poverty* is indicated if family income (given household size) falls below the 1995 federal poverty threshold, while *parental education* is measured as either parent's highest level of education, entered as less than high school, high school graduate (reference), some college, and college graduate. Finally, ecological context is measured as *urban* residence and *neighborhood quality*. Measured in census block groups, the latter indexes the proportion of households that are female-headed, receiving public assistance, living below the poverty line, and the local unemployment rate (α= 0.89). We differentiate living in a poor neighborhood (the highest 30% on our index) or living in a good neighborhood (the lowest 10% on our index). Like the disability measures, all sociodemographic variables are drawn from wave 1.

We capture the multidimensional and dynamic character of the transition to adulthood based on well-recognised markers of the transition to adulthood (Shanahan, 2000). Based on retrospective accounts at wave 3, this includes age-specific measures of *employment status* (full time, part time or unemployed), *degree completion* (none, high school degree or GED, and associates, bachelors or higher), *marriage* (never married, married, formerly married), and *parenthood* (not a parent, parent). All analyses use sampling weights and survey analysis techniques to adjust for the complex sample design (Chantala & Tabor, 1999). Percentages for all variables are shown in table 1.

Analytic strategy: a latent class approach

To model heterogeneous pathways in the transition to adulthood, we use latent class analysis in the program Latent Gold 4.5 (Vermunt & Magidson, 2005). Latent class analysis is a cluster-based approach to measurement models with categorical observed and unobserved variables. Latent classes are defined by the criterion of conditional independence where each observed variable is statistically independent of every other variable within each latent class. Via maximum likelihood estimation, observed data is used to estimate parameters of a measurement model including the number of latent classes, the estimated probability of a latent class, and the conditional probability of the observed variables given latent class. Using a criterion of parsimony, the general objective is to identify the smallest number of classes necessary to adequately characterise the observed data. Additional covariates can be added to the model as predictors of class membership. For the case of three observed categorical variables with two covariates, the model takes the form:

$$P(y_{i11} = m_{11}, \dots, y_{ist} = m_{st} | z_{i1}^{cov}, z_{i2}^{cov}) = \sum_{x=1}^{K} P(x_k | z_{i1}^{cov}, z_{i2}^{cov}) \cdot \prod_{s=1}^{S} \prod_{t=1}^{T} (y_{ist} = m_{st} | x_k)$$

Where y_{ist} equals a response variable for case *i* for a particular role or state *s* (e.g. employment) at age *t* (e.g. 17) and m_{st} indexes a particular category of state *s* at age *t* (e.g. full-time employment at age 21) conditional on the specific class *k* of latent variable *x* (see Hagenaars and McCutcheon (2002)). As can be seen from the probability structure, the observed *y*s are assumed to be mutually independent given membership in a particular category of the latent variable *x*, known as the assumption of local independence. With observed data measuring roles at different ages, the number of latent classes indicates the number of (latent) pathways into adulthood, the latent class probabilities indicate the estimated population probability of each pathway, and the conditional probabilities for the observed variables given latent pathway reveal the relationship among roles within and across ages for different pathways. The multinomial logit-link specification allows for the incorporation of covariates that specify how such factors influence the distribution of *x*, membership in categories of the latent variable. With longitudinal data, we explicitly capture the interlock of roles that together constitute pathways over the life course and formally model how disability and other covariates influence membership in each pathway.

Results

Empirical models of the transition to adulthood

The first aspect of our analyses considers goodness of fit based on the log-likelihood Bayesian Information Criterion (Raftery, 1995). The models include direct effects between indicators (Hagenaars, 1988). Given that parenthood is a non-reversible state, the local independence assumption is difficult to satisfy by simply increasing the number of latent classes. Thus, we included six direct effects for parenthood from one age to the next. We estimated models with one through nine latent classes and examined relative goodness of fit. To ensure validity in our model selection, we repeated this with 20 unique 25% random samples. For both females and males, models with seven latent classes had the lowest BIC statistics (BIC = 16010 and 13369, respectively) and hence are the 'preferred' models. Corresponding role-specific conditional probabilities are graphed to show the interlock of role trajectories across ages that are indicative of multidimensional pathways. These are shown in figures 1 and 2.

Table 1. Frequency distribution for markers of the transition to adulthood and selected covariates, National Longitudinal Study of Adolescent Health.

	Females (N=2299)							Males (N=2197)						
A. Markers of the transition to adulthood														
	Age							**Age**						
	17	18	19	20	21	22	23	17	18	19	20	21	22	23
Degree attainment														
None	78.9%	35.9%	16.6%	11.4%	9.8%	8.3%	7.5%	83.2%	46.1%	22.5%	15.3%	13.2%	11.6%	10.6%
High school	20.9%	63.5%	81.8%	83.6%	76.7%	66.0%	58.9%	16.8%	53.9%	77.0%	81.5%	79.0%	70.9%	64.6%
College	0.2%	0.6%	1.7%	5.0%	13.5%	25.8%	33.7%	0.2%	0.0%	0.0%	3.1%	7.9%	17.5%	24.8%
Married														
No	99.7%	95.7%	90.5%	86.3%	81.3%	75.1%	69.3%	99.8%	98.0%	95.7%	92.8%	88.8%	83.4%	79.4%
Yes	0.3%	4.3%	9.5%	13.7%	18.7%	24.9%	30.7%	0.2%	2.0%	4.3%	7.2%	11.2%	16.6%	20.6%
Parent														
No	95.9%	92.7%	88.6%	83.8%	78.9%	76.2%	71.8%	97.5%	96.6%	94.3%	91.0%	88.1%	85.7%	82.2%
Yes	4.1%	7.3%	11.4%	16.3%	21.1%	23.9%	28.3%	2.5%	3.4%	5.7%	9.0%	11.9%	14.3%	17.8%
Employment status														
Not in labour force	24.7%	18.9%	16.6%	15.0%	13.7%	13.6%	12.9%	20.6%	14.7%	13.5%	11.5%	9.4%	9.8%	7.9%
Part-time work	57.6%	52.0%	43.9%	40.7%	35.3%	29.3%	31.7%	56.9%	48.4%	36.3%	32.0%	28.9%	24.8%	23.2%
Full-time work	17.7%	29.1%	39.5%	44.3%	51.0%	57.1%	55.5%	22.5%	36.9%	50.3%	56.5%	61.7%	65.4%	68.9%

Table 1. (Cont.)

B. Covariates

	Age							Age						
	17	18	19	20	21	22	23	17	18	19	20	21	22	23
Age at Wave 1														
16	19.3%							18.4%						
17	49.3%							49.8%						
18	31.0%							31.0%						
19	0.4%							0.9%						
Disability														
None	89.7%							85.2%						
Physical	4.3%							3.5%						
Learning	3.9%							9.0%						
Mental	2.1%							2.3%						
Race/Ethnicity														
Black	17.4%							15.7%						
Hispanic	11.0%							12.1%						
Family structure														
Single parent	26.0%							22.7%						
Step parent	12.2%							11.6%						
Poverty	21.6%							17.8%						
Parental education														
Less than high school	10.9%							11.3%						
Some college	30.0%							30.6%						
College graduate	32.0%							32.5%						
Community context														
Urban	33.2%							29.7%						
Rural	26.5%							31.1%						
Good neighbourhood	14.1%							12.8%						
Bad neighbourhood	29.2%							29.1%						

Table 2. Bayesian Information Criterion (BIC) statistics for model fit, National Longitudinal Survey of Adolescent Health.

	Females			Males	
Number of pathways	BIC	# parameters		BIC	# parameters
I	19939	41		16653	40
II	17883	101		15287	99
III	16945	161		14309	158
IV	16305	221		13774	217
V	16079	281		13532	276
VI	16031	341		13398	335
VII	**16010**	**401**		**13369**	**394**
VIII	16100	461		13444	453
IX	16170	521		13577	512

Note: Preferred models are in bold.

Contrary to many claims in the contemporary literature (Arnett, 2004 Buchmann, 1989), extent of heterogeneity is not particularly large – seven pathways – and there remains a high degree of institutionalisation of the life course. For both females and males, a first pathway characterises a *school-to-work* transition (see figures 1A and 2A) where the likelihood of high school graduation is very high by 19 (near 1.0), accompanied by a steady increase in the likelihood of full-time work (> .75) through the early 20s. Equally important, likelihoods of marriage and parenthood remain low (< .10). This pathway is the most prevalent pathway for both sexes, yet characterises a somewhat larger proportion of males (.30) than females (.25).

A second, *college-to-work* pathway (see figures 1B and 2B) involves college graduation by age 23 with a high likelihood of part-time work (> .75 for females and > .50 for males) during the interim years. As the likelihood of college graduation increases, the likelihood of part-time work declines and full-time work increases. By 23, the probability of full-time work is high (≈ .75), while movement into family roles is marginal (< .25). This pathway is somewhat more prevalent among females (.19 versus .15). The third pathway shows a *prolonged* transition to adulthood (figures 1C and 2C). While the likelihood of high school graduation is reasonably on time (≈ 1.0 by age 19), there is little movement (< .05) into full-time work, marriage, or parenthood by the early twenties. Instead, there is a high and extended likelihood of part-time work (> .50) followed by sharp increases in the likelihoods of college graduation, full-time employment (from 0.0 at age 21 to ≈ .50 at age 23). This pathway is somewhat more prevalent among males (.20 versus .16).

Figure 1. Role probabilities conditional on latent pathway into adulthood, females, National Longitudinal Study of Adolescent Health.

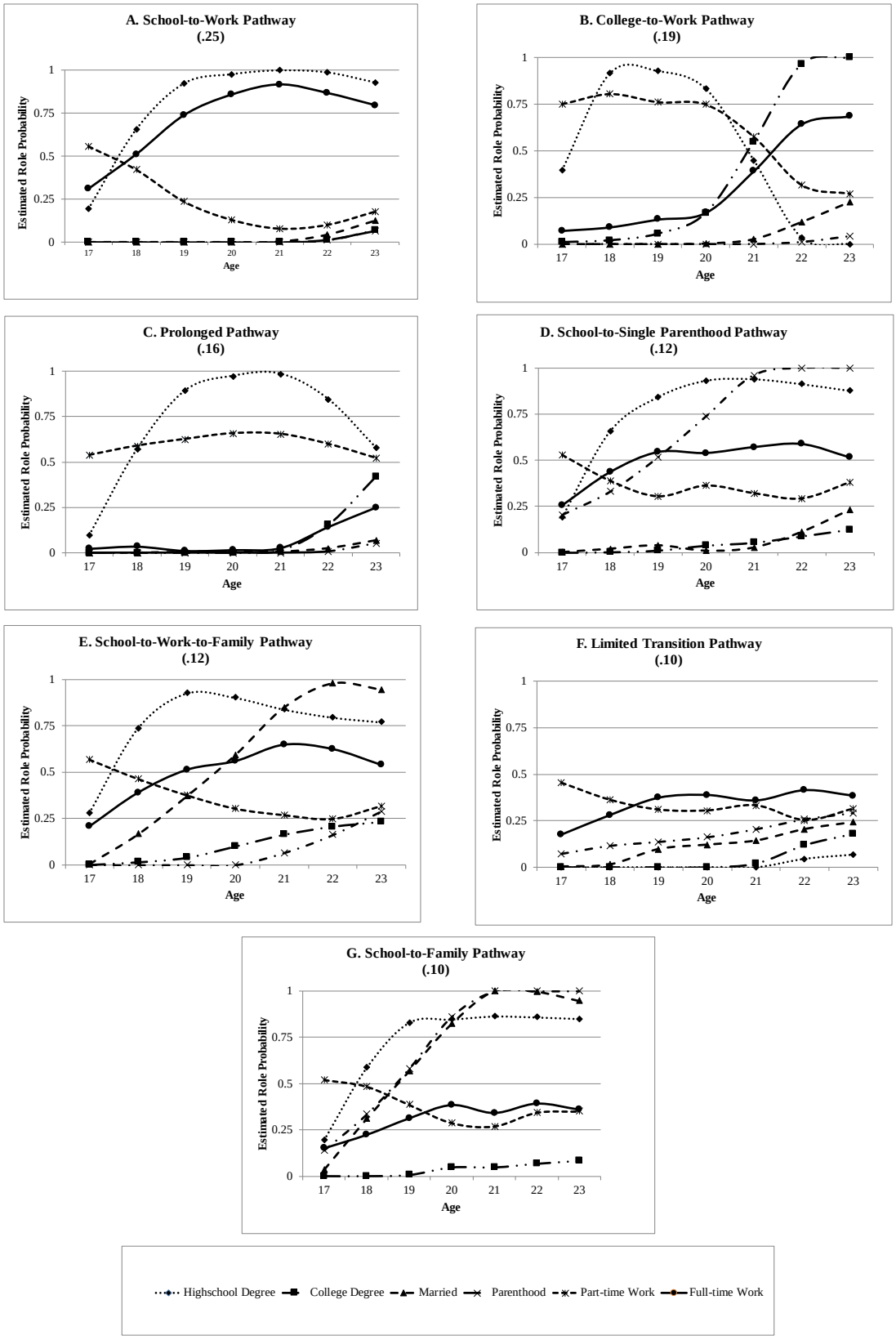
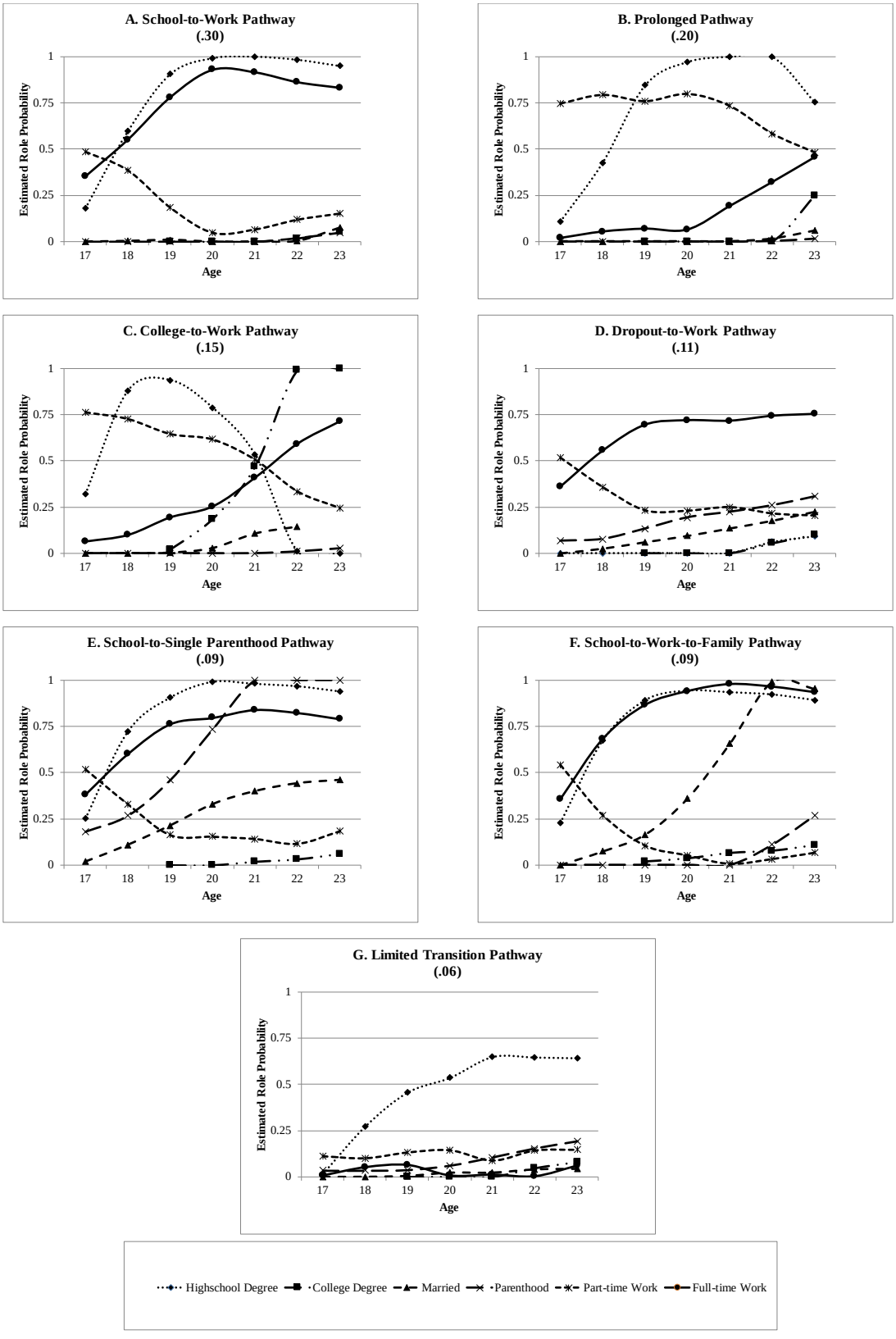


Figure 2. Role probabilities conditional on latent pathway into adulthood, males, National Longitudinal Study of Adolescent Health.



A fourth pathway shows *limited transitions* (see figures 1E and 2G). Here, all role probabilities are low (< .50) and trajectories flat indicating little degree attainment, low probabilities of labour force participation, and little movement into family roles. While women show limited role acquisition across the board, this pathway for males shows slow but steady increases in the likelihood of high school graduation (≈ .60 by age 23). Overall, the prevalence of this pathway is low (.09 for females and.06 for males). A fifth pathway involves *school-to-single parenthood* (see figures 1D and 2E). Here, high school completion is on time (≈1.0 by age 19) and accompanied by steady movement into full-time work (> .75 and >.50 by age 19 for males and females, respectively). In subsequent years, there is a rapid increase (nearing 1.0) in the likelihood of parenthood. Importantly, the likelihood of marriage is considerably lower, less than .50 and .25 for females and males, respectively. This pathway is somewhat more prevalent among females (.12 versus .09).

The sixth pathway is more multidimensional and shows a *school-to-work-to-family* pathway that is quite different between sexes. For females (see Figure 1E), this pathway involves on-time high school completion (≈ 1.0 by age 19) followed by steady increases in the likelihood of full-time work (≈.50 by age 23). Movement into family roles is also strong through the mid 20s with the likelihood of marriage increasing from .25 at age 19 to 1.0 at age 23 and parenthood increasing over the same ages. A similar pattern is seen for males, although prevalence is somewhat lower (.09 versus .12).

The final pathways are gender specific. Females show a *school-to-family* pathway (figure 1G) where a high likelihood of high school graduation in the late teens (≈ 1.0) is coupled with steady increases in the likelihoods of both marriage and parenthood. Almost all females in this pathway are married and have children by age 21. At the same time, labour force participation is more marginal and relatively flat through the early 20s (< .40 for full-time work). This pathway characterises approximately 7% of females. For males, a final pathway involves *dropout-to-work* (figure 2D). Here, the likelihood of any degree completion is effectively zero, yet the likelihood of full-time work increases steadily through the late teens and is substantial by the early 20s (≈ .75). Additionally, movement into family roles is marginal (≈ .25 or lower). This pathway represents 11% of males.

Disability and the transition to adulthood

We next estimate multinomial logistic regression models to predict (latent) pathway membership based on disability and other sociodemographic factors. These results are shown in tables 3 and 4 and show effects relative to the school-to-work pathway. For females (table 3), there are several notable findings. First, there are no significant effects for physical disability. Those with physical disabilities are not substantively different from those with no disability in the pathways they take into adulthood. In contrast, learning disability dramatically decreases the odds of a college-to-work pathway by 84% ($e^{-1.86}$ = .16) and almost quadruples the odds of a limited transition pathway ($e^{1.31}$ = 3.71). The consequences of cognitive disability effects are equally profound; odds of this pathway increase almost 11 times ($e^{2.38}$ = 10.80).

For males (table 4), there is again little evidence that physical disability is particularly consequential in the transition to adulthood. There are also few significant effects for those with a learning disability, although having a learning disability does more than quadruple the odds of a dropout-to-work pathway ($e^{1.49}$=4.44). The consequences of cognitive disability are more robust and show a profound pattern of disadvantage: cognitive disability effectively eliminates college-to-work as a pathway into adulthood, reducing the odds by over 99% ($e^{-5.36}$=.005), increases the odds of a limited transition pathway by almost twelve times ($e^{2.48}$=11.94), and increases the odds of a dropout-to-work pathway by almost four times ($e^{1.34}$=3.82).

Table 3: Unstandardised logit coefficient, females, National Longitudinal Study of Adolescent Health.

	Pathway (Reference: School-to-work)						
	College-to-work	Prolonged	Limited transition	School-to-single parenthood	School-to-work-to-family	School-to-family	Wald
Age							152.45**
17[a]	0.81*	-0.22	-0.13	0.10	0.61	-0.24	
	(0.34)	(0.25)	(0.32)	(0.28)	(0.33)	(0.39)	
18[a]	1.37***	-0.66*	-0.66	-0.07	0.71	0.21	
	(0.31)	(0.31)	(0.39)	(0.32)	(0.37)	(0.43)	
19[a]	-5.45***	-0.21	0.11	-7.07***	1.76	-6.01***	
	(1.63)	(1.48)	(1.91)	(1.59)	(1.56)	(1.36)	
Disability							40.06**
Physical[b]	-0.44	0.00	0.55	0.58	0.67	0.43	
	(0.55)	(0.49)	(0.54)	(0.43)	(0.49)	(0.59)	
Learning[b]	-1.86*	0.12	1.31*	-0.12	-1.12	0.39	
	(0.95)	(0.51)	(0.63)	(0.50)	(0.70)	(0.82)	
Mental[b]	0.19	1.10	2.38**	-0.44	0.31	0.48	
	(1.07)	(0.78)	(0.75)	(0.90)	(0.82)	(1.16)	
Race/Ethnicity							
Black[c]	0.08	0.71*	0.34	0.52	-1.70**	-1.08*	33.98**
	(0.31)	(0.34)	(0.38)	(0.30)	(0.54)	(0.44)	
Hispanic[c]	-0.15	0.30	0.18	0.25	0.19	-0.74*	6.59
	(0.31)	(0.35)	(0.40)	(0.37)	(0.34)	(0.38)	
Household and family							
Single parent[d]	-0.30	0.02	0.00	0.73*	-0.32	-0.27	9.64
	(0.28)	(0.25)	(0.31)	(0.34)	(0.42)	(0.37)	
Step parent[d]	-1.07***	-0.60	-0.57	0.33	-0.44	-0.16	24.08**
	(0.31)	(0.36)	(0.44)	(0.25)	(0.28)	(0.33)	
Poverty[e]	-0.12	-0.03	0.45	-0.12	0.23	0.04	5.08
	(0.29)	(0.26)	(0.27)	(0.22)	(0.27)	(0.27)	

Table 3: (Cont.)

Parent education							
Less than high school[f]	-1.24*	-0.24	-0.12	-0.24	-0.25	-0.11	7.94
	(0.50)	(0.44)	(0.45)	(0.49)	(0.33)	(0.44)	
Some college[f]	0.12	-0.15	-0.77*	-0.56*	-0.25	-0.20	9.68
	(0.24)	(0.23)	(0.32)	(0.27)	(0.25)	(0.32)	
College graduate[f]	1.12***	0.72*	-0.56	-0.32	-0.23	-1.31**	39.07**
	(0.28)	(0.23)	(0.39)	(0.35)	(0.30)	(0.58)	
Neighbourhood characteristics							
Urban[g]	-0.61*	0.05	-0.18	-0.45	-0.27	-0.08	12.25
	(0.21)	(0.24)	(0.26)	(0.28)	(0.29)	(0.35)	
Rural[g]	-0.17	-0.11	-0.69*	-0.26	-0.07	0.16	5.09
	(0.24)	(0.26)	(0.35)	(0.28)	(0.26)	(0.31)	
Good neighbourhood[h]	0.25	0.25	-0.16	-0.70	-0.41	-0.51	6.56
	(0.28)	(0.23)	(0.44)	(0.49)	(0.32)	(0.43)	
Poor neighbourhood[h]	-0.31	0.22	-0.04	0.45*	0.21	0.29	10.26
	(0.26)	(0.31)	(0.32)	(0.21)	(0.34)	(0.33)	
Constant	-1.16	-0.56	-0.52	-0.76	-0.85	-0.81	23.26
	(0.35)	(0.33)	(0.35)	(0.38)	(0.34)	(0.42)	

* $p < 0.05$ ** $p < 0.01$

[a]reference: age 16 [b]reference: no disability [c]reference: white [d]reference: not in poverty [e]reference: intact/other
[f]reference: high school [g]reference: suburban [h]reference: average neighbourhood

Table 4: Unstandardised logit coefficients, males, National Longitudinal Study of Adolescent Health.

	Pathway (Reference: School-to-work)						
	College-to-work	Prolonged	Limited transition	School-to-single parenthood	School-to-work-to-family	Dropout-to-Work	Wald
Age							272.51**
17[a]	0.36	-0.31	-0.45	0.79*	0.83*	0.02	
	(0.36)	(0.23)	(0.37)	(0.38)	(0.38)	(0.27)	
18[a]	0.73*	-0.96**	-0.66	1.16**	1.01*	-0.10	
	(0.31)	(0.32)	(0.41)	(0.41)	(0.37)	(0.34)	
19[a]	-5.70***	0.44	-6.39***	3.27**	2.46*	-6.11***	
	(1.08)	(1.12)	(1.16)	(1.01)	(1.21)	(1.09)	
Disability							222.89**
Physical[b]	-0.31	-0.36	0.02	-0.77	-0.53	0.23	
	(0.50)	(0.41)	(0.51)	(0.67)	(0.50)	(0.41)	
Learning[b]	-1.05	0.67	1.14	0.14	0.33	1.49**	
	(0.61)	(0.55)	(0.63)	(0.55)	(0.50)	(0.39)	
Mental[b]	-5.36***	1.00	2.48***	1.02	0.91	1.34*	
	(0.68)	(0.87)	(0.75)	(0.65)	(0.82)	(0.57)	
Race/Ethnicity							
Black[c]	-0.45	0.54	0.70	0.12	-0.32	0.54	16.49*
	(0.42)	(0.31)	(0.47)	(0.32)	(0.35)	(0.32)	
Hispanic[c]	-0.01	0.01	0.00	-0.28	0.16	0.29	2.69
	(0.35)	(0.34)	(0.44)	(0.35)	(0.34)	(0.29)	
Household and family							
Single parent[d]	-0.65*	-0.17	-0.31	-0.69*	-0.61*	-0.24	11.52
	(0.27)	(0.28)	(0.37)	(0.31)	(0.27)	(0.27)	
Step parent[d]	-0.67*	-0.46	-0.47	-0.14	-0.06	-0.12	5.35
	(0.34)	(0.36)	(0.48)	(0.32)	(0.40)	(0.26)	
Poverty[e]	-0.48	0.13	0.63*	0.59*	0.13	0.68*	17.29*
	(0.41)	(0.30)	(0.31)	(0.26)	(0.28)	(0.26)	

Table 4: (Cont.)

Parent education							
Less than high school[f]	0.14	0.27	0.38	0.29	0.01	0.69*	7.14
	(0.55)	(0.68)	(0.55)	(0.39)	(0.52)	(0.35)	
Some college[f]	0.54	0.63	-0.03	0.06	0.39	0.08	5.86
	(0.32)	(0.37)	(0.45)	(0.28)	(0.32)	(0.25)	
College graduate[f]	1.20***	0.92**	-0.19	-0.30	-0.57	-0.53	39.02**
	(0.31)	(0.35)	(0.46)	(0.35)	(0.39)	(0.32)	
Neighbourhood characteristics							
Urban[g]	0.21	0.06	0.06	0.34	-0.07	-0.13	3.14
	(0.27)	(0.23)	(0.40)	(0.29)	(0.27)	(0.26)	
Rural[g]	0.21	-0.21	-0.20	0.02	0.11	-0.26	3.63
	(0.26)	(0.24)	(0.41)	(0.30)	(0.27)	(0.27)	
Good neighbourhood[h]	0.51	0.14	-0.13	-0.28	-1.35**	-0.75	20.41*
	(0.28)	(0.28)	(0.63)	(0.40)	(0.53)	(0.50)	
Poor neighbourhood[h]	0.22	-0.62*	0.50	0.01	0.07	-0.22	13.31*
	(0.27)	(0.26)	(0.29)	(0.19)	(0.27)	(0.24)	
Constant	-1.71	-0.51	-1.79	-2.11	-1.91	-1.21	50.20**
	(0.44)	(0.39)	(0.47)	(0.46)	(0.44)	(0.39)	

* $p < 0.05$ ** $p < 0.01$

[a]reference: age 16 [b]reference: no disability [c]reference: white [d]reference: not in poverty [e]reference: intact/other
[f]reference: high school [g]reference: suburban [h]reference: average neighborhood

As coefficients from multinomial models are often difficult to interpret given the need to simultaneously incorporate two dimensions of comparison (i.e. reference categories for both the dependent and independent variables), we calculated estimated class probabilities conditional on selected covariates and make comparisons to well-recognised sociodemographic correlates. Beginning with females (see table 5), we first see the variable effects of disability in general for a school-to-work pathway. While the sample average is .25, those with no disability, a physical disability or a learning disability have a similar probability (.26, .22 and .25, respectively). In contrast, those with a cognitive disability have a substantially lower likelihood (.10). If we conclude that cognitive disability lowers the likelihood of a school-to-work pathway by .15 (.25-.10), it is instructive that none of the other covariates have this level of difference. For the college-to-work pathway, the overall probability is .19, yet only 10% of women with a physical disability, 3% of women with a learning disability, and 5% of women with a cognitive disability are found in this pathway. If cognitive disability reduces the probability of a college-to-work pathway by .14, it is again instructive that the effects of factors such as race and ethnicity, family structure, and poverty are much smaller (≅ ± .10) and the only differences that are comparable in magnitude are those for parent's education and neighbourhood quality. Even more striking than the 'pull' that disability exerts from advantageous pathways is the 'push' into the very disadvantaged *limited transition* pathway. Here, the overall probability is .10, yet .31 for those with a learning disability and .48 for those with a cognitive disability. In substantive terms, this implies that almost a third of those with a learning disability and almost half of those with a cognitive disability have the most disadvantageous pathway into adulthood. None of the differences in likelihood associated with any of the other factors even come close in magnitude (≅ ± .08).

Estimated class probabilities for males also show the important intersection of pathway and disability type (see table 6). For the school-to-work pathway, the average likelihood of following this pathway into adulthood is .30. The comparable probability for those with a cognitive disability is only .11, almost two-thirds lower. This difference of .19 is several orders of magnitude greater than differences for any of the other factors considered (≅ ± 0.06). Differences are even starker for the college-to-work pathway. While the overall likelihood of this pathway is .15, similar probabilities for those with learning and cognitive disabilities are .03 and .00. Such differences are considerably larger than those for race, family structure, socioeconomic origins, and neighbourhood characteristics.

If disability exerts a uniquely strong 'pull' away from advantageous pathways, it again exerts a strong 'push' into the more disadvantageous pathways. For example, the likelihood of a limited transition pathway for those with a cognitive disability is .33, over five times greater than that seen for the overall sample (.06) and the difference of .27 is again several orders of magnitude greater than differences seen for any of the other factors included in the model. In the case of dropout-to-work, likelihood is almost three times greater for those with learning disabilities and over two times greater for those with cognitive disabilities. When likelihoods of limited transition and dropout-to-work pathways are considered together, strikingly, over 40% of males with a learning disability and over half of those with a cognitive disability are characterised by the more disadvantageous pathways.

Table 5. Estimated probabilities for latent pathways by covariate, females, National Longitudinal Study of Adolescent Health.

	School-to-work	College-to-work	Prolonged	Limited transition	School-to-single parenthood	School-to-work-to-family	School-to-family
Overall	0.25	0.19	0.16	0.10	0.12	0.12	0.07
Age							
16	0.28	0.08	0.22	0.13	0.13	0.08	0.07
17	0.25	0.17	0.18	0.10	0.13	0.12	0.05
18	0.24	0.27	0.11	0.06	0.11	0.13	0.08
19	0.21	0.00	0.22	0.33	0.00	0.24	0.00
Disability							
None	0.26	0.20	0.16	0.07	0.12	0.12	0.06
Physical	0.22	0.10	0.12	0.09	0.19	0.19	0.08
Learning	0.25	0.03	0.19	0.31	0.10	0.04	0.08
Mental	0.10	0.05	0.21	0.48	0.04	0.07	0.04
Race/Ethnicity							
Black	0.24	0.11	0.25	0.13	0.22	0.03	0.03
Hispanic	0.25	0.09	0.16	0.14	0.14	0.17	0.05
Household and family							
Single parent	0.25	0.12	0.17	0.12	0.20	0.09	0.06
Step parent	0.34	0.10	0.13	0.06	0.16	0.12	0.09
Poverty	0.25	0.08	0.16	0.16	0.16	0.12	0.07
Parental education							
Less than high school	0.27	0.03	0.15	0.18	0.17	0.13	0.08
Some college	0.30	0.16	0.14	0.07	0.12	0.12	0.09
College graduate	0.21	0.33	0.22	0.06	0.08	0.09	0.02
Neighborhood characteristics							
Urban	0.27	0.12	0.20	0.12	0.13	0.11	0.06
Rural	0.27	0.17	0.14	0.06	0.13	0.13	0.09
Good neighbourhood	0.24	0.34	0.19	0.06	0.05	0.09	0.04
Bad neighbourhood	0.24	0.09	0.19	0.11	0.19	0.11	0.07

Table 6. Estimated probabilities for latent pathways by covariate, males, National Longitudinal Study of Adolescent Health.

	School-to-work	College-to-work	Prolonged	Limited transition	School-to-single parenthood	School-to-work-to-family	Drop out-to-work
Overall	0.30	0.15	0.20	0.06	0.09	0.09	0.11
Age							
16	0.31	0.10	0.30	0.09	0.04	0.04	0.12
17	0.30	0.15	0.22	0.05	0.08	0.08	0.11
18	0.31	0.19	0.11	0.05	0.12	0.11	0.11
19	0.13	0.00	0.23	0.00	0.45	0.19	0.00
Disability							
None	0.32	0.17	0.20	0.05	0.09	0.09	0.09
Physical	0.39	0.14	0.14	0.06	0.06	0.07	0.15
Learning	0.20	0.03	0.21	0.10	0.07	0.08	0.31
Mental	0.11	0.00	0.14	0.33	0.12	0.08	0.21
Race/Ethnicity							
Black	0.27	0.09	0.22	0.12	0.10	0.06	0.15
Hispanic	0.28	0.12	0.15	0.08	0.09	0.11	0.18
Household and family							
Single parent	0.34	0.09	0.22	0.08	0.07	0.06	0.14
Step parent	0.36	0.11	0.17	0.04	0.10	0.10	0.11
Poverty	0.27	0.05	0.15	0.11	0.12	0.08	0.21
Parental education							
Less than high school	0.24	0.06	0.12	0.13	0.11	0.08	0.26
Some college	0.30	0.13	0.21	0.05	0.09	0.11	0.10
College graduate	0.29	0.25	0.28	0.03	0.06	0.04	0.05
Neighborhood characteristics							
Urban	0.29	0.13	0.20	0.08	0.11	0.08	0.12
Rural	0.32	0.16	0.16	0.05	0.09	0.11	0.11
Good neighbourhood	0.30	0.25	0.29	0.03	0.06	0.02	0.04
Bad neighbourhood	0.30	0.12	0.12	0.11	0.11	0.10	0.14

Conclusions

As a stratifying condition, sociologists have paid markedly less attention to disability as determinant of life chances than other social factors (notable exceptions include Janus, 2009; Wells et al. 2003). Our research advances understanding of disability and its life course implications in two key ways. We extend previous work by considering the interconnections of multiple roles over time with different disabilities and by comparing the relative effects of disability in the transition to adulthood against multiple agents of stratification (race, family status, and geography). At the outset, we offered several hypotheses that directly assessed different views on whether and how disability influences the transition to adulthood.

A first hypothesis (H1) focused on school-to-work pathways and suggested that cognitive disability rather than physical disability should matter, particularly for pathways involving post-secondary education. Our results provide considerable support. Those with a physical disability were no more or no less likely to have these pathways into adulthood. Our second hypothesis (H2) suggested that those with a cognitive disability should be more likely to drop out of school. Though we did not find this pathway among females, both learning and cognitive disability significantly increased the likelihood of this pathway among men. While hypothesis H3 suggested that learning and physical disability should increase and cognitive disability should decrease the likelihood of a prolonged transition, no form of disability influenced the likelihood of this pathway. A fourth (H4) hypothesis focused on pathways that include movement into family. Here, we focused on the school-to-family pathway among females and suggested that physical disability should be particularly significant. Again, we find no support for this expectation. One possible explanation for this may be that the relationship between disability and attractiveness is much looser than we anticipated (cf. Rojahn et al., 2008) or that changing roles for women that increasingly involve education, particularly higher education, and employment attenuate the importance of attractiveness in relationships (Oppenheimer, 1988).

Finally, we drew upon the life course principle of cumulative disadvantage to suggest that disability can undermine the processes by which individuals make successive role transitions and formulate multifaceted pathways into adulthood. As such, we hypothesised that disability decreases the likelihood of a school-to-work-to-family pathway (H5) and increases the likelihood of a limited transition pathway (H6) and that such effects should be more substantial for cognitive disabilities. While cognitive disability did not influence the likelihood of a school-to-work-to-family pathway, the probability of a limited transition pathway is much greater for those with learning and cognitive disabilities for both women and men and the magnitudes of the predicted probabilities are greater for cognitive disability than learning disability. Indeed, roughly half of men and women with cognitive disabilities have limited transitions. Consistent with life course principles of cumulative advantage and disadvantage, both learning and cognitive disabilities appear uniquely detrimental to one's ability to actualise multidimensional pathways in the transition to adulthood.

As a whole, the findings support our life course perspective emphasising the intersection of disability and institutional context in shaping pathways into early adulthood. In doing so, the research elaborates the mechanisms by which *specific* types of disability matter for *particular* pathways into adulthood. Because different pathways reflect different types of life course capitalisation, disability also plays a large role in shaping the accrual of the assets (or deficits) that determine quality of life across the life span. Those without disabilities are dispersed across pathways but are generally able to complete schooling, often higher education, in a timely manner, with moderately paced and successful movement into full-time work, and subsequent – and hence 'orderly' and efficacious (Hogan, 1978; Rindfuss, Swicegood, & Rosenfeld, 1987) – movement into family roles. In contrast, those with cognitive disabilities have difficulty accumulating the fundamental building blocks of the life course and are heavily concentrated in pathways with only modest educational

attainment, slower movement into work, and marginal movement into family roles.

Our emphasis on the interconnection of pathways, institutions and disability also indicates that physical disabilities are comparatively less consequential in the structuring of life course pathways. While we recognise limitations of statistical power, there is simply less differentiation across pathways in early adulthood based on physical disability relative to cognitive disabilities. From an institutional standpoint, the marginal effects for physical disability may indicate that institutional and cultural accommodations have been more successful with respect to physical disability. Such accommodations are largely technical or engineering matters and may be more easily realised with respect to physical rather than cognitive disabilities. Also possible, the life course consequences of physical disability are mitigated by rehabilitation and physical therapy through adolescence and early adulthood, although this is largely speculative. This is not inconsistent with our emphasis on institutional accommodations that facilitate educational and occupational accomplishment among those with physical disabilities.

Our work is not without limitations. For one, our focus on the multidimensional, dynamic character of the transition to adulthood trades scope for depth. As such, we focus on the early and most complex period of life course transitions. Extending analyses may reveal additional pathways (e.g. college-to-work-to-family). Further, our empirical models do not investigate the qualities of schooling, jobs and relationships; this is an important avenue of future work in understanding of the links between disability and the life course and between health and attainment more generally. This will provide an important extension of inquiry into life course capitalisation processes (Hagan, 1998) and mechanisms of cumulative advantage and disadvantage (Willson, Shuey, & Elder, 2007).

In the end, disability is clearly an important feature of the contemporary life course and an important aspect of health selectivity in the unfolding life span (cf. Palloni, 2006). While we cannot claim to have controlled for all possible confounding factors (and instead have only ruled out some likely prospects), effects of disability are large yet variable: disability is an important life course contingency only to the extent that it intersects with the institutional character of life course pathways. Cognitive disability is particularly significant and, given the emergence of a post-industrial economy that is increasingly organised around cognitive rather than physical capabilities, it seems uniquely implicated in broad processes of cumulative (dis)advantage through the strong role they play in fostering disadvantaged pathways into adulthood. Regardless of institutional accommodations or its endogenous character, disability stands out as a key factor structuring the life course.

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Endnotes

1. Notably, to the best of our knowledge, we are the first to use the Add Health data to study disability in the transition to adulthood in this way; past research utilised the National Educational Longitudinal Surveys (NELS:88) and the National Longitudinal Transition Studies (1 and 2).
2. The ten US federally defined categories are: 1) mental retardation; 2) hearing impairments; 3) speech or language impairments; 4) visual impairments; 5) serious emotional disturbance; 6) orthopedic impairments; 7) autism; 8) traumatic brain injury; 9) other health impairments; and, 10) specific learning disabilities. We recognise that we are not able to distinguish among specific learning disabilities such as attention deficit and attention deficit hyperactivity disorders and other newly emerging disabilities such as autism.

Mental health problems and social disadvantages as predictors of teenage parenthood: A register-based population study of Swedish boys and girls

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Abstract

It has been argued that the relationship between mental health and teenage parenthood might be explained by the connection of social disadvantage and mental health. This paper embraces a life course approach and investigates the link between social and health disadvantages and teenage parenthood in Sweden, in attempt to disentangle experiences of early mental health problems from other social disadvantage factors. The research questions were explored through random intercept logistic models for panel data. The data for this study consists of all individuals born in Sweden between 1989 and 1994, drawn from Swedish population registers. The final models comprised 680,848 individuals who were followed throughout their teenage years. The results show that mental health problems in youth function as an independent predictor of teenage parenthood, even after adjusting for other social disadvantage factors. This observation applies for both boys and girls. Activities aimed at increasing the perceived life opportunities of youth and giving significance to life may be considered as means of preventing teenage parenthood through policy. This study suggests that such activities could be extended to include teenagers with mental health problems.

Keywords

Adolescence; adolescent parents; family; fertility; longitudinal; mental health; teenage parenthood

Introduction

Teenage pregnancy and teenage parenthood are often described as public health concerns with adverse outcomes for both mother and child (Cunnington, 2001; Lawlor & Shaw, 2002). However, claims of casual links between further adverse life course outcomes and teenage parenthood have been disputed, with research finding that these continued adverse outcomes can partly or completely be attributed to aspects such as socioeconomic factors prior to birth (Cunnington, 2001; Furstenberg, 1991; Geronimus & Korenman, 1992). Teenage parents tend to come from more-disadvantaged backgrounds, with lower parental income and education compared to their peers (Al-Sahab, Heifetz, Tamim, Bohr, & Connolly, 2012; Geronimus & Korenman, 1992; Väisaenen & Murphy, 2014). These pre-existing characteristics create social selection, where individuals from underprivileged backgrounds are more likely to become teenage parents and at the same time tend to fare worse later in life. Distinguishing between the risk factors for teenage parenthood and the consequences of becoming a parent early in life is crucial because the public framing of teenage parenthood as a societal problem puts teenage parents in a vulnerable position, with risk of social exclusion, stigmatisation, and deepening their disadvantage.

This study adopts a life course approach to examination of the link between social and health disadvantages and teenage parenthood. It disentangles experiences of early mental health problems from other social disadvantage factors such as low parental education and income. The goal of the study is to determine whether selection of individuals with mental health issues into teenage motherhood or fatherhood is independent of other factors. I used data on individuals born 1989–1994 from the Swedish population register and modelled longitudinally.

The few available findings on the association between mental health and teenage parenthood support the notion that health-related disadvantages are precursors of teenage parenthood. However, the relatively low prevalence of teenage parenthood often inhibits study population sizes (e.g. Kovacs, Krol, & Voti, 1994; Nilsen et al., 2012; Wahn & Nissen, 2008; Woodward, Fergusson, & Horwood, 2006). Low prevalence of teenage parenthood is especially evident with teenage fatherhood, which makes young fathers challenging to reach. Hence most previous studies focus solely on teenage mothers and do not provide evidence on their male counterparts (e.g. Barett, Katsiyannis, Zhang, & Kingree, 2015; Hall, Kusunoki, Gatny, & Barber, 2014; Nilsen et al., 2012; Väisanen & Murphy, 2014; Wahn & Nissen, 2008). This study overcame these limitations by using high-quality data covering the whole population, and includes both men and women.

Background

A socially disadvantaged background is associated with increased risk of further social exclusion over the course of life. Previous research demonstrated that teenage parenthood is one such event that links social disadvantages to later social exclusion, although the causal links are unclear (Gibb, Fergusson, Horwood, & Boden, 2015; Olausson, Haglund, Weitoft, & Cnattingius, 2001). The terms ‘advantage’ or ‘disadvantage’ can be understood as affiliation with a social group that possesses more or fewer opportunities, which place individuals at varying levels in the social hierarchy based on wealth, power, and prestige (Braveman & Gruskin, 2003). Mental health problems are one example of a health-related disadvantage that is associated with stigma and social exclusion, often even after mental health treatment (Link, Phelan, Bresnahan, Stueve, & Pescosolido, 1999). It is plausible that such health-related disadvantage would be connected to events and states, like teenage parenthood, that eventually lead to social exclusion.

Theoretical perspectives

Several explanations of the association between social and health disadvantages and teenage parenthood have been presented. One suggested explanation is an increase in sexual risk-taking among teenagers with disadvantaged backgrounds (Kessler et al., 1997; Moilanen, 2015). However, others argue that teenage parenthood as a behavioural outcome is independent from sexual activity and pregnancy (Barrett et al., 2015).

The notion of *opportunity costs* might offer an explanatory mechanism for the two types of selection into young parenthood investigated in this study: socioeconomic background and mental health problems. *Opportunity costs,* a concept introduced by Becker (1960), centre on the fact that today’s decisions are based on past experiences as well as on thoughts about the future. The *opportunity cost* of a choice is the value foregone by rejecting the most highly valued alternative, i.e. the cost that is sacrificed by choosing one alternative before another (Buchanan, 2008).

From this perspective, children incur two types of costs: direct and indirect, related to the time that could be spent on alternative activities such as participating in education or working for wages. Thus, the ‘price’ of children is lower for individuals who perceive their chances of acquiring education or income from work experience as low. Thus, we can expect a selection of low-income individuals into young parenthood. An important distinction here is that the *perceived* cost of a decision might not be the factual cost, but the type of cost depends on the available sets of information. Education and career success opportunities, or the risks and rewards of becoming a parent, may be over- or undervalued by the individual. *Perceived opportunity costs* therefore connect micro-level individual motivation and perception of an individual’s alternatives to the macro-level structural opportunities available for work and education. In other words, the *opportunity cost* might be perceived as lower not only for individuals from low-income backgrounds, but for individuals with other types of disadvantaged backgrounds. Mental health problems in youth could appear to

close the doors of lucrative career paths and high educational achievement, making the cost of early parenthood seem lower.

Parenthood choices can also be examined from the perspective of the theory of the value of children developed by Hoffman and Hoffman (1973). Hoffman, Thornton and Manis (1978) observed that both men and women seem to universally infuse children with the same types of values: love, companionship, and joy. However, individuals with lower education levels placed greater significance on these values (Hoffman et al., 1978) and it is hypothesised that this could be due to lesser-educated individuals having fewer alternative means to fulfil certain needs. This, in turn, could lead to lesser-educated individuals perceiving fewer beneficial opportunities in their future life and, hence, putting greater emphasis on what children might bring to their life. Hoffman's arguments may be extended to include social disadvantages such as mental health problems. I argue that mental health problems could also be perceived as a roadblock in self-esteem-yielding activities such as work and education. This perception leads to more dependence on family to fulfil their need for positive self-esteem.

Friedman, Hechter and Kanazawa (1994) provided further arguments pertaining to parenthood focused on the mechanisms of *uncertainty reduction* across the life course. Obtaining a stable job or long-term education are ways of reducing uncertainty in life; getting married and having children are other ways. According to Friedman et al. (1994), when one or more of these certain paths is perceived as blocked, the probability of another potential path increases. This is true even if the chosen path is associated with negative outcomes, since we focus on minimising uncertainty rather than maximising utility. Hence, young men and women suffering from mental health problems, and therefore facing more obstacles in education attainment and paid work, may choose early family formation as a route towards uncertainty reduction and reaching stability in their lives.

Empirical research on mental health and early parenthood

Connections between teenage parenthood and health-related disadvantages occurring due to mental health problems are less studied, compared to other types of disadvantages, and the existing results lead to varying conclusions. Kalucza, Hammarström and Nilsson (2015) did identify a selection, with men who had self-reported mental health problems in adolescence being less likely to become fathers, with no such relationship identified for women. Meanwhile, Jonsson et al. (2011) did not identify any selection into later adult parenthood by mental health for either men or women.

Carlson (2011) found a curvilinear relationship between mental health and age at first child, where both early and late timing of parenthood is related to a higher degree of depressive symptoms. Correspondingly, Selling, Carstensen, Finnstrom, Josefsson and Sydsjö (2009) found that women were more likely to give birth at ages 20–24 years if they had previously been hospitalised for mental health illnesses. After age 24, previously hospitalised women who had not yet had their first child, were less likely to give birth than their healthy counterparts.

Nilsen et al. (2012) reported more pregnancies among young women aged 21–24 who had experienced adolescent depression. This pattern continues when looking at even younger ages at first child with Olsson, Hansson, and Cederblad (2006) revealing increased prevalence of teenage parenthood among former mental health inpatients compared to the general Swedish population. The relationship between mental health problems and teenage parenthood has also been found in studies of psychiatric disorders among women and men, based on archival and retrospective survey data (Barett et al., 2015; Kessler 1997 respectively), and in studies looking at aggression and delinquent behaviour (Gaudie et al., 2010).

Co-occurring social disadvantages may muddle the relationship between mental health and teenage parenthood. Hall, Kusunoki, Gatny and Barber (2014) found that depression is correlated with an elevated risk of teenage motherhood but this association ceased to be significant after controlling for socioeconomic factors. Mollborn and Morningstar (2009) observed that mental distress was not a significant predictor of teenage childbearing except for teens living below the poverty line.

Summing up, it appears that mental health issues are associated with teenage parenthood. However, it remains unclear whether this relationship is causal or spurious (e.g. Hall et al.,

2014; Kovacs, Krol, & Voti, 1994). In yet other cases, mental health together with low socioeconomic status seem to exert a cumulative effect leading to young parenthood (Mollborn & Morningstar, 2009). Hence, more research is needed in order to disentangle the impact of mental health from other sources of social disadvantage in order to understand the mechanisms behind transition to parenthood in the early life course stages.

This study

This study investigates the association between teenage parenthood and social and mental health disadvantages. Previous studies have explored the precursors of teenage parenthood. However, this study takes a unique approach by trying to disentangle the experiences of early mental health problems from other social disadvantage factors using data from a population register. Swedish population registers and prescribed-drug registers facilitated the utilisation of longitudinal modelling of the associations between socioeconomic factors, mental health problems, and teenage parenthood for young men and women.

Research questions

1. Are mental health problems during adolescence associated with becoming a teenage parent, and does this relationship persist even when adjusting for other social disadvantages?
2. What associations between teenage parenthood and other types of social disadvantages can be identified, while controlling for mental health?

Population and data

The data for this study derived from individuals born in Sweden between 1989 and 1994, pulled from Swedish population registers. In total, 7.9% of boys and 10.7% of girls in the population had at least one prescription for psychotropic drugs, preceding childbirth in cases of teenage parents. The proportion of missing values from the data is very low overall due to the nature of the Swedish registers, which have complete data on births and medical prescriptions. The registers had low proportions of missing values in family forms (0.01%), income of mother (1.51%, mother of index person) and age of mother at first child (0.15%, mother of index person). Attrition rates for age of father at first child (father of index person) and for highest educational level achieved by mother (mother of index person) were 0.53% and 1.05%, respectively. Individuals with missing data were excluded from the analysis (n=13,655, 2%). The final models contained 348,073 men and 332,775 women.

Measures

The outcome variable *teenage parenthood* is defined as having a child before age 20, a cut-off in line with international public health statistics and previous research (e.g. Darroch, Singh, & Frost, 2001; World Bank, 2016). Teenage parenthood rates in Sweden are lower than in other western countries (Darroch, Singh, & Frost, 2001), with about 5.6 births occurring per 1,000 women aged 15–19 in 2014 (World Bank, 2016).

The outcome *having a child as a teenager* could be repeated for a given individual, and there were 348 instances of individuals having a second child while still a teenager. The six cohorts used included 6,984 teenage parents, of which 75% (n = 5,205) were women and 25% (n = 1,779) were men.

Mental health was measured using psychotropic drug prescriptions as a proxy for mental health issues. The records were extracted from the prescribed drugs register, where data from 2005 to 2010 were available. The variable used is a binary variable and denotes whether there was at least one instance of drug prescription per six-month period, and was lagged by 12 months to avoid the risk of the pregnancy being the reason for the mental health issue.

Covariates

Although the prevalence of teenage parenthood is higher among women than men, previous studies have shown that the risk factors connected to teenage parenthood do not differ between sexes (Woodward, Fergusson, & Horwood, 2006), except for maternal age and exposure to parental separation.

Mother's (of teenage parent) age at first child and *Father's (of teenage parent) age at first child* aim to capture intergenerational transitions of family forming patterns, which has proven significant in previous studies (e.g. Murphy & Wang, 2001; Sipsma, Biello, Cole-Lewis, & Kershaw, 2010; Wahn & Nissen, 2008). The ages of mothers and fathers were grouped into three categories each: teenage parenthood (< 20 years), early parenthood (20–27 years), and later parenthood (> 27 years) for mothers; and teenage parenthood (< 20 years), early parenthood (20-29 years), and later parenthood (> 29 years) for fathers. The cut-off

between early and later parenthood was chosen with respect to the mean age at first child in Sweden for mothers and fathers, respectively, during the year of birth for the study cohorts.

Socioeconomic position is considered a stable precursor of teenage parenthood (Al-Sahab et al., 2012; Geronimus & Korenman, 1993; Väisaenen & Murphy, 2014) and was measured by observing two variables. One variable, *highest education of mother*, originally contained seven categories spanning from < 9 years of compulsory school to a doctoral degree, but for the analysis were recoded into three categories: nine years or less of compulsory school, senior high school and higher education. This, to simplify the model while still maintaining important breaks in the education trajectories. Analysis with the full seven-category variable yielded no additional significant differences between the education categories. The second, *mother's income*, involved earned incomes averaged over five years (index persons' ages 8–13) and divided into quartiles.

Previous studies show an association between *family form* and teenage parenthood (Fomby & Bosick, 2013; Woodward, Fergusson, & Horwood, 2006; Vikat, Rimpela, Kosunen & Rimpela, 2002). Based on the mother's civil status, family form was measured until the index person reached age 13 and thus became 'at risk' of teenage parenthood. The mother could be denoted as married, cohabitating, in partnership (legal union for homosexual relationships in Sweden pre-2009), or single.

Any shift in status each year from the previous year was recorded, and family form was classified into the following categories: *Two adults, stable throughout childhood*; *Single and stable through childhood*; *Parent passed away*, when the individual lost one or two parents at any point during childhood; *family disruption*, mothers household went from two adults to one at any point during childhood; and *Step family*, when the individual gained a parent but did not experience later disruption during the study period. Since some of the mothers (0.7–1.2% per year) were missing data for at least one of the 13 years, missing values were replaced by last known status.

Teenage fertility rates differ between countries, (Nordic countries have especially low rates (Darroch et al. 2001)), as well as within Sweden (with increased prevalence in rural settings (Statistics Sweden 2016)). Therefore, I included two variables adjusting for *birthplace of mother* and population density in the *region* of upbringing (measured at the start of the risk period). These variables can influence the propensity of becoming a teenage parent through varying social norms about expected age at first child in these different contexts.

Birthplace of mother was categorised into the Nordic countries (Sweden, Norway, Denmark, Finland and Iceland), the remainder of Europe and other western countries (US, Canada, Australia, New Zealand), or 'Other'.

The variable *regions* consisted of five regions, and all Swedish municipalities were divided into homogenous regions based on population density, and not geographic location. Municipality divisions were conducted with the help of categories created by Statistics Sweden (2003). The first category, *Metropolitan*, includes the three largest cities in Sweden and their closely surrounding areas. The second category, *Bigger cities*, comprised municipalities with > 90,000 inhabitants within a 30-km radius of the municipality centre, the most densely populated area in the municipality. Category 3, *Smaller cities*, included municipalities with > 27,000 but < 90,000 inhabitants within a 30-km radius, and > 300,000 inhabitants within a 100-km radius of the municipality centre. Category 4, *Semi-rural areas*, comprised municipalities who also had > 27,000 but < 90,000 inhabitants within a 30-km radius, and < 300,000 inhabitants within a 100-km radius, of the municipality centre. Lastly, *rural areas* included the remaining municipalities with < 27,000 within a 30-km radius from the municipality centre. Region of residency was measured at age 13, which is considered the start of the 'at risk' period for teenage parenthood.

Statistical analysis

The research questions were addressed through panel data models, specifically random effects models. This type of model makes it possible to analyse the probability of having a child during teenage years, conditional on both the time-varying covariate drug prescriptions, as well as the other time-fixed covariates. The models, utilising person specific intercepts, allow error terms and random effects to have correlated variability enabling repeated measures of the same individuals. The individuals were followed from before turning 13 until turning 20 in six-month intervals, resulting in

15 person periods per individual. The time-varying mental health variable 'Prescriptions' was individual mean centred, which constitutes using the individual mean for the time-varying variable as a control in the model. Hence, the variability around each individual's mean was modelled, thereby solving issues of unobserved heterogeneity and selection (Curran & Bauer, 2011).

The models were run separately for men and women, and included a variable controlling for time to account for the fact that the prevalence of teenage parenthood increases in later years. Intergenerational transmission of fertility was tested for both men and women using both the mother's and father's age at first child, and the model with the strongest effects was chosen, in order to provide the best control available while estimating the effect of mental health prescriptions and other social disadvantage measures. Variance influence factors (VIFs) were used to check for multicollinearity among the covariates. Sensitivity analyses were performed by calculating fixed effects models with the outcome *teenage pregnancy* and the time-varying variable *prescriptions.* The fixed effects models had comparable results, although the random effects models yielded more conservative coefficients. Moreover, the random effect models were calculated using increasing integration points up to 100 with stable coefficients.

Results

I ran separate random intercept logistic models for men and women to investigate whether mental health issues in youth are associated with later teenage motherhood and fatherhood. Model 1 contained: the variable *prescriptions* for measuring mental health issues, a mean-centring variable for *prescriptions*, and a time variable (not reported) accounting for the fact that most teenage births occur in later adolescent years. The models for women included 331,775 individual and the models for men 348,073 individuals. The prevalence of having at least one instance of prescriptions for psychotropic drugs were 7.94% for men and 10.67% for women, and the proportion of individuals becoming teenage parents were 0.5% of men and 1.54% of women. Background variables were added to model 2 to determine whether mental health issues was still significant in the presence of other types of social disadvantages and other known predictors of teenage parenthood, while at the same time, revealing if these factors were relevant for both teenage mothers and teenage fathers in this setting. Complete descriptive of all variables included in the models can be found in the appendix, table A1.

As table 1 illustrates, model 1 shows that mental health problems in youth lead to an almost three-fold increase in the odds of becoming a teenage father, and a 2.6-fold increase in the odds of becoming a teenage mother. After adding the other disadvantage variables and contextual background variables in model 2, the association remains and even grows stronger as factors such as patterns in intergenerational transmission of fertility, income, and the mother's education is included. The connection between mental health problems and teenage parenthood remains strong for both boys (OR = 3.68) and girls (OR = 5.12). Running a pooled model with both boys and girls (not shown) interacting gender and prescriptions reveals that mental health problems do indeed have a larger impact for women (CI95% OR 3.69 – 5.55 for prescriptions in reference to no prescriptions) than for men (CI95% OR 1.99 – 3.08 for prescriptions in reference to no prescriptions).

Table 1. Random intercept logistic models for teenage parenthood in girls and boys.

	Model 1 Men OR (CI 95%)	Model 2 n = 348,073 OR (CI 95%))	Model 1 Women OR (CI 95%))	Model 2 n = 331,775 OR (CI 95%))
Prescriptions	2.85*** (2.35 – 3.45)	3.68*** (2.06 – 6.56)	2.53*** (2.28 – 2.81)	5.12*** (3.60 – 7.30)
Fathers / Mothers age at first child				
Teenage parent		3.75*** (2.73 – 5.16)		2.57*** (2.29 – 2.89)
Young parent		1.31*** (1.18 – 1.45)		1.35*** (1.27– 1.44)
Later parent		Ref.		Ref.
Highest completed education, Mother				
9 years or less		3.18*** (2.70 – 3.74)		3.93*** (3.54 – 4.37)
Senior high school		1.76*** (1.53 – 2.02)		2.20*** (2.01 – 2.41)
Higher education		Ref.		Ref.
Highest completed education, Mother *x* Prescriptions				
9 years or less		0.96 (0.51 – 1.80)		0.58***(0.41– 0.83)
Senior high school		1.00 (0.57 – 1.75)		0.89 (0.66 – 1.19)
Higher education		Ref.		Ref.
Maternal income				
Quartile 1		2.37*** (1.98 – 2.84)		2.87*** (2.56 – 3.22)
Quartile 2		1.75*** (1.45 – 2.11)		1.98*** (1.76 – 2.23)
Quartile 3		1.43*** (1.18 – 1.74)		1.57*** (1.38 – 1.77)
Quartile 4		Ref.		Ref.
Maternal Income *x* Prescriptions				
Quartile 1		0.72 (0.38 - 1.34)		0.49***(0.35 – 0.68)
Quartile 2		0.67 (0.35 – 1.32)		0.64** (0.45 – 0.91)
Quartile 3		0.79 (0.39 – 1.57)		0.50***(0.34 – 0.73)
Quartile 4		Ref.		Ref.
Family form				
Two adult household		Ref.		Ref.
Step family		1.98*** (1.54 – 2.54)		2.31***(1.98 – 2.66)
Single adult household		2.31*** (1.85 – 2.88)		3.06***(2.71 – 3.46)
Divorce/separation		2.11*** (1.89 – 2.36)		2.42***(2.27 – 2.59)
Parent passed away		2.16*** (1.71 – 2.73)		2.80***(2.45 – 3.19)
Region				
Metropolitan		Ref.		Ref.
Bigger cities		1.35*** (1.18 – 1.54)		1.32***(1.22 – 1.42)
Smaller cities		1.38*** (1.18 – 1.60)		1.41***(1.29 – 1.54)
Semi-rural areas		1.65*** (1.35 – 2.03)		1.44***(1.27 – 1.63)
Rural areas		1.46*** (1.19 – 1.81)		1.62***(1.44 – 1.83)
Region of origin, Mother				
Scandinavia		Ref.		Ref.
Europe and West		1.43** (1.12 – 1.82)		0.96 (0.81 – 1.13)
Other		0.63*** (0.50 – 0.80)		0.63***(0.55 – 0.72)
AIC	28140.07	27231.31	72423.98	68662.70

Note: *p < .05. **p < .01 ***p < .001

Moreover, model 2 revealed a significant interaction between mental health-related prescriptions and mother's income for girls. This demonstrated that the association between mental health issues and becoming a teenage mother is stronger among girls from the highest income quartile, compared to all other income quartiles. No such statistical significant interactions were found for boys. The same pattern can be seen when interacting maternal education with prescriptions, with a larger impact among women from mothers with higher education compared to women whose mother had nine years or less of education. Again, this is only true for women, and no statistically significant differences were found in the impact of prescription on the probability of teenage parenthood in the different education categories for men.

Model 2 was intended to determine the remaining associations between teenage parenthood and other social disadvantages while controlling for mental health. This model demonstrated that low socioeconomic position, measured by low maternal education and income, increased the probability of teenage parenthood for both boys and girls, with education being a more important factor than income. Teenage parenthood was the least likely among children from homes with maternal tertiary education, followed by senior high school, with highest likelihood among nine years of schooling or less.

Additionally, teenage parenthood appeared less likely to occur within a traditional nuclear family setting. Individuals from all the family forms measured (single, divorced, step family, and parental loss), were more likely to become teenage parents than individuals from a stable two-adult household. The single parent household, either through divorce or parental loss, held the highest propensity for teenage births for both girls and boys.

The data showed that intergenerational transmission of fertility plays an important role for both boys and girls, although differences were evident. For boys, fathers' age at birth of first child had the strongest impact, whereas for girls, age at which her mother had her first child was strongest. If the parent had the first child as a teenager, the children were more likely to become teenage parents too, compared to parents who had their first child at a later age. Lastly, individuals living in less densely populated areas at age 13 were more likely to become teenage parents, suggesting that these different types of regions may assert different normative expectations about age at birth of first child. Furthermore, controlling for the birth country of the mother showed that second-generation immigrant youth from outside of European and Western contexts were less likely to become teenage parents than Scandinavian and European/Western descendants. This association was driven by second-generation immigrants from countries that all had substantive representation in the population, while at the same time having very low teenage parenthood rates. These were countries or regions such as Cyprus/Turkey, the former Yugoslavian republics, Syria/Lebanon/ Jordan/Palestine and Iran/Afghanistan/Pakistan/ Bangladesh.

Discussion

It has been argued that the relationship between mental health and teenage pregnancy might be explained by the connection of social disadvantage and mental health (Hall et al., 2014). However, my results show that mental health problems in youth function as an independent predictor of teenage parenthood, even after adjusting for other social disadvantage factors, in line with some previous research (e.g. Olsson, Hansson, & Cederblad, 2006; Barett et al., 2015; Kessler et al., 1997). In addition, my results expand on previous knowledge by showing that this is true for both boys and girls. Altogether, this illustrates that mental health problems, on their own, are an important area of research concerning the family patterns and life trajectories of young people.

The strength of the association between mental health and teenage parenthood could relate to feelings of fewer work and education opportunities, and hence low opportunity costs of early parenthood. The perception of fewer education and work opportunities might trigger an increased need for meaning, fulfilment and uncertainty reduction to be met through parenthood. Such perceptions could increase the value placed on children by youth with mental health problems as well as other types of social disadvantage.

Interestingly, mental health problems interacted with other social disadvantages in a manner unlike the one identified by Mollborn and Morningstar

(2009). They saw mental health problems becoming significant only within the low-income group. On the contrary, my results show that the association between mental health problems and teenage parenthood were even stronger among high-income girls and girls of homes with high maternal education levels. While Mollborn and Morningstar (2009) saw a cumulative disadvantage, i.e. when several disadvantages converge to become a risk factor, in their American study, this Swedish study divergence from the expected life course seemed to be a more influential risk factor. The combination of mental health problems and origins in a high income and education household might sharpen the contrast between the expected and anticipated educational and income trajectories. Parental class is shown to be a strong predictor for teenage educational and occupational aspirations (Baker et al., 2014; Schoon & Parsons, 2002; McCulloch, 2017). In turn, higher educational aspirations should lead to postponement of other central life course events, such as childbearing, since more years are needed in education, as argued by Crockett and Beal (2012). A sharp contrast between these normatively expected trajectories and the individual lived reality for these young women with mental health issues, could lead young women to choose parenthood as a means of reducing uncertainty to a greater extent.

In addition, analyses of the associations between teenage parenthood and social disadvantage, while controlling for mental health, revealed that low socioeconomic status, measured by low maternal education and income, increased the probability of teenage parenthood for both boys and girls. This finding aligns with persistent results from various environments over time (Väisanen & Murphy, 2014) that also demonstrate a stronger association between decreased probability of teenage parenthood and mother's education than between the former and mother's income. Education may be a better indicator of the cultural capital associated with transference of norms and values surrounding family, and may also imply that economic capital does not have as strong an influence on the shaping of family decisions.

Variables such as family form, age of parents at birth of first child and location also showed a persistent association with teenage parenthood, even in the presence of mental health measures. Living in an intact nuclear family seemed to decrease the chances of teenage parenthood, while having a parent who had their first child as a teenager increased it. Intergenerational transmission of fertility remained a pervading predictor of teenage parenthood, in line with previous research (Murphy & Wang, 2001; Sipsma et al., 2010; Wahn & Nissen, 2008). Interestingly, sex was a crucial factor of this predictor, as girls had the strongest association with their mother becoming a teenage parent, while for boys the age at birth of first child of fathers had the strongest impact.

A unique strength of this study is the inclusion of teenage fathers as well as teenage mothers. Far less data on the health and background of teenage fathers is available, which may partly be due to low prevalence and recruitment challenges. Attempts to include teenage fathers in studies of the precursors and consequences of young parenthood are essential. The increased participation of men in family life has been dubbed the second part of the gender revolution (Goldscheider, Bernhardt, & Lappegård, 2015). Fulfilling the desire to encourage parental equality, with fathers taking an active part of their children's lives, requires knowledge about both mothers and fathers.

A limitation of this study is the measure used to denote mental health problems. The data from the drugs register provided rich and comprehensive information about drugs prescribed for mental health issues, and prescription data has previously been utilised as proxies for somatic health issues (e.g. Baranowska-Rataj, DeLuna & Ivarsson, 2016) as well as mental health issues (e.g. Brännlund, Strandh & Nilsson, 2017; Norström, Lindberg & Månsdotter, 2012). However, the youth in this study who were categorised as having had mental health problems were only those who sought treatment, and were prescribed psychotropic drugs. This does not capture individuals who are referred to psychologists (without receiving prescription medication), or individuals who do not seek treatment at all. Both the groups who did not seek support from the healthcare system and those referred to psychological treatments might differ from the group with mental health problems treated through pharmacology. However, Sweden has seen an overall increase of the prescription of psychotropic drugs for both issues such as depression, anxiety and sleeping problems and ADHD over the last decade (The National Board for

Health and Welfare, 2017). Still, it is important to remember that this measure is a proxy for certain types of serious mental health issues demanding medication. Moreover, this study does not have the possibility to capture what type of mental health issues the prescriptions targets, which would be an interesting venue for further research.

The results presented here have implications for both policy and professionals. An awareness of the association between mental health problems (and other types of social disadvantages) and teenage parenthood informs the professional that teenage parents constitute a group at risk of later adverse outcomes for both parent and child. This knowledge can be used to better identify individuals with special support needs. However, young parenthood is not necessarily negative. Even so, age is readily available information that might indicate a heightened probability of mental health problems, which, in turn, might present additional challenges for both parent and child.

It is critical not to assume that mental health problems are present in all teenage parents. In reality, most children of young parents do not experience adverse outcomes (Shaw, Lawlor, & Najman, 2006). Young parenthood breaks the normative expectations of fertility behaviour, and young mothers in particular have expressed feelings of stigmatisation by society as one of the hardest challenges of parenthood (Wahn, Nissen, & Ahlberg, 2005). Teenage parents might experience others' assumption of the presence of mental health problems or adverse family backgrounds as further stigmatisation. These issues require careful consideration by the professional.

Activities aimed at increasing the perceived life opportunities of youth and giving significance to life may be considered as means of preventing teenage parenthood through policy. This study suggests that such activities could be extended to include teenagers with mental health problems. However, prevention of teenage parenthood should not be the sole focus of these activities. If policymakers fear that teenage parenthood will lead to decreased life opportunities and negative health outcomes for both parent and child via pathways of social disadvantage, then policy should target facilitation of restarting and completion of education. This point has already been argued by Lawlor and Shaw (2002).

Lastly, future research should concentrate on elucidating the motivations of teenage parents today, and on the ways in which policy can facilitate creation and maintenance of positive lifelong outcomes for the parents themselves and for their children.

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Appendix

Table A1. Descriptive statistics of study variables

Variable	Men, n 348,073 % (n)	Women, n 331,775 % (n)
Teenage parents	0.50 (1740)	1.54 (5109)
Prescriptions	7.94 (27637)	10.67 (35412)
Mothers age at first child		
Teenage parent	2.49 (8655)	2.51 (8315)
Young parent	46.61 (162224)	46.58 (154554)
Older parent	50.91 (177194)	50.91 (168906)
Fathers age at first child		
Teenage parent	0.54 (1888)	0.55 (1824)
Young parent	44.74 (155715)	44.50 (147643)
Older parent	54.72 (190470)	54.47 (180721)
Highest education of mother		
9 years or less	11.23 (39088)	11.23 (37273)
High school (Gymnasium)	57.83 (201299)	57.85 (191924)
Higher education	30.94 (107686)	30.92 (102578)
Family form		
Stably two adults	60.01 (209176)	59.59 (197709)
Stably single	3.19 (11103)	3.43 (11411)
Diseased, one or two	3.06 (10640)	3.11 (10324)
Family disruption	30.73 (106987)	30.95 (102668)
Family merger	2.92 (10167)	2.91 (9663)
Regions		
Metropolitan	28.94 (100736)	28.89 (95851)
Bigger cities	38.86 (135255)	38.91 (129078)
Smaller cities	19.36 (67391)	19.45 (64517)
Semi-rural areas	6.30 (21939)	6.26 (20756)
Rural areas	6.56 (22752)	6.50 (21573)
Earned income of mother		
Quartile 1	0 – 146163	0 – 146163
Quartile 2	146163 – 188861	146163 – 188861
Quartile 3	188861 – 236685	188861 – 236685
Quartile 4	236685 – 7471743	236685 – 7471743
Birth country of Mother		
Scandinavia	90.59 (315324)	90.62 (300646)
Europe and West	3.29 (11450)	3.37 (11180)
Other	6.12 (21297)	6.01 (19947)

Examining life course trajectories of lesbian, gay and bisexual people in England – exploring convergence and divergence among a heterogeneous population of older people

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Abstract

Because of limitations in collecting sexuality data, there are very few studies that quantitatively explore the life courses of lesbian, gay, bisexual (LGB) individuals. Likewise it is rare that normative patterns of life course trajectories are assessed in terms of their applicability to LGB individuals. We review the current literature on LGB life course trajectories and discuss potential reasons for gaps in the literature. We explore approaches for defining LGB status. We use data from a cohort of people aged 50 and over (English Longitudinal Study of Ageing) to explore the tempo and occurrences of transitions to adulthood and to older age, and establish some of the differences based on sexual orientation. We examine the connecting health behaviours and life course turning points that may explain some of the differences described above. We show that while the first quartile of transitions to adulthood are experienced fairly uniformly by sexual orientation, differences open up thereafter. LGB people's life course trajectories are marked by different patterns of care, with LGB people less likely to provide care in the form of parenthood, but potentially more likely to provide care earlier to close friends or relatives. Analyses of connecting events suggest that LGB life course trajectories may be marred by higher levels of volatility, including higher risk financial hardship. Caveats to these results are outlined in full in the paper.

Keywords

LGB; life course; ageing; adulthood

Introduction

The life course approach was developed to explore normative trajectories, which can then be used to contrast different patterns of development by individual characteristics. This approach has been used to establish the similarities and differences in trajectories by gender, socioeconomic status (SES), ethnicity and many other characteristics. Because of limitations in reporting of sexuality and other issues, there are very few studies that quantitatively model the life courses of LGB individuals. Likewise it is rare for normative transition markers to be evaluated in terms of their applicability to LGB individuals. Here, we aim to contribute to plugging this evidence gap through exploring descriptive accounts of a cohort of people aged 50 and over and their experiences of transitions to adulthood and to older age, and to explore some of the differences based on sexual orientation. We also examine some of the connecting health behaviours and life course turning points that may explain differences in the transitions described above. The LGB acronym covers a heterogeneous spectrum of people and each of the broad groups within the LGB spectrum may share some commonalities in experience; although conversely may differ from one another due to the impact of cumulative advantage and disadvantage (Dannefer, 2003), as well as psychological stress resulting from differential exposure to homophobic or heteronormative treatment (minority stress; (Meyer, 1995)). Any reductive technique – as is the case for almost all results from quantitative research – will underestimate heterogeneity in experience and need. Nevertheless, identifying some common or dominant experiences does provide a starting point for identifying areas for future research. For analytical reasons, in this paper we focus on LGB people although do recognise that transgender people are also likely to experience different life course trajectories, and posit that within this broad category there will exist a plurality of experience.

We begin by considering the current literature on how life course transitions (transitions to adulthood, transitions to ageing, and other life course events) have been applied to LGB life course trajectories. This is followed by a discussion of our methods, including a description of the ELSA (English Longitudinal Study of Ageing) dataset, an explanation of the derivation of variables including LGB status and a description of the modelling of the Kaplan Meier survival curves and accelerated failure time models for life course events. We finish with a discussion of the three key findings – LGB differences in terms of parenthood, caring and sexual assault), the limitations of the study, and a suggestion for future directions in methods for LGB life course research.

Background

Life course events

Transitions to adulthood

Research on transitions to adulthood has focused on studying the timing and context of experiencing the 'big five' transitions to adulthood, which have notionally included: "leaving school, starting a full-time job, leaving the home of origin, getting married, and becoming a parent for the first time" (Shanahan, 2000, p667). While the exact definition of these transitions has changed across studies, and has tended towards broader status characteristics around leaving education, entering paid employment, independent living, and stepping into family formation and parenthood (Schoon, Chen, Kneale, & Jager, 2012; Schulenberg & Schoon, 2012), the substantive nature of these transition markers has remained remarkably constant and they have been used to examine transitions across diverse populations.

Developmental theories of the transition to adulthood have recently speculated on the emergence of a defined period between the ages of 18 and 25 years, where young people explore different social roles, which can be non-normative and temporary, before acquiring some of the more enduring responsibilities of young and later adulthood (Arnett, 2000). Since then, others have questioned the equity of different social groups' experiences of this period of role exploration (Bynner, 2005), and a number of these markers of adulthood individually have been associated with considerable degrees of socioeconomic polarisation in the UK (Kneale & Joshi, 2010; Lupton et al., 2009; Sigle, 2016) and beyond (Rindfuss, Morgan, & Offutt, 1996; Rogan & Reynolds, 2015). Studies taking a more person-centred approach have also confirmed that those from more disadvantaged backgrounds are likely to have completed a number of transitions to adulthood in rapid succession precociously compared to more advantaged peers (for example Schoon et al., 2012), while gender is

also identified as a prime antecedent of different transition patterns (Bynner, 2005; Schulenberg & Schoon, 2012). Other characteristics, both innate and structural, such as ethnicity, have also been investigated (Arnett, 2003; Bynner, 2005) and such research has prompted critical discourse around variations in the meaning of adulthood across different groups (Arnett, 2003). Others have been critical of the way in which transition patterns that are dominant within minority groups have nevertheless been considered deviant due to their divergence from patterns observed among majority groups (Geronimus, 2003, 2004). In the case of other minority groups, and particularly the group in focus in this paper – LGB people – less is understood about how the transition across these 'big five' markers of adulthood varies compared to heterosexual peers. This means that critique and debate around how and when groups differentiated by sexual orientation experience transition to adulthood using these markers, and the appropriateness of the markers themselves, is underdeveloped.

Life course turning points and connecting events to older age

In many ways, we are still at the cusp of understanding whether LGB lives follow trajectories of divergence or convergence compared to their non-LGB peers. Nevertheless, some common themes have emerged in the extant literature that suggest potentially divergent life course trajectories may emerge early on through LGB people's greater risk of experiencing difficulties in their relationships. US data suggests that non-heterosexual young people receive less parental support during the (chronological) period of transitioning to adulthood than their heterosexual peers (Needham & Austin, 2010). This lower level of parental support is also found to explain health disparities occurring early on in life such as increased risks of depressive symptomology and substance abuse (Needham & Austin, 2010). Other social relationships may also be vulnerable to strain, and LGB people experience substantially higher levels of bullying than non-LGB people, as well as lower levels of life satisfaction during teenage years (Henderson, 2015). This latter study supports the minority stress hypothesis, which states that identifying as a minority group, or having this identity ascribed by others, can lead to unequal treatment. This may result in psychological stress, manifested through higher incidence of mental health problems, including depression and anxiety (Lehavot & Simoni, 2011; Meyer, 1995, 2003), and higher incidence of linked outcomes, including suicide, substance abuse and affective disorders (Meyer, 2003). In later adulthood, these unequal starts may continue through into different ageing 'processes' among LGBT people (for example Harrison, 2006), and may also help to explain why and how LGB people enter into older ages with different levels of 'capital'. Previous studies have found that LGB people experience ageing with different forms of social capital, being much more likely at age 50 to be single and to have experienced multiple cohabiting relationships of shorter duration than non-LGBT people, a potential reflection of inadequate support services and societal hostility towards same-sex relationships over their earlier life course (Kneale, Sholl, Sherwood, & Faulkner, 2014; Meyer, 2003). Different levels of social capital are one factor that places LGB adults at greater risk of negative physical and mental health conditions (Fredriksen-Goldsen et al., 2013). UK data also suggests that LGB people of all ages may have greater levels of income and wealth instability, with gay men and bisexual women being much more likely to be in receipt of means tested benefits (Uhrig, 2015) and in later life may be less able to draw upon property wealth as a source of income during retirement (Kneale, 2016).

However, many open questions remain in terms of our understanding of normative LGB life course patterns during adulthood (Furstenberg, 2010). Many key life course events may be significant both in their own right and in terms of how they influence the transition to adulthood and beyond, and some of these may be more pertinent than the standard measures when considering how LGB trajectories differ from the heterosexual norms. Experience of societal hostility and inequality in opportunities may be associated with life course volatility as exhibited by higher exposure to risky behaviours, encountering more dangerous situations, including exposure to physical and sexual violence, and more challenging circumstances, such as poor health or financial hardship; these in turn may see LGB people reach older age with systematically different levels of acquired advantage and disadvantage.

Transition to older age

In addition to the transitions to adulthood described above, it is unclear whether LGB

individuals fit into the normative patterns of transitions to older age. Biological markers of ageing can be pronounced and revolve around the extent of diminution of functional capability (Kuh & NDAP Network, 2007). The social markers of transitions to older age are less defined but may include retirement (Kim & Moen, 2002), assumption of caring responsibilities (Hughes, Waite, LaPierre, & Luo, 2007; Utz, Carr, Nesse, & Wortman, 2002), changes in marital status (and particularly experiencing widowhood) (Chudacoff & Hareven, 1979), as well as experiences of serious ill-health or infirmity and the development of care needs (French & Steele, 2015; Settersten Jr & Mayer, 1997). Although the very notion of such transition markers of ageing has been criticised because such named events are often negative and are assumed to be additive in nature (Settersten Jr & Mayer, 1997), a similar situation prevails as above where the literature exploring whether, how and why LGB ageing patterns differ is underdeveloped. This has led to older LGB people being characterised as societally invisible and consequently being underserved by formal systems of support (Fredriksen-Goldsen & Muraco, 2010).

Where LGB experiences of older age have been considered, many suggest that older LGBT people's experience of ageing is marred by some of the same discrimination observed in younger years (Addis, Davies, Greene, MacBride-Stewart, & Shepherd, 2009). Greater contact with care providers through institutional or domiciliary care can be particularly stressful for older LGBT people who may come into contact with heteronormative or homophobic attitudes and behaviours among care providers or other care recipients (Addis et al., 2009; Musingarimi, 2008; Phillips & Marks, 2008). However, while there are many who emphasise disproportionately negative circumstance in older age for LGB people (Green, 2016; Musingarimi, 2008; Potter, Bamford, & Kneale, 2011), others emphasise the diversity of experiences (Hammack & Cohler, 2011; Muraco & Fredriksen-Goldsen, 2016). Nevertheless, gaps remain in the body of evidence and many studies that aim to take a life course approach are based on narrative accounts collected among LGB people, as opposed to studies that offer comparative analyses. Therefore, while some of the evidence above suggests that LGB people may be at risk of unequal starts in life as well as disorganised patterns of ageing, there has been little extant research exploring how LGB trajectories may differ across the big five markers of transition to adulthood and how potential inequalities persist into older age.

Methods and data

Data

There are now a growing number of data sources that allow researchers to identify sexuality. However, the English Longitudinal Study of Ageing (ELSA) was one of the first to measure older people's lifetime same-sex experiences and desires (Steptoe, Breeze, Banks, & Nazroo, 2013)[1]. ELSA is a longitudinal study focused on older people aged 50 and over and is the prime source of quantitative insights into the ageing process in the UK. The study originally recruited around 12,000 respondents, with the first full wave of data collection occurring in 2002; since then, the panel has been replenished three times to maintain representation of younger age groups (50–55), so that in 2012, in the sixth wave of data collection, data were collected from 9,169 core study members. This sweep included data on sexual relationships and activities from a total of 6,201 respondents. The data in this paper also draw upon a life course history module that was fielded in wave 3 (2006), with data collected from 7,855 individuals. Much of these data were collected through computer-aided personal interviews, although some questions were completed through a 'life grid'. Collecting retrospective data in this way does introduce the risk of measurement error in terms of participants' ability to accurately recall past events (recall bias) compared with a more prospective design. However, there is little reason to suspect that this potential error would be distributed unevenly across LGB and non-LGB people.

Identifying LGB older people in ELSA

The ELSA questionnaire asked respondents to describe their same and opposite sex attraction and separately their sexual experiences during their lifetime. Respondents were given the option of reporting lifetime desires or experiences that were either (1) exclusively for/with the opposite sex; (2) mainly for/with the opposite sex with some for/with the same sex; (3) equally for/with the opposite and same sex; (4) mainly for/with the same sex with some for/with the opposite sex; (5) exclusively for the same sex; in addition to (6), a no desire/experience category[2]. Of those with any

sexual experience, 94.9% of men and 96.7% of women reported exclusively heterosexual sexual experiences over their lifetime; in comparison, of those who reported any sexual desires over their lifetime, 94.6% of men and 93.5% of women reported exclusively heterosexual attraction (estimates not restricted to those with life course history data). Measures of sexuality over the life course provide unique insight but also raise several challenges in these data. Firstly, the sampling strategy employed in creating the ELSA study did not oversample LGB people (or other minority populations such as ethnic minorities (Lee, Nazroo, O'Connor, Blake, & Pendleton, 2015)), and regardless of the derivation strategy chosen to identify potential LGB respondents, the relatively small sample does impinge on generalisability to the wider older LGB population. Secondly, the inclusion of a 'lifetime' indicator means that in addition to increasing the potential for recall error, we are also unable to identify when same or opposite sex behaviour took place.

In this study we examine differences between 'heterosexual' respondents (referred to as non-LGB from this point onwards) and a combined category that includes 'lesbian, gay and bisexual' respondents (referred to as LGB from this point onwards). The 'LGB' category is formed of those respondents who report mainly and exclusively same-sex experiences or attraction and those respondents who report experience or attraction equally to the opposite and same sex over their lifetime. In addition, to account for those respondents with same-sex experiences that may only have occurred later in life, we also include those respondents with 'some' same-sex experience in our LGB category; this approach means that we do not include respondents who report some same-sex attraction at some point in their life time (and no experience) as being LGB. The small sample of LGB older people we identify precludes exploration within the LGB spectrum. The data collected allow for a plurality of potential approaches that could be taken in defining individuals as LGB, which are explored elsewhere (see supplementary materials and discussion further in the paper).

Deriving measures of life course experiences, covariates and analytical sample

In this study we examine transitions to adulthood using the 'five big markers' of adulthood (first parenthood, cohabiting partnership, paid employment, exits out of the parental home and out of full-time education). Some logical inconsistencies were observed in these variables, for example first births occurring during infancy, and cases with these logical inconsistencies were dropped[3]. We also examined life course turning events through exploring the age at which respondents reported first being exposed to risky or harmful situations. These reflected both socioeconomic risk (first experience of financial hardship), risky health behaviour (age first smoked on a daily basis), and other traumatic events (age at which respondents experienced physical assault and sexual assault (including harassment and rape)). Finally, in examining ageing transitions, we derived variables reflecting the age at which respondents reported first experiencing a serious illness or disability, and the age at which they first provided care to a close friend or family member. We also derived a variable reflecting age at retirement based on reports collected from waves 1–6. In keeping with the descriptive, theory-generating, account presented here, we do not introduce a number of covariates that may explain our results. In addition to our main covariate of interest – LGB status – we only introduce age group and gender as potential confounding variables.

Modelling strategy

First we examine the age at which the first 25% and 50% of respondents experienced life course events by LGB status, using Kaplan–Meier product-limit estimate of the survivor function (Kaplan & Meier, 1958). We develop these analyses further through constructing regression models to account for age and gender as potential confounders. Cox's Proportional Hazards specifications were rejected because we did not have support for the proportional hazards assumption. After exploring the shape of the hazard (of experiencing the event), we then tested a number of the accelerated failure time model specifications, using information criterion and Cox-Snell residuals to evaluate overall model fit (Jenkins, 2005). We found that the log-logistic specification provided the best fit, and in some cases provided the only possible fit. For consistency, this specification was used in all regression models.

Missing data and consequent restricted sample size was problematic in these analyses. The number of LGB participants identified was affected by three

factors. Firstly, not all respondents at wave 6 were present at wave 3 due to wave non-response and replenishment of the ELSA sample since wave 3; and many of those present at wave 3 had attritted by wave 6 (either temporarily or permanently, including respondents who had died). Secondly, both the life course history and sexual behaviour modules achieved substantially lower response rates than for their respective waves as a whole. Thirdly, there were item non-response and logical inconsistencies. Despite missingness and attrition being substantial challenges, and representing caveats to the findings presented, we do not impute missing values, primarily because it is likely that this missingness is not at random. Furthermore, sensitivity analyses suggested that where data was observed at wave 6 but not wave 3 in our analyses, this was not patterned by LGB status. To boost the power of our analyses, in analysing ageing transitions and life course turning events we allow the analytical sample to vary across models.

Results

Our results begin by examining frequencies for life course events by sexual orientation (table 1). We firstly discuss the markers of transition to adulthood (left education and entered labour marker, left parental home, cohabiting partnerships, parenthood), followed by other key turning points (daily smoking, financial hardship, physical assault, sexual assault) and finally markers of ageing (retirement, development of serious illness or disease, provided care for relative or close friend). We then show how the tempo of experiencing the big five markers of transition to adulthood differs by sexual orientation (table 2), and examine whether those differences are robust to the impact of age group and gender (table 3). We then consider how the timing of the four life course turning points (physical assault, sexual assault, severe financial hardship, daily smoking) differs by sexual orientation (table 4). Finally, we consider the tempo of markers of reaching older age (retirement, development of serious illness or disease, providing care for relative or close friend) (table 5) and whether patterns by sexual orientation remain significant once we control for age and gender (table 6).

Life course events occurrence by sexual orientation

Examining the breakdown by sexual orientation of major markers of transition to adulthood (table 1), shows that by the age of 50 LGB people and non-LGB people are equally likely to have experienced almost all of these transitions. The exception to this rule is parenthood, which is more frequently experienced among heterosexual people. However over 70% of those identified as LGB have nevertheless experienced parenthood by the age of 50, suggesting that even this marker of family formation holds considerable salience for older LGB people. Most markers of older age are also experienced uniformly, with retirement and the development of a serious illness or disease being experienced as frequently among LGB as non-LGB people aged 50 and over. This suggests that there are some similarities among the life course trajectories of LGB and non-LGB people, although we do find that LGB people are more likely to provide care for close friend or relative than non-LGB people. Examining life course turning points and health events, shows greater differences by sexual orientation than observed for the measures of transitions to adulthood and ageing above. The proportions experiencing physical assault are not significantly different for LGB and non-LGB. However, there are indications that LGB people are more likely to reach older age having experienced traumatic events including severe financial hardship (17.4% among non-LGB compared to 24.6% among LGB people) and sexual assault (6.0% among non-LGB compared to 11.8% among LGB people).

Table 1: Descriptive statistics displaying sample size, demographic characteristics and experiences of transition markers by LGB status: weighted percentages and Ns (unweighted obs in parentheses). All data weighted by wave 6 weights and standard errors account for sample design.

		Heterosexual	Lesbian, gay or bisexual	Total
Background characteristics				
Age group (in 2006)	**Under 65**	55.3	66.4	55.7
	65–75	26.1	23.5	26.0
	75+	18.6	10.2	18.3
	Total (%)	100.0	100.0	100.0
	Weighted N	2942.4	126.8	3069.2
	Observations	(3488)	(159)	(3647)
	P	0.027		
Gender	**Male**	46.3	48.9	46.4
	Female	53.7	51.1	53.6
	Total (%)	100.0	100.0	100.0
	Weighted N	2942.4	126.8	3069.2
	Observations	(3488)	(159)	(3647)
	P	0.578		
Markers of transition to adulthood				
Parenthood status	**Childless**	9.5	28.7	10.3
	Parent	90.5	71.3	89.7
	Total (%)	100.0	100.0	100.0
	Weighted N	2942.4	126.8	3069.2
	Observations	(3488)	(159)	(3647)
	P	<0.001		
Ever cohabited	**No**	3.0	5.0	3.1
	Yes	97.0	95.0	96.9
	Total (%)	100.0	100.0	100.0
	Weighted N	2942.4	126.8	3069.2
	Observations	(3488)	(159)	(3647)
	P	0.142		
Ever been employed	**No**	0.2	0.8	0.2
	Yes	99.8	99.2	99.8
	Total (%)	100.0	100.0	100.0
	Weighted N	2942.4	126.8	3069.2
	Observations	(3488)	(159)	(3647)
	P	0.237		
Ever left parental home	**No**	1.1	0.5	1.0
	Yes	98.9	99.5	99.0
	Total (%)	100.0	100.0	100.0
	Weighted N	2942.4	126.8	3069.2
	Observations	(3488)	(159)	(3647)
	P	0.490		

Table 1: Cont.

Health trajectories and life course turning events				
Ever been sexually assaulted (incl. rape and harassment)	**No**	94.0	88.2	93.8
	Yes	6.0	11.8	6.2
	Total (%)	100.0	100.0	100.0
	Weighted N	2573.7	105.8	2679.5
	Observations	(3056)	(136)	(3192)
	P	0.007		
Ever been physically assaulted	**No**	6.6	6.9	6.7
	Yes	93.4	93.1	93.3
	Total (%)	100.0	100.0	100.0
	Weighted N	2576.4	104.8	2681.2
	Observations	(3057)	(135)	(3192)
	P	0.904		
Ever experienced financial hardship	**No**	82.6	75.4	82.3
	Yes	17.4	24.6	17.7
	Total (%)	100.0	100.0	100.0
	Weighted N	2457.3	102.5	2559.8
	Observations	(2927)	(132)	(3059)
	P	0.072		
Ever been a daily smoker	**No**	40.2	41.8	40.3
	Yes	59.8	58.2	59.7
	Total (%)	100.0	100.0	100.0
	Weighted N	2856.0	121.3	2977.4
	Observations	(3381)	(152)	(3533)
	P	0.714		
Markers of transition to older age				
Ever experienced serious illness or accident	**No**	75.2	78.8	75.4
	Yes	24.8	21.2	24.6
	Total (%)	100.0	100.0	100.0
	Weighted N	2515.6	105.8	2621.4
	Observations	(2989)	(136)	(3125)
	P	0.413		
Ever retired (by 2012)	**No**	15.2	16.3	15.2
	Yes	84.8	83.7	84.8
	Total (%)	100.0	100.0	100.0
	Weighted N	2491.9	99.3	2591.2
	Observations	(2992)	(129)	(3121)
	P	0.741		
Ever provided care for close friend or relative	**No**	79.8	70.2	79.5
	Yes	20.2	29.8	20.5
	Total (%)	100.0	100.0	100.0
	Weighted N	2489.2	100.1	2589.3
	Observations	(2960)	(129)	(3089)
	P	0.024		

Timing of transitions to adulthood

Results from Kaplan-Meier survival curves show that the age at which the first quartile of heterosexual and LGB people experience the 'big five' transitions to adulthood is almost identical (table 2). This consistency holds for the median age for heterosexual and LGB people for age at first cohabitation (23 years), age on leaving the parental home (heterosexual 22, LGB 21 years), age on leaving full-time education (15 years) and age on entry to the labour market (15 years). However, the median age at first parenthood occurs three years later for LGB people at 29 years compared to heterosexual people (26 years). Later entry to parenthood is also confirmed in table 3 when accounting for age and gender as potential confounders, with a time ratio of 1.13 observed for LGB people compared to heterosexual people. While this is a statistically significant difference, the result nevertheless suggests that family formation is a frequently occurring transition experience for many LGB people.

Table 2: Age at first quartile/median age of experiencing five transitions to adulthood by sexual orientation (years)

	Heterosexual		**Lesbian, gay or bisexual**	
	First quartile	Median	First quartile	Median
Age at first parenthood	23	26	23	29
Age at first cohabiting partnership	21	23	20	23
Age on leaving parental home	19	22	19	21
Age left full-time education	15	16	15	16
Age entered labour market	15	16	15	16
N (obs)/ N (weighted)	3488 *(2942.4)*		159 *(126.8)*	

Table 3: Time ratios from log-logistic accelerated failure time models for transitions to adulthood

	Age at first parenthood		Age at first cohabiting relationship		Age at first employment		Age left education		Age left parental home	
Sexual orientation (base: heterosexual)										
	Un-adjusted	Adjusted	Un-adjusted	Adjusted	Un-adjusted	Adjusted	Un-adjusted	Adjusted	Un-adjusted	Adjusted
Lesbian, Gay or Bisexual	1.126*	1.130**	1.011	1.014	1.030*	1.022	1.031*	1.022	0.972	0.981
	(0.047)	(0.047)	(0.021)	(0.019)	(0.012)	(0.011)	(0.012)	(0.011)	(0.019)	(0.017)
Gender (base: Male)										
Female		0.890***		0.901***		0.994		0.994		0.952***
		(0.008)		(0.006)		(0.003)		(0.003)		(0.007)
Age group (base: 50–64)										
65-74 years		0.992		1.029***		0.971***		0.971***		1.049***
		(0.011)		(0.007)		(0.004)		(0.004)		(0.008)
75+ years		1.052***		1.063***		0.912***		0.910***		1.086***
		(0.015)		(0.010)		(0.006)		(0.006)		(0.012)
N (obs)	3647	3647	3647	3647	3647	3647	3647	3647	3647	3647

Exponentiated coefficients (Time ratios: values over one indicate a slower transition to the event; standard error of unexponentiated coefficients in parentheses)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Health trajectories and life course turning points

Earlier results suggested that many of the transitions to adulthood and ageing were experienced at similar points among LGB and heterosexual people; table 4 examines life course events that occur between transitions to adulthood and older age. In the unadjusted models, we found that LGB people had an increased risk of experiencing severe financial hardship at earlier age (borderline statistically significant; p=0.06), though this effect attenuated once we control for age and gender. However, the magnitude of the coefficient, which showed a substantial difference, changed very little; this could suggest in a larger sample this apparent difference may be robust to other factors. LGB people's risk of sexual assault (including harassment and rape) remained much higher and occurred earlier in the life course than for non-LGB people, even after accounting for age and gender. Kaplan-Meier survival curves (shown in supplement), find that by the age of 15, 5% of LGB people reported experiencing sexual assault and by the age of 23, 10% did so; by age 24 years, 5% of heterosexual people had experienced sexual assault and the point at which 10% experienced assault was not observed in these data. The risk of physical assault was not statistically different for LGB individuals, similarly no differences were observed in the risk of becoming a daily smoker, despite population-level studies suggesting LGB adults are at greater risk of smoking than non-LGB people (Gruskin, Greenwood, Matevia, Pollack, & Bye, 2007).

Table 4: Time ratios from log-logistic accelerated failure time models for markers of life course turning points

	Age at first sexual assault		Age at first physical assault		Age at first experience of severe financial hardship		Age first smoked on a daily basis	
Sexual orientation (base: heterosexual)								
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Lesbian, Gay or Bisexual	0.349**	0.426*	0.923	1.003	0.696	0.754	1.057	1.073
	(0.385)	(0.364)	(0.134)	(0.092)	(0.194)	(0.186)	(0.124)	(0.120)
Gender (base: Male)								
Female		0.209***		1.100**		0.879		1.485***
		(0.236)		(0.034)		(0.084)		(0.045)
Age group (base: 50–64)								
65–74 years		3.923***		1.547***		1.444***		1.104
		(0.239)		(0.067)		(0.102)		(0.053)
75+ years		8.315***		1.909***		1.877***		1.016
		(0.393)		(0.096)		(0.150)		(0.075)
N (obs)	3192	3192	3196	3196	3059	3059	3533	3533

Exponentiated coefficients (Time ratios: values over one indicate a slower transition to the event; standard error of unexponentiated coefficients in parentheses)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Timing of 'ageing' life course events

We see that LGB people retire earlier than non-LGB people, with the age first quartile occurring two years earlier at 56 years for LGB people compared with 58 years for heterosexual. However, these differences do not remain when we consider the median age of first occurrence or when we control for differences in the age and gender profile (tables 5 and 6). We see similar ages for first incidence of experiencing a serious illness or accident. However we see that experiences of ill-health disproportionately featured in the ageing trajectories of LGB people due to earlier experiences of providing care. The age at which the first quartile of LGB people started to provide care for a relative or close friend occurred 21 years earlier, at 54 years, than for heterosexual people (75 years). This difference remained after accounting for sample differences in age and gender, so that the times before which LGB people became carers were approximately 20% shorter than among non-LGB people (table 6).

Table 5: Age at first quartile/median age of experiencing retirement transitions by sexual orientation (years)

	Heterosexual		Lesbian, gay or bisexual	
	First quartile	**Median**	**First quartile**	**Median**
Age at first serious illness or accident	68	-	67	-
N (obs)/ N (weighted)	2989 *(2516)*		136 *(105.8)*	
Age at retirement	58	60	56	60
N (obs)/ N (weighted)	2992 *(2492)*		129 *(99.3)*	
Age first provided care for relative or close friend	75	-	54	-
N (obs)/ N (weighted)	2960 *(2489)*		129 *(100.1)*	

Where '-' indicates that percentile does not experience the event.

Table 6: Time ratios from log-logistic accelerated failure time models for transitions to older age

	Age at first serious illness		Age at retirement		Age first provided care to a relative or close friend	
Sexual orientation (base: heterosexual)						
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Lesbian, Gay or Bisexual	1.181	1.217	0.986	0.987	0.788**	0.806**
	(0.235)	(0.230)	(0.011)	(0.011)	(0.081)	(0.078)
Gender (base: Male)						
Female		1.370***		0.962***		0.774***
		(0.086)		(0.003)		(0.036)
Age group (base: 50–64)						
65–74 years		1.031		1.003		1.134***
		(0.094)		(0.004)		(0.038)
75+ years		1.105		1.014*		1.212***
		(0.130)		(0.005)		(0.051)
N (obs)	3125	3125	3121	3121	3089	3089

Exponentiated coefficients (Time ratios: values over one indicate a slower transition to the event; standard error of unexponentiated coefficients in parentheses)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Alternative definitions of LGB

We conducted sensitivity analyses exploring the impact of using alternative definitions LGB status (see supplementary material for details) on those variables where being LGB patterned the frequency or tempo of transitions experienced. Alternative definitions showed LGB people as having similar experiences in terms of later/lower levels of parenthood and earlier/increased risks of sexual assault and financial hardship, and an earlier age of providing care for friends or family. However, for both alternative definitions, differences from heterosexuals did not remain statistically significant when age and gender covariates were added in the models for sexual assault, financial hardship and provision of care (see supplementary material). In the case of experiences of sexual assault and financial hardship, the magnitude of the coefficients suggested some differences, although the models may have been underpowered, particularly to explore interaction effects. In the case of provision of care, the magnitude of coefficients also attenuated with adjustment for covariates.

Differences in transitions to parenthood remain robust to alternative definitions of LGB status and alternative categorisations of sexuality also reveal differences in the tempo of experiencing financial hardship and sexual assault by sexual orientation, but these differences do not remain statistically significant in adjusted models. Descriptive analyses using Kaplan-Meier survival curves, disaggregated by gender or age cohort with alternative measures of sexuality also demonstrate that LGB people experience lower and later parenthood. They also show that particular LGB groups experience earlier and more frequent experiences of sexual assault, provision of care, and financial hardship (see supplement). However, these charts also suggest that interaction terms might better capture this variation or intersectionality, which the analytical sample sizes included in these models do not support.

Differences between the analyses that form the mainstay of this study and those in the sensitivity analyses are driven by classification choice of a small group of individuals who have experienced

some same-sex activity, but report exclusively opposite sex desires across the life course. In the main analyses included here (table 2 onwards) this group are classified as LGB, but are classified in the definitions used in the sensitivity analyses as non-LGB. Among those with information on transitions to adulthood, this group includes 47 individuals (weighted down to 36), 37% of whom are women and 89% were aged 50–64 years. Despite the gender imbalance towards men, it was females in this group who reported noticeably high levels of sexual assault (39% vs 14%), provision of care (63% vs 33%), and financial hardship (37% vs 31%). Based on these analyses, individuals who have experienced same-sex contact, but not same-sex desire, appear particularly vulnerable to some of the adverse transitions explored here, particularly among women, albeit with caveats around the extremely small sample sizes. We are unable to comment whether the same-sex experience, which in this case is reported as being unaccompanied by desire, is consensual or non-consensual. Elsewhere, other studies have speculated that some older people reporting early same-sex experience that was not carried through into later adulthood may be reporting on experiences of abuse, particularly among men (Layte et al., 2006). This explanation may not apply fully in this case, particularly given differential gender profile reporting adverse events, and given that the time of same-sex contact cannot be established, although this possibility cannot be fully discounted either.

Other studies have found that adolescents and adults who experience same-sex sexual contact, but report no same-sex desires (Zhao, Montoro, Igartua, & Thombs, 2010) or heterosexual identification (Schrimshaw, Siegel, Downing Jr, & Parsons, 2013), are at risk of adverse outcomes (mental health outcomes in both studies cited). From an analytical perspective, is remains unclear whether this group should be included as 'LGB' or not in the analyses, highlighting the challenge, and pitfalls, of attempting to impose an 'essentialist' perspective on sexuality (Layte et al., 2006). Again, a larger sample would allow greater flexibility and sensitivity in the way in which LGB is defined.

Discussion

Key findings

These results suggest that LGB life course trajectories exhibit elements of both convergence and divergence with those of heterosexual peers. Both LGB and non-LGB people exhibit a surprising uniformity in early trajectories, reaching the first quartile milestone at which the 'big five' transitions to adulthood are experienced within a year of each other. Differences begin to open up at this point in terms of family formation patterns being experienced later, with the median age at first parenthood occurring six years later for LGB people at age 29 years, and ultimately this postponement does indicate fewer parents among LGB people by the age of 50. Retirement and the age at which people experience a serious illness also show a remarkable degree of uniformity across groups in tempo, although caring duties appear to feature much earlier in the life course of LGB people, and particularly non-heterosexual women (see supplementary materials). However, this earlier transition to a caring role does not lead to earlier exits from the labour market for LGB people, despite caring being linked to earlier retirement (King & Pickard, 2013). In addition to differences in family formation and caring patterns, there are indications that LGB people reach older age having experienced severe financial hardship at earlier ages (not statistically significant), and have been much more likely to have experienced trauma through sexual assault, although this latter finding is sensitive to the definition of sexuality used. While the baseline risk of experiencing sexual assault is relatively low for both groups, and lower than might be expected given the estimates of attempted and actual non-volitional sex found among older people elsewhere (Macdowall et al., 2013), the potential increased risk for LGB people appears substantial and non-ignorable.

Limitations

The results presented here are accompanied by four caveats. The first of these is the size of the sample, and the small group of LGB people that were identified and upon which these analyses are based. By its very nature, the small sample increases the risk of type II errors but also meant that we were unable include a robust set of controls for known differences between LGB and non-LGB populations, such as socioeconomic differences (Uhrig, 2015), to avoid overfitting models. This meant that we were unable to disaggregate differences between lesbian, gay or bisexual men and women. As the sensitivity and descriptive analyses presented in the supplementary appendix

file show, there are likely to be substantial differences across the LGB spectrum.

A second caveat is around our method of classifying people as 'LGB'. Sexuality is a highly complex construct that is found to be fluid across the life course. Assumptions that sexual identification is fixed by older age are unfounded (Knocker, 2012), and some of the results appeared particularly sensitive to the presence of a small group of people whose sexuality may not be best represented through a binary indicator, as was the case in these models.

The third caveat was in our choice of indicators, which arguably attempted to impose a heteronormative lens onto the life course of LGB people. In particular, markers of a 'full' transition to adulthood will hold different significance to older LGB people, particularly with respect to family formation (Westwood, 2013). The very way in which life course markers of transitions to adulthood and ageing are selected may need adapting to avoid imposing heteronormative conceptions of successful and complete transitions when understanding LGB lives (Cronin & King, 2014). This is an important consideration, although the analyses here can also be viewed as providing a descriptive account of the convergence and divergence of life course trajectories when imposing what is essentially a heteronormative framework of measuring youth and ageing transitions. Many of the markers explored here do appear to resonate and have significance in the lives of this sample of LGB older people. However, this doesn't negate that other markers not explored here may hold equal or greater significance in exploring LGB life course trajectories, and may differ substantially according to the groups contained within the acronym itself.

The fourth caveat is in our own interpretation of the results and the difficulty in generalising the findings. While we refer to these results as being germane to the lives of people aged 50 and over (in 2006), the applicability of the findings is limited in the ways described above because of the small sample and the heterogeneity among LGB people. The generalisability of the results is also impeded by the influence of context that may be driving these results. It is unclear the extent to which shifting contexts in social norms will impact on family formation patterns of LGB people who are currently experiencing transitions to adulthood. As we witnessed in debates around same-sex marriage in the UK and elsewhere, for example, for some, societal acceptance is congruent with 'assimilation' into structures and experiences that were previously restricted, while for others societal acceptance is hinged on difference and opportunities to express and celebrate difference (Walther, 2015); for most others this distinction is context dependent.

Future research

The opportunities for identifying LGB people in large-scale surveys have expanded and this is to be welcomed. However, this is not necessarily congruent with opportunities to robustly study LGB life course patterns, and to comparatively understand the needs of LGB people at different life course stages. This paper has made a contribution to this end through presenting evidence of convergence and divergence at different stages and across different markers. However, these analyses alone are insufficient to provide an evidence-based case for the type of support that LGB people may need in navigating different life course transitions. Nevertheless, they do provide the basis for further enquiry and provide early indications as to the challenges that LGB people may face in comparison to their heterosexual peers, particularly around experiences of care giving, experience of severe trauma (sexual assault) and potentially around differential levels of reciprocal support available in older age from children. To maximise investments in existing surveys, future enquiry could focus on developing ways of exploiting the small pockets of data on LGB people held across different large-scale surveys. This is in order for the avenues of enquiry outlined above to be pursued across different age, gender and socioeconomic intersectionalities without statistical power being a perfunctory restriction to meaningful analysis, as is arguably the case in most extant quantitative literature. Some of this may involve critically examining the applicability of methods developed in systematic review literature and particularly Individual Participant Data (IPD) meta-analysis (Tierney et al., 2015), which may provide future analyses with sufficient statistical power to better understand the many remaining substantive questions about the comparative nature of LGB life course trajectories.

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Endnotes

1. However, the ELSA wave 6 data do not measure whether older people's gender identity has changed since the gender ascribed to them at birth.
2. The small number of asexual people identified (41) were excluded.
3. In the case of parenthood, if a logical inconsistency was provided for the first birth, values for the second were substituted in a small number of cases to attempt to preserve the size of the sample. Cases removed due to logical inconsistencies (including some that were 'don't knows') accounted for 15 parenthood histories; four cohabiting histories; seven employment histories; eight educational histories (including seven who did not attend school); and seven independent housing histories.

RESEARCH NOTE
Does the association between teen births or abortions and educational attainment vary by socioeconomic background in Finland?

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Abstract

Teen mothers often have a lower socioeconomic position as adults than other women due to selection, opportunity costs of childbearing, or both. Few studies examine whether that is the case after an induced abortion as well. Also, few studies explore whether the strength of the association between teen pregnancy and adulthood socioeconomic position differs by family background. This study uses Finnish register data of 53,252 women born between 1975 and 1979 to examine with logistic regression whether the likelihood of having tertiary education depends differently on teen birth and abortion experiences by parental socioeconomic position. I also control for and report whether having a partner providing childcare helps mitigate the negative association between teen motherhood and education. The results show teen mothers had lower odds than those who aborted to have tertiary education, and both groups were behind those with no teen pregnancy. These groups' education did not vary statistically significantly by family background, although the gap in the probability of having tertiary education between teen mothers and those with no teen pregnancy among the lowest socioeconomic backgrounds was 43%-points, and only 27%-points among the highest. Teen mothers with and without a partner had similar probabilities of having tertiary education (8–11%). Those who had an abortion and subsequently separated from their partner, however, had similar probability of having tertiary education as teen mothers (13%), although others who had an abortion had a much higher probability (20%). Selection shapes these relationships. Survey and register data should be combined to study these associations using methods of causal inference.

Keywords

Teenage pregnancy; induced abortion; Finland; register data; socioeconomic position

Introduction

There is an association between starting childbearing in adolescence and low socioeconomic position later in life (Assini-Meytin & Green, 2015; Hoffman, 1998; Kane, Morgan, Harris, & Guilkey, 2013; Lawlor & Shaw, 2002; Mollborn, 2010; Olausson, Haglund, Weitoft, & Cnattingius, 2001; Paranjothy, Broughton, Adappa, & Fone, 2009; Taylor, 2009). This may be due to opportunity costs of having children, which make it challenging to study and build a career (Becker, 1991); or due to selection into early parenthood of those from low socioeconomic backgrounds and with low career aspirations (Geronimus & Korenman, 1992; Smith & Roberts, 2011). Many studies have aimed to establish whether teenage motherhood is causally linked with lower socioeconomic position in adulthood using methods such as propensity score matching (Lee, 2010), inverse probability weighting (Diaz & Fiel, 2016), sibling fixed effects (Geronimus & Korenman, 1992; Hoffman, Foster, & Furstenberg Jr., 1993), miscarriage as an instrumental variable (Ermisch & Pevalin, 2003), or discrete factor models of treatment effect (Kane et al., 2013). A causal link would show that the low socioeconomic status of young mothers is due to opportunity costs rather than selection, whereas absence of such a link would demonstrate the opposite.

Many studies have ignored induced abortions and focused only on the effect of teen birth on later socioeconomic status (Ermisch & Pevalin, 2003; Geronimus & Korenman, 1992; Hoffman et al., 1993; Kane et al., 2013; Lee, 2010) or treated everyone who experienced a teen pregnancy the same regardless of the outcome of that pregnancy (Diaz & Fiel, 2016). Due to severe underreporting of abortion in surveys (Jones & Kost, 2007), studying those who had an abortion as a separate group has often not been possible (e.g. Diaz & Fiel, 2016). Such research is needed, however, as it is of interest to describe whether women who avoid becoming teen mothers by obtaining an abortion end up in a different socioeconomic position compared to those who had no teen pregnancy or those who gave birth. The few previous studies including abortion showed terminating a pregnancy before age 20 (Fergusson, Boden, & Horwood, 2007 in New Zealand) or 25 (Olsson et al., 2014 in Australia) was associated with a higher socioeconomic status later in life than among teen mothers, but lower than among those who had no pregnancy in adolescence (controlling for parents' socioeconomic status).

Women who give birth or obtain abortions as teenagers are likely to share a range of characteristics making them susceptible to teen pregnancy. Thus, studying those who had a teen birth and those who had an abortion separately gives more nuanced information about how teen pregnancy is associated with socioeconomic outcomes than only studying teen mothers, and whether choosing an abortion rather than a birth might be associated with improved socioeconomic outcomes. It is important to keep in mind, though, that selection influences who chooses an abortion. Pregnant teens from less advantaged backgrounds are more likely to choose to give birth than those from higher socioeconomic backgrounds (Ermisch & Pevalin, 2003 in the UK; Väisänen & Murphy, 2014 in Finland).

Most studies have ignored that teen pregnancy may be more harmful in socioeconomic terms for those from backgrounds where teen parenthood is atypical. Opportunity costs of teen childbearing may be the highest for women from high socioeconomic backgrounds facing promising career prospects (Diaz & Fiel, 2016). The aim of this study is to address this gap by using register data of women born between 1975 and 1979 in Finland to examine whether their level of education at age 30 depends on their teenage pregnancy history (no pregnancy, birth, or abortion) and to what extent this relationship interacts with the socioeconomic background of their parents. Finally, I examine whether having a partner at the time of and since the teen pregnancy modifies the association between teen births (or abortions) and education. If partners provide help with childrearing, having one may mitigate the opportunity costs of teen childbearing. I chose level of education as the outcome of interest, because early childbearing may lead to difficulties in attending school due to childrearing responsibilities. Low education is associated with a higher chance of unemployment and low income, thus correlating with socioeconomic position (see e.g. Taylor, 2009 in the US).

Register data can mitigate the shortcomings of survey data, such as underreporting of abortion. Registers provide large sample sizes and do not suffer from attrition, underreporting, or recall bias.

However, these data do not allow for causal inference, as only a limited amount of information on the background characteristics of these women is available (see Data and methods section). The strength of this study is twofold: 1) the large sample size allows for reliable estimation of the interaction between teenage births/abortions with parental socioeconomic background; and 2) I am able to compare the outcomes of those who had a birth to those who had an abortion.

The Finnish context is interesting for a study on this topic. Finland has had one of the lowest teen childbearing rates and the lowest teen abortion rate among Nordic countries since the mid-1980s (Bender, Geirsson, & Kosunen, 2003; Leppälahti, Gissler, Mentula, & Heikinheimo, 2012). In the mid-1980s the teenage abortion rate in Finland was 20 per 1000 women aged 15 to 19. It declined to 10 in the mid-1990s but increased to around 14 per 1000 women around the end of the decade (Gissler & Heino, 2011; Leppälahti et al., 2012; Vuori & Gissler, 2013). The teenage birth rate declined from 27 per 1000 women in 1975 to 10 in 1999 and 8.5 in 2009 (Gissler & Heino, 2011). In Finland, abortions can be obtained due to 'social reasons' within the first trimester. If the woman is younger than 17, or there is another special social reason for abortion, an abortion can be allowed until the end of 20 weeks' gestation (FINLEX, 2013; Knudsen et al., 2003).

The education system, which is free of charge, consists of comprehensive and compulsory basic education at primary and lower-secondary levels (9–10 years), after which one can choose to leave school or to enter vocational or academic upper-secondary education (typically three years), before potentially studying an undergraduate-level degree (or above) in tertiary education (Aho, Pitkanen, & Sahlberg, 2006). A high proportion of Finns study beyond the compulsory lower-secondary level. For instance, in 2014, 73% of the population aged 25–34 had at least upper-secondary education (Official Statistics of Finland, 2015). Therefore, I focus on the likelihood of obtaining tertiary education as the outcome – there would not be much variation in the outcome if it were 'upper-secondary level or higher'.

Data and methods

Nationally representative data on women born between 1975 and 1979 were obtained from the Register of Induced Abortions, the Medical Birth Register, and the Population Register of Finland. Statistics Finland linked these registers using a unique identification number held by each permanent resident in Finland. The register aims to capture all induced abortions performed in Finland. Evaluation studies have found these registers to be reliable, capturing 97% of abortions (Gissler & Shelley, 2002; Heino, Niinimäki, Mentula, & Gissler, 2017).

The data were selected using two-stage sampling. First, an 80% random sample of those women who had had at least one abortion since age 15 and before year 2010 (the end of the study period) was selected (N=20,844). All women who had ever had an abortion were not included in the data, because Statistics Finland does not allow the use of complete (sub-)populations for research purposes on ethical grounds. Second, a comparison group, twice the size of the abortion group, of women who had not had an abortion were selected using random sampling (N=41,248). I use weights to account for this sampling design. Overall the unweighted sample includes almost half of the women born between 1975 and 1979. See Väisänen (2015) for more information about the dataset, which was extracted from a larger study.

The outcome variable is the level of education at age 30: low (lower-secondary level); middle (upper-secondary level); and high (tertiary education).

The variable measuring teen pregnancy includes three mutually exclusive categories: no pregnancy, one abortion, or one birth between ages 15 and 19. Thus, I excluded women who had more than one teen pregnancy (N=1,119, 1.8% of the sample)[1]. Since the associations between teen pregnancy and education probably are stronger among these women, the estimates in this study are conservative. I chose to focus on ages 15–19, since there was no information about pregnancies before age 15 in my dataset and because many previous studies of adolescent pregnancy have focused on women younger than 20 (e.g. Bender et al., 2003; Driscoll, 2014; Lee, 2010; Taylor, 2009; Väisänen & Murphy, 2014). I conducted robustness checks with teen pregnancy divided into two categories: early teen pregnancy (ages 15–17) and late teen pregnancy (ages 18–19), but the differences between these groups were small.

Parents' socioeconomic status represents the highest occupational status among the adult members of the teen's household, regardless of whether that was held by the woman's mother,

father, or a step-parent. The choice regarding which status was the highest was made by Statistics Finland. Parents' socioeconomic status was measured when the women were approximately 15 years old. The categories include upper- or lower-level non-manual employee; manual worker[2]; or other. Upper-level employee is regarded as the highest status followed by lower-level employees and manual workers. 'Other' category includes farmers, students, and pensioners, as well as those who are self-employed, long-term unemployed, outside the workforce, and outside the other categories (Official Statistics of Finland, 2013). Thus, most people in this group are relatively disadvantaged, but the group is heterogeneous and therefore difficult to position within the hierarchical order. Place of residence (level of urbanisation and province) at the age of 15 was measured in these data, but other measures of the childhood circumstances of these women were not available.

The relationship status variable has three categories including 'no partner at the time of teen pregnancy (or no teen pregnancy)', 'stable partnership since the teen pregnancy', and 'had partner at the time of the teen pregnancy but the union dissolved'. Partner is defined as a cohabiting or marital partner, as no data on non-cohabiting relationships is available in population registers.

Overall 53,252 women were included in the analyses. I excluded those missing crucial information, such as parents' socioeconomic status, and those who emigrated or died before age 30. I included only those born in Finland and speaking one of the official languages, Finnish or Swedish, as their native language. This was due to detailed information about the country of origin among non-native Finns being missing from my dataset. Cultural background and immigration status is associated with fertility behaviour and the likelihood of abortion (e.g. Adserà, Ferrer, Sigle-Rushton, & Wilson, 2012; Malin & Gissler, 2008; Stonawski, Potancokova, & Skirbekk, 2016). Not being able to account for this variation would have made the results regarding immigrant women difficult to interpret[3].

I analysed these data using cross tabulations and logistic regression. I ran two regression models: one for all women and one for those who experienced a teen pregnancy. The first model tests the interaction between teen births/abortions and parental socioeconomic status; the latter the interaction between teen births/abortions and relationship status in addition to parental socioeconomic status. I show the results as odds ratios and average marginal effects at representative values (i.e. predicted probabilities) (see Williams, 2012). All analyses were conducted in Stata 14.

Results

Descriptive statistics

Approximately 3.8% of women had an abortion before age 20 and 2.5% had a birth (table 1). Out of first pregnancies before age 20, 60% ended in abortion (not shown). Those who obtained an abortion as a teenager more often had tertiary education at age 30 than those who gave birth, but less often than women who did not experience a teen pregnancy. Women from manual worker backgrounds had completed tertiary education less often by age 30 than those from higher socioeconomic backgrounds, particularly those from upper-level employee backgrounds (table 1).

Teen pregnancies were more common among those from manual worker backgrounds (4.2% of those from manual worker backgrounds had an abortion, 3.2% a birth) than among those from upper-level employee backgrounds (2.6% abortion, 0.6% birth) (not shown). The other socioeconomic groups were between these two.

Regression results

The odds of having received at least tertiary education were the highest among those with no teen pregnancy, followed by those who had an abortion. Those from the highest parental socioeconomic background were the most likely to be highly educated. The interaction between these two variables was not statistically significant (p=0.395, joint Wald-test, not shown), indicating that teen birth or abortion experiences are not differently associated with the odds of obtaining tertiary education depending on parental socioeconomic background (table 2, model 1).

Table 1. Weighted % of explanatory variables by level of education, unweighted N in each category, and the weighted % of each explanatory variable category in the total sample.

Level of education	*Lower secondary*	*Upper secondary*	*Tertiary*	*Total*	*N (un-weighted)*	*% of total*[a]
	7.8	48.6	43.6	100	53,252	
Teen pregnancy (p<0.001)						
No teen pregnancy	6.6	47.9	45.5	100	47,039	93.6
Abortion	19.6	59.8	20.7	100	4,577	3.8
Birth	35.4	57.7	7.0	100	1,636	2.5
Parental socioeconomic status (p<0.001)						
Manual worker	8.9	55.4	35.7	100	16,816	35.0
Other	7.6	50.6	41.8	100	13,286	28.2
Lower-level employee	6.6	46.3	47.2	100	9,793	20.8
Upper-level employee	3.8	31.0	65.2	100	7,129	16.0
Partnership status (p<0.001)[b]						
No partner/pregnancy	7.4	48.3	44.3	100	51,778	97.9
Stable partner	28.5	62.1	9.4	100	546	0.9
Dissolution from partner since	30.5	60.1	9.4	100	922	1.3
Number of children age 30 (p<0.001)						
No children	6.0	43.0	51.0	100	23,851	47.1
One child	7.1	46.6	46.3	100	12,445	22.7
Two children	8.7	56.8	34.5	100	11,932	21.4
Three or more children	17.6	63.9	18.5	100	5,024	8.8
Place of residence at age 15: level of urbanisation (p<0.001)						
Urban	8.8	47.1	44.1	100	32,730	60.8
Semi-Urban	6.5	50.5	43.0	100	10,099	19.3
Rural	5.8	51.7	42.5	100	10,322	19.9
Place of residence at age 15: province (p<0.001)						
South	9.8	48.5	41.7	100	19,410	35.9
West	6.8	49.6	43.6	100	19,040	36.3
East	6.4	46.5	47.1	100	6,686	12.8
Oulu	6.3	48.5	45.1	100	5,515	10.6
Lapland	6.4	46.1	47.5	100	2,307	4.2
Aland	13.6	73.2	13.2	100	193	0.3

Notes: [a] Columns total 100%; [b] Refers to partnership status at the time of teen pregnancy.

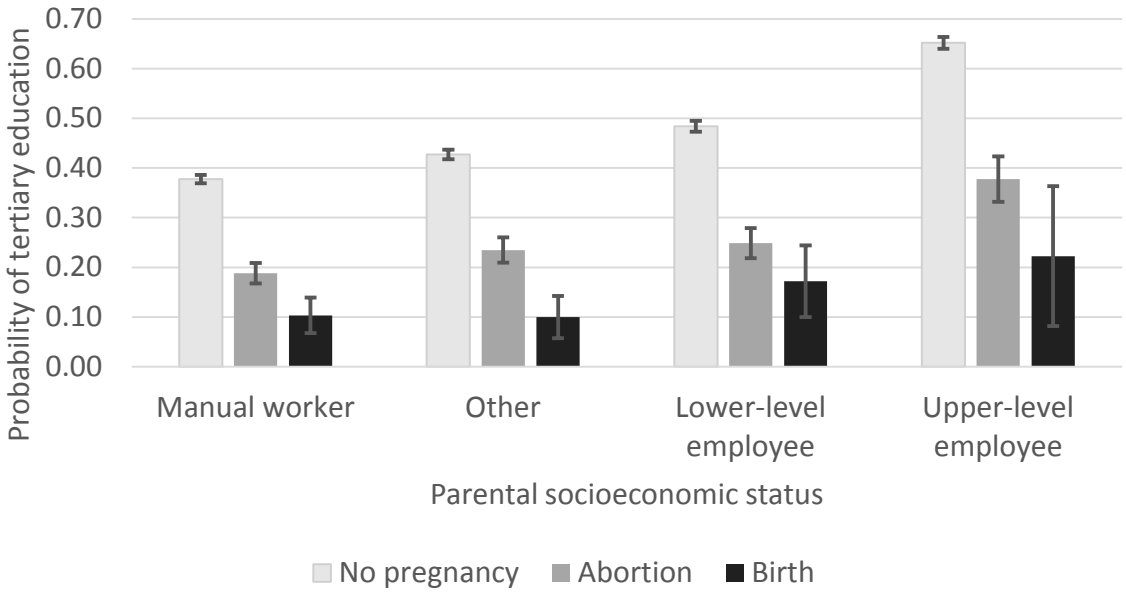
Table 2. The association between explanatory variables and tertiary education among all women (model 1) and those who had a teen pregnancy (model 2), odds ratios (ORs) and standard errors [se].

	Model 1		Model 2	
Variable	**OR**	**[se]**	**OR**	**[se]**
Teen pregnancy				
No teen pregnancy (ref.)	1.00		(n/a)	
Abortion	0.37***	[0.03]	1.00	
Birth	0.18***	[0.04]	0.37***	[0.10]
Parental socioeconomic status				
Manual worker (ref.)	1.00		1.00	
Other	1.24***	[0.03]	1.29*	[0.13]
Lower-level employee	1.57***	[0.05]	1.41**	[0.15]
Upper-level employee	3.23***	[0.11]	2.59***	[0.33]
Interaction: parental socioeconomic status and teen pregnancy				
Abortion x Other	1.08	[0.11]	(n/a)	
Abortion x Lower	0.92	[0.10]	(n/a)	
Abortion x Upper	0.83	[0.11]	(n/a)	
Birth x Other	0.78	[0.24]	0.73	[0.23]
Birth x Lower	1.16	[0.38]	1.34	[0.45]
Birth x Upper	0.78	[0.37]	1.00	[0.48]
Partnership status[a]				
No partner or no teen pregnancy (ref.)	1.00		1.00	
Stable partner since teen pregnancy	1.17	[0.22]	1.12	[0.25]
Dissolution from teen pregnancy partner	0.88	[0.12]	0.61**	[0.099]
Interaction: partnership status and teen pregnancy				
Birth x Stable partner since teen pregnancy	(n/a)		1.28	[0.50]
Birth x Dissolution from teen pregnancy partner	(n/a)		2.30*	[0.78]
Number of children age 30				
No children (ref.)	1.00		1.00	
One child	0.90***	[0.023]	0.62***	[0.062]
Two children	0.57***	[0.016]	0.45***	[0.046]
Three or more children	0.27***	[0.013]	0.26***	[0.042]
Place of residence at age 15: level of urbanisation				
Urban (ref.)	1.00		1.00	
Semi-Urban	1.05	[0.030]	1.04	[0.11]
Rural	1.04	[0.030]	1.09	[0.12]
Place of residence at age 15: province				
South (ref.)	1.00		1.00	
West	1.23***	[0.032]	1.21	[0.12]
East	1.51***	[0.053]	1.80***	[0.24]
Oulu	1.44***	[0.055]	1.61***	[0.23]
Lapland	1.55***	[0.085]	1.78**	[0.33]
Aland	0.24***	[0.064]	0.73	[0.41]

Notes: [a] Refers to partnership status at the time of teen pregnancy; * p<0.05, ** p<0.01, *** p<0.001; n/a = not applicable.

I calculated predicted probabilities of the interaction effect, although it was not statistically significant (figure 1). The results indicate there may be some differences in the association between teen birth/abortion and education depending on parental socioeconomic background, even though statistical significance was not reached. For instance, those from manual worker backgrounds who had a teen birth (abortion) had around 27%-points (19%-points) lower probability of having tertiary education than those from the same background who had no teen pregnancy. Those from upper-level employee backgrounds who had a birth (abortion) had 43%-points (27%-points) lower probability of having obtained tertiary education than those from the same background who had no teen pregnancy. As only a small proportion of women became pregnant before age 20, the confidence intervals are wide and the interaction not statistically significant.

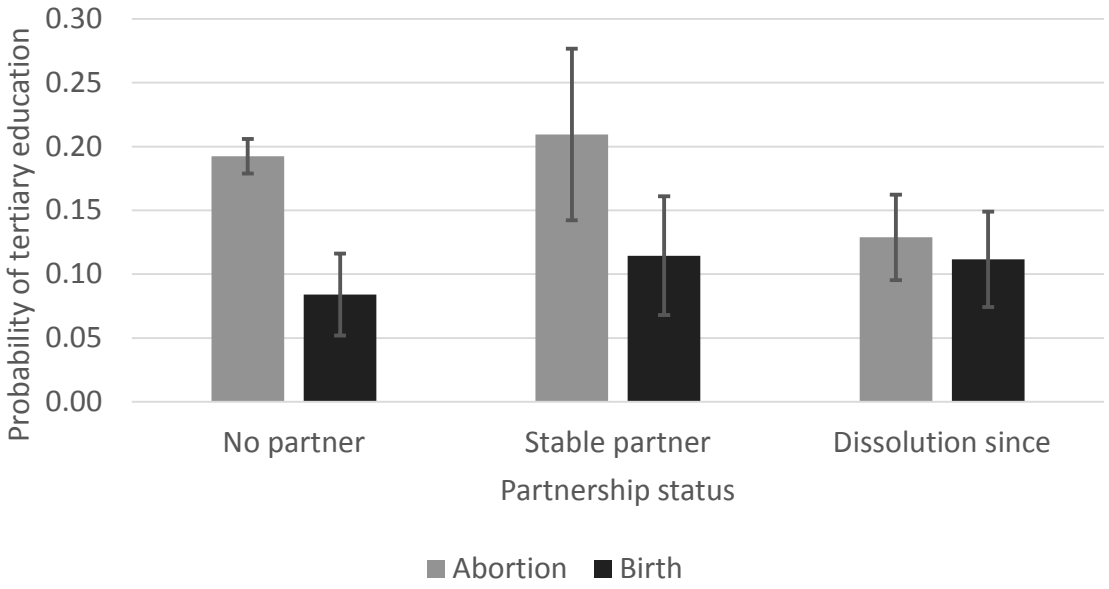
Figure 1. Average marginal effects at representative values of the interaction between parental socioeconomic status and teen births and abortions among all women.



Notes: Controlling for partnership status, number of children at age 30, and place of residence; based on model 1 in table 2.

The results including only women who experienced a teen pregnancy were similar to model 1, where all women were included (table 2, model 2). However, while partnership status was not significantly associated with the outcome in model 1, among women who had a teen pregnancy it was. There was also an interaction effect between teen pregnancy outcomes and the partnership status (p=0.046, joint Wald-test of the interaction, not shown). Interestingly, there was almost no advantage in having a partner among those who became teen mothers in terms of education: teen mothers had between 8% and 11% probability of having tertiary education. Among those who had an abortion, having separated from their partner since the pregnancy was associated with a probability similar to teen mothers to having tertiary education (13%), while those who had no partner or had a stable partner, had around 20% probability (figure 2).

Figure 2. Average marginal effects at representative values of the interaction between partnership status at the time of teen pregnancy and teen births and abortions among women who experienced a teen pregnancy.



Notes: Controlling for parental socioeconomic status, number of children at age 30, and place of residence; based on model 2 in table 2.

Discussion

This study examined whether the likelihood of obtaining higher education is differently associated with teen births and abortions depending on socioeconomic background. In line with Diaz and Fiel (2016), there was some indication that those from higher socioeconomic backgrounds may suffer a higher 'penalty' of teen birth than those from lower socioeconomic backgrounds, where teen pregnancies are more common. The gap in the probability of having tertiary education between those with and without a teen birth was the biggest among women from the highest socioeconomic background. However, the interaction was not statistically significant. The lack of statistical significance may have partly been due to the small numbers of women in each teen pregnancy category when stratified by parental socioeconomic status despite the large sample size of over 50,000 women.

A new finding in this study was that the 'penalty' associated with teen abortions was lower than that associated with teen childbearing, but it may vary by parental socioeconomic status. Selection into who has an abortion matters. Some teens may have chosen to terminate their pregnancy in order to finish their education and get stable employment before childbearing (see e.g. Ekstrand, Tydén, Darj, & Larsson, 2009 in Sweden), but even in the absence of opportunity costs, teens from higher socioeconomic backgrounds who had an abortion may be further behind those from similar backgrounds and no pregnancy than teens from lower socioeconomic backgrounds.

Interestingly, teen mothers did not seem to benefit in socioeconomic terms from having a partner, as it made almost no difference to their likelihood of obtaining tertiary education. Perhaps they never planned to obtain higher education and therefore having a partner sharing childcare responsibilities was not associated with educational achievement. Future studies should investigate the aspirations of young mothers in Finland.

Surprisingly, partnership mattered the most among those who had a teen abortion. Women who separated from their partner after the abortion had a much lower likelihood of obtaining tertiary education than other women who chose abortion – the likelihood was close to that of an average teen mother. These women may be a highly selected group, perhaps leading an unstable life overall, which may correlate with a low propensity of obtaining higher education. More studies on the topic are needed.

A limitation in this study was that these women were born in the late 1970s. They were teenagers in the early 1990s and in their thirties ten years ago. Future studies should collect more recent data to examine whether these trends have changed. Teen birth and abortion rates continued to decline in Finland since the early 2000s, reaching 6.3/1000 for births and 8.4/1000 for abortions in 2015 (Heino & Gissler, 2016; Vuori & Gissler, 2016). Thus, selection into experiencing teen pregnancy may have become stronger, but at the same time, fewer women experience an early pregnancy, making the population-level effect smaller.

Finland is an interesting case study due to its progressive social security system aimed at reducing opportunity costs of childbearing by ensuring everyone has access to affordable day care and free education (Aho et al., 2006; Haataja, 2006; Vikat, 2004), and due to its relatively low teen pregnancy rates (Bender et al., 2003; Leppälahti et al., 2012). In countries such as the United States or the United Kingdom, where the opportunity costs of childbearing are higher, the differences may be larger. On the other hand, in both of these countries teen pregnancy rates are higher than in Finland, which indicates less strong selection. This may counterbalance any differences between countries like Finland and countries like the US and the UK.

The strengths of this study include the large sample size, no underreporting of abortion, and no attrition. However, the main limitation is that information on the background characteristics was limited, which did not allow me to control for selection into teen pregnancy. Thus, this study cannot formally test whether the lower socioeconomic position of teen mothers is due to selection or opportunity costs (or both). Since teens who chose an abortion and thus avoided opportunity costs had lower education than those with no teen pregnancy, selection seems to play a role, but more information on the background, aspirations, and future plans of these women is needed to confirm this. Nordic countries could be at the forefront of this research by linking population registers to survey data, thus overcoming the main limitations of each data source on its own.

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Endnotes

1. The 'no pregnancy group' includes those who had miscarriages and/or stillbirths, as no information of these pregnancy outcomes was included in my dataset. Sensitivity analyses including women who had more than one teen pregnancy were conducted and the interpretation of the main results remained qualitatively the same.
2. Upper-level employees are in managerial, professional, and related occupations, whereas lower-level employees have administrative and clerical occupations. Manual workers typically work in manufacturing or distribution of goods and services. (Official Statistics of Finland, 2013).
3. Sensitivity analyses including migrant women were conducted. The results regarding the effect of parental socioeconomic status and teen pregnancy on education remained largely unchanged. Those from migrant origins were less likely to obtain higher education than those from a Finnish background.

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