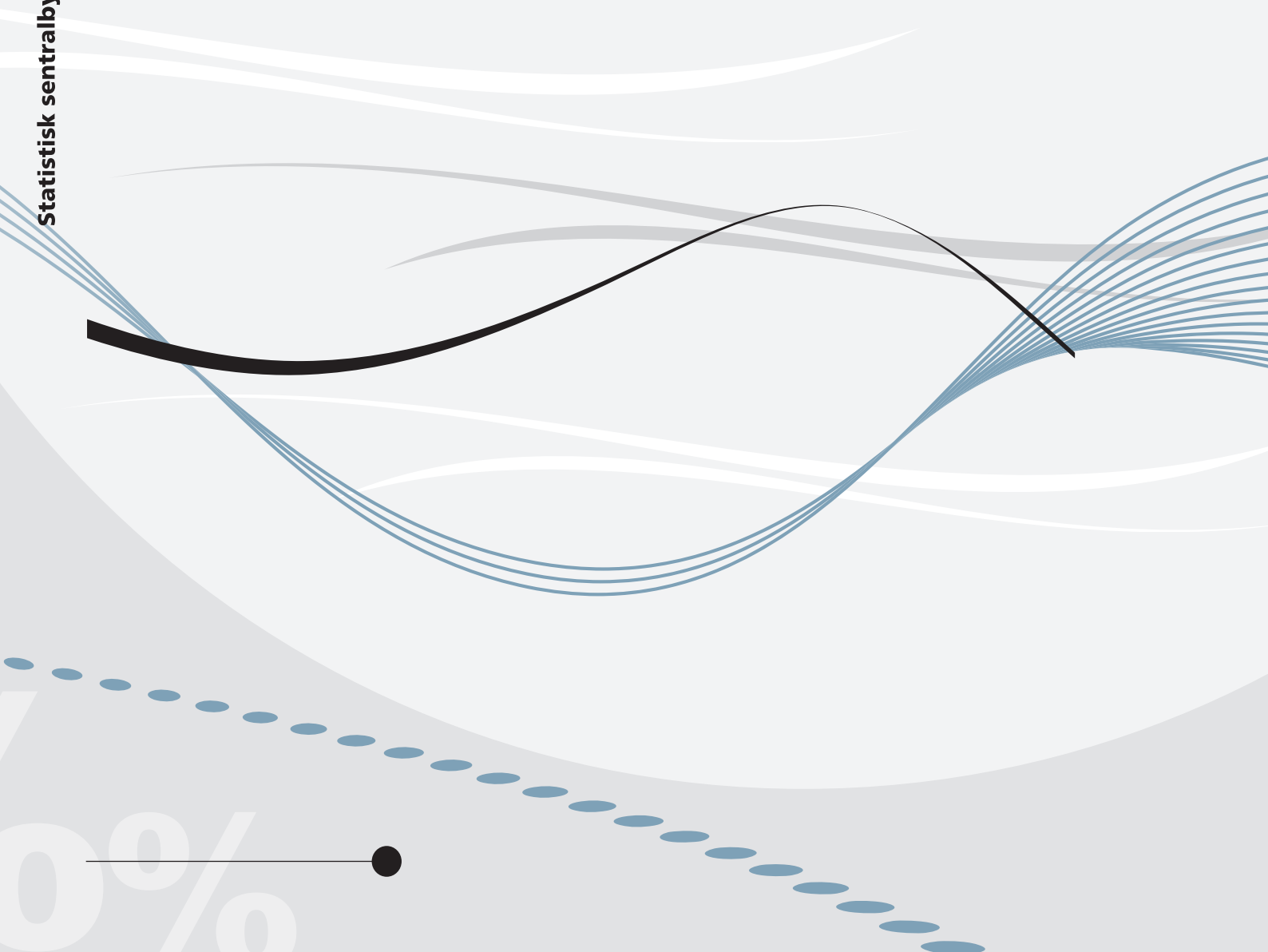


Marianne Tønnessen, Kjetil Telle and Astri Syse

Childhood residential mobility and adult outcomes



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Astri Syse*

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Abstract:

This study analyses the relation between moving during childhood and four different outcomes later in life. We use detailed data on complete cohorts born in Norway between 1965 and 1980 (N=967 151), their parents and siblings, and information on all their moves between Norway's municipalities. We use traditional logistic regression models and sibling fixed-effects models. First, we assess how different outcomes are affected by the number of times a child has moved. Next, we examine whether the child's age at moving is important.

The results show that children with more residential relocations during childhood are more likely to drop out of high school, to have low adult income, to experience early parenthood and to die at young age. The sibling fixed-effects models largely confirm this picture. We also found that children who moved prior to elementary school do not have severe long-term outcomes compared with children who did not move at that age, whereas children who moved during teens did have more adverse outcomes than those who did not move at that age.

Keywords: Childhood; Residential mobility; Internal migration; Movers; Outcomes;

JEL classification: J31, O15, R23

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Sammendrag

Mange personer i Norge har flyttet én eller flere ganger i løpet av oppveksten. I denne analysen har vi sett på sammenhengen mellom flyttinger i alderen 0-18 år og hvordan det går med personene senere i livet. Vi har i hovedsak sett på fullføring av videregående skole, inntekt som voksen (ved alder 28), hvor mange som blir tenåringsforeldre og hvor mange som dør tidlig (i alderen 15-28 år).

I analysene bruker vi registerdata over samtlige personer født i Norge i årene 1965-1980, og informasjon om alle deres flyttinger mellom norske kommuner. Det utgjør i underkant av en million personer, og 40 prosent av dem har flyttet én eller flere ganger i alderen 0-18 år. 19 prosent har flyttet bare én gang, mens 11 prosent har flyttet tre eller flere ganger. Flertallet av flyttingene skjedde før barna begynte på skolen.

Det er grunner til å tro at flytting kan være både positivt og negativt for et barn. Men når vi sammenligner gruppen som har flyttet én eller flere ganger med de som ikke har flyttet, ser vi et ganske entydig bilde: Flytterne har i gjennomsnitt høyere risiko for lav utdanning, lav inntekt, tidlig foreldreskap og tidlig død, sammenlignet med de som bodde i samme kommune gjennom hele oppveksten.

Så kan vi spørre: Er det flyttingen i seg selv som er årsaken til dette, eller kan det være andre ting som både er årsak til flyttingen og i tillegg påvirker hvordan det går med barna senere i livet? Et eksempel kan være skilsmisse, som både kan være en belastning i seg selv for barna, og dessuten føre til at de flytter.

I et forsøk på å komme nærmere et svar på dette, kontrollerer vi for andre faktorer som kan henge sammen med både flyttingen og de senere utfallene. Takket være det store datamaterialet kan vi bruke to ulike metoder: Tradisjonell logistisk regresjonsanalyse med en rekke kontrollvariable, og i tillegg en såkalt søsken-fast-effekt-analyse som gjør det mulig å kontrollere for alle kjennetegn, observerbare og uobserverbare, som påvirker søsken likt.

De to metodene gir ganske like konklusjoner: Selv når vi kontrollerer for mange av ulikhetene mellom barn som flytter og barn som ikke flytter, for eksempel barnets nummer i søskenflokk, antall søsken, foreldrenes utdannings- og inntektsnivå og om de er gift eller ikke, gir flytting fortsatt økt risiko for ikke å fullføre videregående skole, for lav inntekt som voksen, for å bli tenåringsforelder og for å dø tidlig.

Denne risikoen øker for hver ekstra gang barnet flytter. Og risikoen blir høyere jo senere i oppveksten flyttingen skjer. For flyttinger før barna begynner på skolen (dvs. i alderen 0-6 år), finner vi ingen klar risikoøkning.

Lav utdanning, lav inntekt eller tidlig foreldreskap er ikke nødvendigvis negativt for dem som opplever det. Men resultatene av vår analyse tyder likevel på at barn som flytter mye, og særlig tenåringer som flytter, kan være ekstra sårbare.

1. Introduction

Every day, children around the world are moved to new places, new schools, and new neighborhoods. They have to cope with and adjust to a new life, make new friends, learn new cultural codes, find their place in a school class and catch up with the curriculum. Parents may hope that any transitional problems are temporary, and that residential relocations do not harm children in the long run.

Research is, however, not so comforting on that point. Theoretically, there are reasons to expect both advantages and disadvantages from moving during childhood. Whereas general migration theories state that people usually move because they presume it will give them a better future, other theories point at several reasons why moving may be harmful for a child. Loss of social capital, psychological distress, reduced coping, problems finding good friends, and cumulative stressful events may contribute to reduced long-run welfare for childhood movers.

Empirical studies show that, before controlling for differences between moving and non-moving children, movers generally show poorer performance than non-movers, almost regardless of the outcome studied. However, when controlling for various pre-existing differences between the two groups, the adverse effects of moving are substantially reduced. In some studies they vanish completely.

If moving during childhood is detrimental, increased societal mobility may result in increased personal as well as societal problems, unless steps are taken to counter the possible adverse effects for the moving children. In order to design and target such policies and interventions appropriately, it is important with more detailed knowledge on what kind of moving is detrimental for what kind of children, and at what ages relocation may be most harmful.

Research on effects of childhood moving has mainly used sample surveys (most often with $N < 5\,000$), typically focusing on short-term effects for the child. Usually only one outcome has been studied each time (like health, education, or crime), by using ordinary least squares or probit/logistic regression methods to control for differences between the movers and non-movers.

In this paper, we utilize exceptionally rich longitudinal demographic data on complete Norwegian birth cohorts – including information on siblings and parents – to examine the association between childhood moves at different ages and a variety of outcomes in early adulthood. Using register data for all children, we do not have issues relating to sample selection and attrition (such as loss of the most mobile families). The large data material allows us to study several different outcomes – also

relatively rare outcomes, like early mortality – which makes us able to paint a broader picture of the adult welfare of childhood movers. It also makes it possible to study subgroups, and to use several methodological approaches: In addition to traditional logistic regression methods, we apply sibling fixed-effects models, an approach that takes into account more of the unobserved, stable differences between the families that move and those who stay put.

Our main outcomes are education (high school drop-out), low adult income (at age 28), early parenthood (before age 20), and early mortality (death at age 15-28). The early parenthood and early mortality outcomes are, in addition, elaborated by analyses of incidents of cervical cancer (an indication of early unsafe sexual behavior¹) and of different causes of death.

We aim at addressing the following research questions:

Is childhood moving harmful?

*What effect does the **number** of childhood moves have?*

At what age does moving impact most strongly?

Our results confirm that, in general, children who move a lot are worse off than the ones who stay, even after control for a vast number of potential confounding factors. These results are largely confirmed in sibling fixed-effects models.

2. Theory and previous research

There are several – partly complementary – theories on why residential mobility could be harmful for children, as well as theories on why residential mobility could be beneficial. We now briefly review these theories.

Loss of social capital. Social capital theory, as known from Coleman (1988), argues that social capital, such as relationships, ties and networks within and between families, enhances a child's human development, cognitive capacity and social functioning. When families move, the child breaks ties

¹As the causes of childhood cancer in general are relatively poorly understood, and few associations between social status and/or other common demographic characteristics have been identified (Klassen et al. 2007), elevated rates of childhood cancers among movers compared with non-movers cannot be expected. However, there is a strong link between behavioral factors and cervical cancer, one of the most common cancers in young women. Cervical cancer is caused by a sexually transmitted disease, Human Papilloma Virus (HPV), associated with unsafe sexual behavior. HPV infections are, however, very common and prevalent in most populations, but factors such as long-standing or frequent infections together with lack of screening for this disease, appears to strongly increase the cancer risk in young women (Wheeler 2013). Cervical cancer by age 28 was thus considered an indication of early unsafe sexual behavior.

with friends and close adults, which disrupts important relationships, information sources and networks that could monitor and guide positive behavior. Residential mobility can disrupt both the 'inter-family' social capital (due to lost contact with other families, teachers, neighbors etc.) and the 'intra-family' social capital (due to strain on the internal relationships between parents and children).

Psychological distress. Children who move away from people or places they are attached to, may suffer from a feeling of loss and alienation. Residential mobility can lead to anxiety, excitement and loneliness, as well as lower subjective well-being in the long term (Oishi and Talhelm, 2012).

Reduced coping. Coming to a new place may be challenging for a child. When you are a newcomer, you lack basic knowledge about local conditions and norms. Life can feel less safe and harder to control. Coping, which can be defined as the ability to adequately manage the demands of a situation, may become more challenging. At school, residential mobility may disrupt the continuity of a student's learning processes, and the student may miss key educational material. Changing school may also affect student coping ability and thereby lead to reduced educational achievements (Boon, 2011).

Bad friends or no friends. Finding new friends may be hard for a newcomer, and finding close and good friends may be even harder. South *et al.*(2005) surmise that 'newcomers are more likely to be welcomed into – and perhaps embraced by – low-performing and relatively delinquent friendship cliques'. The newcomers may also be more exposed to victimization because others view them as alone or weak.

Cumulative stressful events. Events that would otherwise be manageable, may become a tougher burden when it occurs at a time when the child or adolescent already has got to handle several other demanding events. The more life stressors a child experiences, including relocation(s), the more likely it is that there will be a negative outcome on the child's adjustment (Humke and Schaefer, 1995). Simmons *et al.*(1987) found that children or adolescents are at elevated risk if they are forced to cope with several life transitions concurrently, such as pubertal development, family disruption, early dating, school transition and residential mobility. Children who move may also have to handle changes in the affective states of parents and siblings if they too have problems adjusting to the new place.

On the other hand, many general migration theories explain residential mobility by pointing at the benefits for the movers. People usually change residence because they presume it will give them a better future. While neoclassical economic migration theory stresses individual determinants like

income and work opportunities, the ‘new economics of migration’ asserts that the migration decisions are not made in isolation, but in larger units – typically families or households (Massey *et al.*, 1993). So, although a residential move may be considered beneficial for the family as a whole (or at least for the parents who make the decision), it may still be bad for the child. However, good parents would be assumed to at least take into account the prospects for their children when deciding whether to stay or move. If the family moves because of better job opportunities, the short-term disadvantages of moving may be compensated for in the longer run through improved family economy and better housing. Residential relocation may also give the child new opportunities to make friends, join new groups, and increase its repertoire of experiences and knowledge of different places as well as a broader sense of autonomy, independence, and open-mindedness to new situations.

To summarize, there are theoretical reasons to expect both positive and negative effects of childhood relocations. Further, it is reasonable to hypothesize that the number of moves and the age at moving may affect the future wellbeing of the child to varying degrees, as is outlined in more detail below.

Number of moves: If moving is harmful, many moves may be even more harmful – particularly if there are long term disadvantages that are not overcome shortly after the move. Both social capital problems and psychological distress may be hypothesized to increase by number of moves. On the other hand, the child may get useful practice from moving, so that coping improves each time. Previous moves may be seen as providing a type of ‘inoculation’ against the stressors of moving, making new adjustments easier (Scanlon and Devine, 2001).

Age at moving: Babies, young children and adolescents may be affected differently by relocations. On the one hand, small children can be particularly vulnerable because they are in a phase of rapid cognitive, physiological and affective development (Knudsen *et al.*, 2006). On the other hand, the impact of moving may be more damaging to the social connections of teens than to those of small children because parents to a larger extent are involved in helping the younger children manage the transition to a new neighborhood by visiting schools, talking to teachers etc., while disruption of peer groups may be more salient for the transitions of teenagers who may also feel compelled to make the transition independently of their parents (Pettit, 2004). If the mobility primarily disrupts the ‘inter-family’ social capital, whereas the ‘intra-family’ social capital stays more intact, we could expect adolescents to be hardest affected by a move, as they are more dependent on networks outside the family. They may also have to handle additional stressful events at the same time, like pubertal development and detachment from parents.

Moreover, coping may be easier when the move happens at a natural crossroad in childhood, like school start or other transitions that are similar for both stayers and movers.

Previous empirical research

What has empirical research shown? First, the descriptive statistics usually show a clear pattern: Moves during childhood are associated with poorer performance both during childhood and to some extent also in adulthood, almost regardless of the outcome studied. It is less clear, however, whether the adverse association remains when important pre-existing differences in the characteristics of children are taken into account. As Long (1992) stated, ‘Children who have moved with above-average frequency are less likely to be living with both parents, more likely to be poor, and more likely to be in households where the householder was unemployed or failed to graduate from high school. These differences are often striking.’ It is thus important to attempt to separate the effects of the moving itself from such underlying factors.

Second, when various differences between movers and stayers are controlled for, the adverse associations are substantially reduced. Some studies find that the negative associations more or less disappears after such controls,² while in a number of other studies the adverse associations remains.³ Only very few studies find beneficial associations between childhood relocation and outcomes after including such controls.⁴

In studies where an adverse effect of moving is identified, this adverse effect is usually found to increase with the frequency of moves.⁵ Only a few studies have found that timing and number of moves appear to make no difference for a child’s well-being.⁶

²See for instance Dong *et al.* (2005) and Murphey *et al.* (2012) for health and certain health behaviors; Alexander *et al.* (1996) for school achievements; Verropoulou *et al.* (2002) for school attainments and well-being; and Gasper *et al.* (2010) for adolescent delinquency.

³See for instance Bures (2003) or Busacker and Kasehagen (2012) for health; Pribesh and Downey (1999), Astone and McLanahan (1994) or Haveman *et al.* (1991) for school performance; and South *et al.* (2005) and Stack (1994) for early sexual activity.

⁴One of them is a study from Canada, where Hango (2006) concludes that childhood residential mobility actually had a positive long-term impact on educational attainment. Also some analyses from US ‘Moving To Opportunity’ and similar programs, where low-income families got the opportunity to move to more wealthy areas, suggest that such moving reduces violent criminal behaviour by teens (Ludwig *et al.*, 2001) and increase youth’s performance in education and employment (Rosenbaum, 2001).

⁵See for instance Astone and McLanahan (1994), Temple and Reynolds (1999), Scanlon and Devine (2001), Jolleyman and Spencer (2008), Gilman *et al.* (2003) and Busacker and Kasehagen (2012).

⁶Such as Verropoulou *et al.* (2002).

Results are more conflicting when it comes to age at moving. In their review of associations between residential mobility and behavioral and emotional problems, Jelleyman and Spencer (2008) found particular evidence for a negative effect if the child was in school age. Rumbold *et al.* (2012) identified a sensitive period before two years of age (but not for the age periods 2-5 or 5-9 years) where residential mobility was associated with detrimental effects on mental health in later childhood. Haveman *et al.* (1991), studying high school completion, found moves to be most harmful if the child was 4-7 years or 12-15 years old, whereas Myers (1999) concludes that adolescence appears to be the age when the effect of migration on social integration is most pronounced.

In summary, research on childhood mobility has given somewhat ambiguous results. A possible reason for this is that moving affects children differently. Verropoulou *et al.* (2002) conclude that 'geographic mobility seems to be a heterogeneous experience, with heterogeneous outcomes'. This is confirmed also in other studies. Tucker *et al.* (1998) found that school lives of children who moved frequently were not significantly harmed as long as they resided in families in which both parents were present; for children in other family structures, any move was associated with an adverse school life. Oishi and Schimmack (2010) saw a negative association between residential moves and well-being among introverts but not among extroverts. Likewise, Long (1975) found that frequent long-distance movement was associated with an increased likelihood of enrolment below the modal grade, except for children of college graduates.

Another possible reason for the ambiguous results is differences in research designs. Most of the quantitative research on children and residential mobility uses ordinary regression analyses, controlling for various observed variables – variables that differ somewhat between the analyses. Access to data that enables a control for unobserved family characteristics is, however, rare. One exception is Gasper *et al.* (2009), who use random effects models to study effects of residential mobility on adolescent delinquency. Their results show that mobility and delinquency are spuriously related: Youths who move are more likely to be delinquent, but this is explained by their characteristics, not by their higher mobility.

3. Data and methods

In this study, we use a linked data set from various Norwegian registries encompassing the entire population. This has several advantages. First, we do not have to handle problems that are typical for sample surveys, like missing responses and selection bias. Second, we are able to draw a broad picture of the associations between childhood mobility and several aspects of later adult life. Third, the large

data set makes it easier to study various subgroups separately. Finally, it makes it possible to supplement the traditional logistic regression analyses with sibling fixed-effects models, which also controls for unobserved family-specific characteristics that do not vary between siblings.

Data sources

We have used detailed registry data covering the entire Norwegian population through December 2008, and linked them to data from four other sources by means of the personal identification number assigned to everyone who has lived in Norway after 1960.

For children born 1965-1980, the *Norwegian Population Register* provided information on date of birth, death or migration, dates of moves between Norwegian municipalities and dates of birth of all children and their parents. The latter allows us to identify early parenthood, defined as becoming a parent before age 20. Also parents' marital status is obtained from this registry, available from 1970 onwards. For children born 1965-1969, having parents who were married in 1970 and onwards is coded as having married parents through childhood. Unique family numbers enable us to link information on children to that of their mothers and fathers (and sisters and brothers), thus obtaining a dataset comprising demographic information on complete birth cohorts of children born 1965-1980 in Norway and their parents and siblings.

Children's educational levels are extracted from the *Norwegian National Education Database*, complete from 1970. In total, educational specifications are lacking for less than one per cent of the individuals. Among fathers, 1.9% lack educational status while the corresponding value among mothers is 0.8%. Exclusion of individuals with missing educational attainment rendered identical results, and these individuals are thus kept in the study cohort and categorized with low education. We define the outcome variable *high school drop out* as not having completed high school during the follow-up period.⁷

The *Norwegian Directorate of Taxes* provides information on yearly gross labor earnings from 1967 onwards, and information on children's earnings at age 28 have been extracted and categorized in percentiles by birth year. In this study, income is defined as gross labor earnings including labor related benefits (such as sick leave benefits). We define an outcome variable *low income* as belonging

⁷This means that all individuals are followed to at least age 28. Very few non-immigrant Norwegians complete high school after this age.

to the lowest sixth of the distribution at age 28. Likewise are yearly statistics on parents' incomes when the children were 10 years old categorized in percentiles by calendar year. Persons with missing income are coded as having no income.

Cause-of-death for children who died between age 15 and 28 is obtained from the *Cause-of-death registry*, complete from 1963. The coding is based on various versions of the International Classification of Diseases (ICD-6 through ICD-10), depending on year of death. We focus on three broad categories of causes-of-death: Accidents, suicide and substance abuse related deaths. A specification of the ICD-10 codes comprising the respective categories is included in a footnote in Table 1.

Information on cervical cancer is drawn from the *Cancer Registry of Norway*, which has registered all cancer diagnoses nationwide since 1953. Mandatory reporting from clinicians, pathologists, and death certificates ensure quality and completeness (Larsen *et al.*, 2009).

Approval to conduct the study has been provided by the Ethics Committee for Medical Research in Norway, and the linkage using the personal identification numbers has been performed by Statistics Norway. The data available for research did not include the real personal identification number, only the same random number for each individual.

Samples

Altogether, we started out with 967 151 Norwegian-born children (51% male), for whom all childhood moves (0-18 years) between Norwegian 420-460 municipalities (the number of municipalities has varied through the study period) has been recorded. We have linked children to their mothers (complete linkage) and fathers (98.9% linked, i.e. fathers were not found for 11 109 children) through unique family identification numbers, and parental characteristics are included in the analyses as control variables. As we use logistic regression models to examine the association between moves and adverse outcomes at or before specific ages, we have excluded individuals who emigrated or died prior to these ages. We are thus left with 943 821 children in the analyses of early mortality (between age 15 and 28), 940 008 children in the analyses of high school completion and early parenthood, and 923 602 children in the analyses of income level at age 28. For cervical cancer, we are left with 458 237 women alive after age 18.

The distributions of outcomes for these four different samples are shown in Table 1. The distribution across covariates is virtually identical across the different samples, and is shown for one of the samples in Table 2.⁸

In sibling fixed-effects models, siblings are linked to one another through their mother. These analyses include all children for whom we could identify at least one sibling born in the period 1965-1980.⁹

Methods

We analyze the data using two different methods: Traditional logistic regression models and logistic regression models with sibling fixed effects. In different ways, these two methods aim at isolating the effect of moving from the effect of other factors.

Logistic regression analyses

To estimate probabilities for an adverse outcome y (i.e. high school drop-out, low income at age 28, early mortality, early parenthood and cervical cancer), we use logistic regression models controlling for observable characteristics of the child and his or her family:

$$(1) \quad Pr(Y_i=1) = \Lambda(\alpha_0 + \eta M_i + \alpha X_i)$$

where

Y_i ~ Dichotomous outcome variable (indicator that child i is a high school drop-out, has a low income, died before age 29, became a parent before age 20 or had cervical cancer before age 29)

M_i ~ Variable capturing moves during child i 's childhood

X_i ~ Vector of characteristics of child i and of his or her parents

First we examine the effect of the *number* of residential moves during childhood (age 0-18 years). In Table 3 and Table 4, we let M include three categories: Never moved, moved one to three times, or

⁸The distributions were virtually identical across the slightly different samples cohorts. The distributions not shown are, however, available upon request.

⁹Altogether 56 718 children without siblings (5.9%) were identified in the complete cohort. Further, 174 048 children did not have siblings born within the period 1965-1980, and were thus also excluded from the fixed-effects analyses. Due to the nature of these models, siblings with similar outcomes are also excluded in the analyses. The respective number of children included in the different fixed-effects models is noted in the relevant tables.

moved four times or more. In Figure 2 (upper panel), a finer categorization is shown (one through six moves are shown separately, whereas seven or more moves are grouped together). Second, the *timing* of moves is examined to assess whether moves are more harmful at certain ages than at others. We use moves during age 0-6, 7-12, 13-15 and 16-18 which correspond to school periods in Norway. These analyses on the effect of age are restricted to include children who have moved only once (compared with children who have never moved) to avoid confounding age at moves with number of moves (Table 5, Table 6 and upper panel in Figure 3).

All models are adjusted for the child's gender, birth cohort, number of siblings and order among siblings, the mother's education, her income and employment status at age 10 of the child, her age at birth of the child and whether or not she remained married through the child's first 18 years¹⁰, as well as the father's education and income at age 10 of the child. Categorizations and estimates of control variables are shown in Tables 2 and 3. Lastly, we added interaction terms to the models to assess possible effect modifications, and undertook stratified analyses to explore probabilities for adverse outcomes for subgroups of movers based on sociodemographic characteristics.

Sibling fixed-effects models

The data also make it possible to set up a sibling fixed-effects logit model (Chamberlain, 1980) to control for any omitted variables capturing time-invariant, family-specific characteristics. This allows us to control for many potentially confounding unobserved factors that we are unable to capture by the ordinary cross-sectional logistic regression models described above, such as variables related to parents' relocation decision, the parents' personalities, their attitude towards their children's welfare, family atmosphere, etc. This model sweeps out any time-invariant characteristics – observable or not – of the siblings in the same family by taking deviations from the family means. We thus include only the covariates that vary between children within families, i.e. the child's gender, birth cohort and order among siblings, the mother's income and employment status at age 10 of the child, her age at birth of the child and whether or not she remained married through the child's first 18 years, as well as the father's income at age 10 of the child.

Table 4 portrays the modeled results by number of moves, whereas Table 6 depicts the results by age group. For comparison, the results from the ordinary logistic regression model and the sibling fixed-

¹⁰If marital status changes as a consequence of an earlier residential relocation, it is an outcome variable that we should not control for. However, our results remained unaffected or became stronger if we dropped this control from the models.

effect models are shown side by side in Figure 2 (number of moves) and Figure 3 (age group for moves).

4. Results

Descriptive statistics

Descriptive statistics of the total number of moves and the ages at moving is provided in Figure 1. Further, outcome and covariate distributions are portrayed in Tables 1 and 2.

Altogether, 40% of the children have moved once or more between municipalities during childhood. A total of 19% have moved only once, 11% have moved twice, and 11% have moved three times or more. As can be seen from Figure 1, moving is most common among the youngest children, and the majority of moves occur prior to elementary school start.

Table 1. Distribution of outcomes by whether or not the individuals moved during childhood (age 0-18)

	Never-movers		Ever-movers	
	N	%	N	%
<i>Educational attainment (N=940 008)</i>				
Not completed high school	124 954	22.3	94 169	24.9
Completed high school	436 358	77.7	284 527	75.1
<i>Income age 28 (N=923 602)</i>				
Low income	80 778	14.6	70 183	18.9
Higher income	472 441	85.4	300 200	81.1
<i>Parenthood < age 20 (N=940 008)</i>				
Yes	28 421	5.1	26 546	7.0
No	532 891	94.9	352 150	93.0
<i>Cervical cancer < age 29 (N=458 237)</i>				
Yes	96	0.0	99	0.1
No	270 392	100.0	187 650	99.9
<i>Early death (age 15-28) (N=943 821)</i>				
Yes	4 521	0.8	3 653	1.0
Suicide ¹	991	0.2	893	0.2
Drug abuse/related mental illnesses ²	261	0.0	355	0.1
Accidents ³	2 962	0.5	2 338	0.6
No	558 437	99.2	377 210	99.0

¹ Intentional self-harm comprised ICD-10 codes X60-X84, and was renamed suicide. ² Mental and behavioral disorders comprised ICD-10 codes F00-F99. On closer examination, it turned out that the majority of the deaths in this category were related to substance abuse (F10-F19), and the category was thus renamed substance abuse related deaths. ³ Accidents comprised all deaths within the ICD-10 codes V01-X59.

As shown in Table 1, around 25% of movers have not completed high school, compared with around 22% of those who never moved. Likewise, 19% of movers belong to the lowest income group at age 28, whereas this is the case for 15% of non-movers. Movers become to a larger extent parents at an early age (7% vs. 5%). They are slightly more likely to be diagnosed with cervical cancer, another

indication of early sexual activity, although the incidence is very low. Further, early deaths are slightly more common among movers, although also this is a fairly rare event. Particularly, the movers are over-represented in deaths due to drug abuse or related mental illness, with almost two times higher incidence than non-movers.

Figure 1. Residential mobility among children born in Norway 1965-1980, by age.

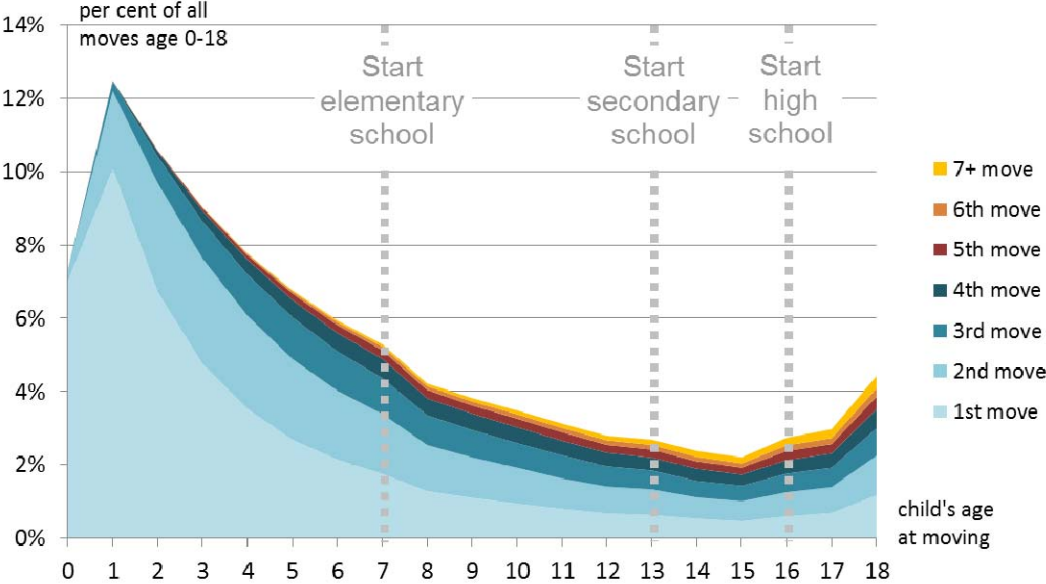


Table 2 displays covariate characteristics, and shows that compared with children who never moved, the movers more often have younger mothers. Their mothers are also slightly less likely to be employed. We did not undertake analyses of fathers’ employment as this pertains to around 96%.¹¹ Most strikingly, whereas 77% of the non-movers have parents who remain married throughout their childhood this is true for only 55% of the movers. On the other hand, compared with the non-movers, movers more frequently have mothers and fathers with a higher education. In line with this, the income distribution of children from moving and non-moving families differ somewhat, with movers having both a higher proportion of mothers and fathers in the highest as well as in the lowest income group. The mean family income is slightly higher for movers than for non-movers (not shown). Lastly, children who have moved are more frequently the oldest child in the family, whereas non-moving children are more often the youngest child.

¹¹ Around 3% of fathers of non-movers were not employed when their child was 10 years old, whereas this was the case for around 5% of fathers of movers.

Table 2. Characteristics of children and their parents by whether or not the children have moved between age 0 and 18 years.^a

	Never-movers % (N=561 312)	Ever-movers % (N=378 696)
<i>Children</i>		
<i>Gender</i>		
Male	48.1	49.5
Female	51.9	50.5
<i>Year of birth</i>		
1965-70	41.7	40.4
1971-75	31.2	32.9
1976-80	27.1	26.7
<i>Number of siblings</i>		
0	5.0	6.6
1	36.3	39.3
2	34.1	33.9
3+	24.6	20.2
<i>Number among siblings</i>		
Oldest	33.1	51.0
Middle	23.3	21.3
Youngest	43.6	27.7
<i>Parents' characteristics</i>		
Mother higher education	15.5	25.5
Mother works ^b	75.9	73.8
<i>Mother's age at birth</i>		
< 20 years	5.3	10.0
20-24 years	30.0	41.3
25-34 years	52.7	44.3
35+ years	12.0	4.5
Mother married through childhood	76.6	55.1
Father higher education	17.5	32.9

^aThe figures are for the cohort used in analyses of high school completion and early parenthood (alive through age 19). Slightly different cohorts were used for analyses of early death (alive through age 14, N= 562 958 never-movers and 380 863 movers) and income (alive through age 28, N= 553 219 never-movers and 370 383 movers). The characteristics distributions are virtually identical in the three cohorts. ^bAt age 10 of child.

Multivariate analyses

The effect of the number of moves

Multivariate logistic regression analyses show that children who have moved during childhood have higher odds of experiencing all of our adverse outcomes, compared with children who have not moved. Moreover, the odds ratios nearly linearly increase with the number of moves (Table 3 and Figure 2, upper panel). For instance, the odds ratio (OR) of completing high school was 1.21 (95%

confidence interval (CI) 1.19-1.22) for children moving one to three times during childhood compared with never-moving children. This OR increased to 1.64 (CI 1.61-1.68) for children who have moved more than three times. Similarly, the OR of experiencing early parenthood increases from 1.35 (CI 1.33-1.38) for children moving one to three times to 1.84 (CI 1.78-1.91) for children moving more than three times. For having low income the increase in OR was from 1.16 (CI 1.15-1.18) to 1.45 (CI 1.42-1.49), and for early mortality the increase was from 1.17 (CI 1.12-1.23) to 1.31 (CI 1.20-1.44). Results from the sibling fixed-effects model show the same univocal pattern for education, income and early parenthood (Table 4 and Figure 2, lower panel), although for early mortality the results were less significant and not monotonically increasing with the number of moves.

Figure 2. Associations between moving and given outcome, by number of moves during childhood. Odds ratios ('Never moved' = ref). Traditional logistic regression models (top) and sibling fixed-effect models (bottom). All columns with a figure show results significant at the 0.05 level

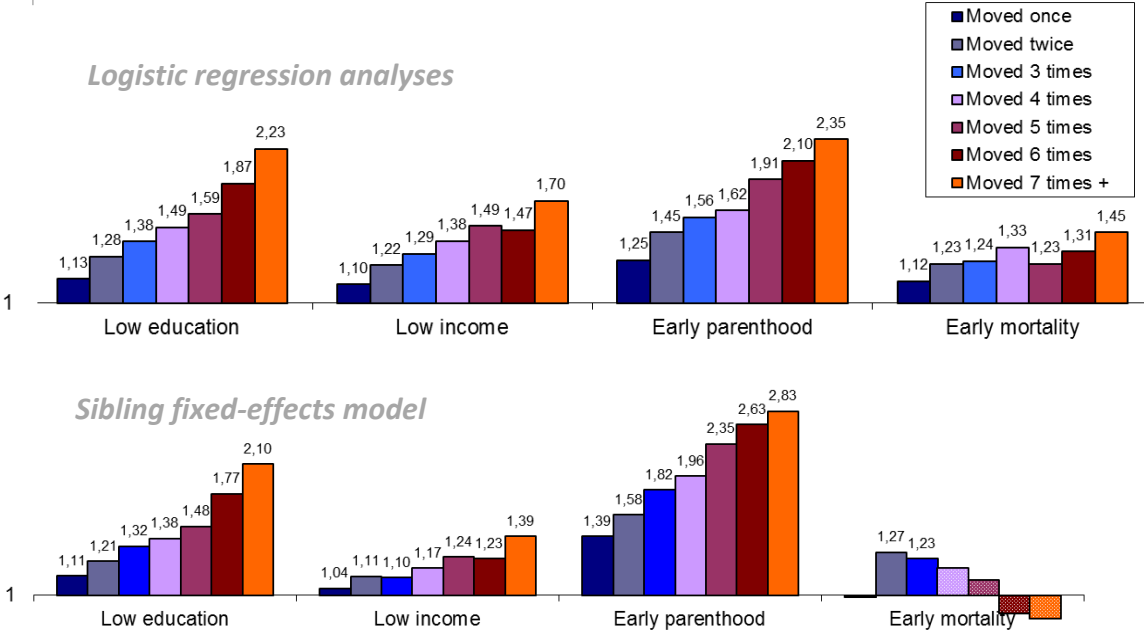


Table 3. Risk of adverse outcomes by number of moves. Odds ratios. Standard logistic regression model

	Low education N=(940 008)			Low income N=(923 602)			Early parenthood N=(940 008)			Early mortality N=(943 821)		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Never moved	ref			ref			ref			ref		
1-3 moves	1.21	1.19 1.22		1.16	1.15 1.18		1.35	1.33 1.38		1.17	1.12 1.23	
4+ moves	1.64	1.61 1.68		1.45	1.42 1.49		1.84	1.78 1.91		1.31	1.20 1.44	
Child												
Boy (girl=ref)	1.21	1.19 1.22		0.50	0.49 0.51		0.23	0.22 0.23		2.98	2.83 3.14	
1 sibling (only child=ref)	0.72	0.71 0.74		0.81	0.79 0.83		0.95	0.90 0.99		0.83	0.75 0.92	
2 siblings	0.80	0.78 0.82		0.82	0.80 0.85		1.33	1.26 1.39		0.87	0.78 0.96	
3 siblings	1.02	0.99 1.04		0.90	0.88 0.93		1.98	1.88 2.08		0.93	0.84 1.04	
Mid-child(ren) (oldest/only child = ref)	1.50	1.47 1.52		1.04	1.02 1.06		1.50	1.46 1.54		1.30	1.21 1.40	
Youngest child	1.75	1.73 1.78		1.04	1.02 1.06		1.55	1.50 1.59		1.32	1.23 1.40	
High education (low education=ref)	0.46	0.45 0.46		1.34	1.31 1.36		0.54	0.52 0.55		0.95	0.89 1.02	
Employed (not employed=ref)	0.86	0.85 0.87		0.84	0.83 0.85		1.01	0.99 1.04		0.91	0.86 0.96	
Income	0.99	0.99 0.99		0.99	0.99 0.99		0.99	0.99 0.99		1.00	0.99 1.00	
Mother												
Married through childhood (not=ref)	0.60	0.59 0.60		0.75	0.74 0.76		0.69	0.68 0.71		0.69	0.66 0.73	
Aged 20-24 years at child's birth(<20=ref)	0.74	0.73 0.76		0.97	0.94 0.99		0.64	0.62 0.66		0.84	0.77 0.92	
Aged 25-34 at child's birth	0.58	0.56 0.59		1.05	1.02 1.07		0.41	0.40 0.43		0.80	0.74 0.88	
Aged 35+ at child's birth	0.48	0.47 0.49		1.14	1.11 1.18		0.34	0.32 0.35		0.80	0.72 0.90	
Father												
High education (low education=ref)	0.43	0.42 0.44		1.26	1.24 1.28		0.51	0.50 0.53		0.82	0.77 0.87	
Income	0.99	0.99 0.99		0.99	0.99 0.99		0.99	0.99 0.99		0.99	0.99 0.99	

¹The child's year of birth was also controlled for.

Table 4. Risk of adverse outcomes by number of moves. Odds ratios. Sibling fixed-effects model

	Low education (N=236 329)			Low income (N=213 334)			Early parenthood (N=97 366)			Early mortality (N=15 358)		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Never moved	ref			ref			ref			ref		
1-3 moves	1.15	1.11 1.18		1.06	1.03 1.09		1.46	1.39 1.54		1.07	0.95 1.21	
4+ moves	1.37	1.29 1.45		1.17	1.10 1.24		1.95	1.78 2.14		1.01	0.81 1.25	

Covariates controlled for: The child's gender, birth cohort and number among siblings, the mother's income and employment status at age 10 of the child, her age at birth of the child, whether or not she remained married through the child's first 18 years, and the father's income at age 10 of the child.

The effect of age

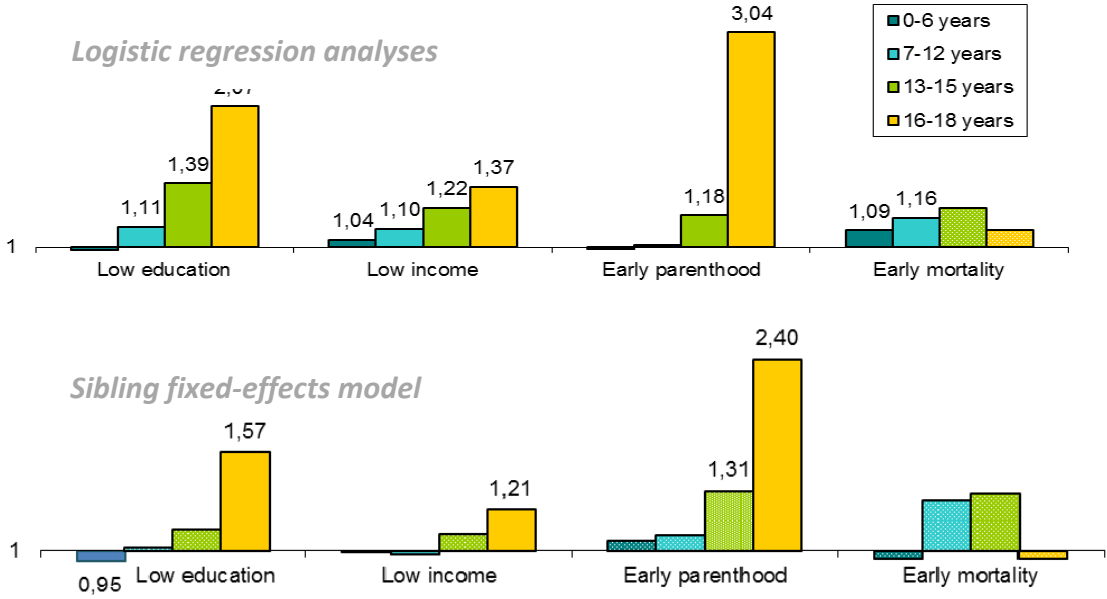
We also observe a strong and positive relationship between age at moving and risk for adverse outcomes. As shown in Table 5 and Figure 3 (upper panel), the logistic regression analyses indicate that residential mobility prior to entering elementary school (age 0-6) does not have considerable long-term effects, whereas moves during high school years (age 16-18) appear to be risk factors for low education, low income and early parenthood. Compared with children who have never moved, the odds ratio is 2.07 (CI 2.00-2.15) for children who moved at age 16-18 years. For low income, this OR is 1.37 (CI 1.31-1.42), and for early parenthood it is 3.04 (CI 2.91-3.18). For early mortality, there seems to be an increased risk among those who moved before age 13, but for higher ages there appears to be no significant impact.

Also here, the sibling fixed-effects model shows the same trend: Teenage moves seem to be a particular risk factor for low education, low income and early parenthood. For early mortality, there are few observations (N=10 252) and no significant results.

The results described above are based on analyses of children who moved only once during childhood. We have also performed similar analyses for all moves of all children, by age group for each move. These analyses show the same trend, only with more significant results (not shown). However, this approach can make it hard to disentangle the effect of age and the effect of number of moves, and is thus not discussed further but is available upon request.¹²

We have also done a separate analysis to investigate whether moves are less harmful when they happen in connection with natural school transitions. However, no clear patterns were discovered (not shown, available upon request).

Figure 3. Associations between moving and given outcome, by age at moving (for children who moved once during childhood). Odds ratios ('Never moved' = ref). Logistic regression models (top) and sibling fixed-effect models (bottom). All columns with a figure show results significant at the 0.05 level



¹²The results are available upon request. As a robustness check, we also examined the outcome patterns for age at moves for children who moved twice, three or four times versus those who moved only once. The patterns were similar, although the point estimates varied slightly (also available upon request).

Table 5. Risk of adverse outcomes by age at moving for children who moved once during childhood. Odds ratios. Standard logistic regression model.

	Low education (N=733 928)			Low income (N=722 526)			Early parenthood (N=733 928)			Early mortality (N=736 310)		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Never moved	ref			ref			ref			ref		
0-6 years	0.99	0.97	1.00	1.04	1.02	1.06	0.99	0.96	1.02	1.09	1.02	1.17
7-12 years	1.11	1.08	1.14	1.10	1.07	1.14	1.01	0.96	1.07	1.16	1.03	1.31
13-15 years	1.39	1.32	1.47	1.22	1.15	1.30	1.18	1.08	1.29	1.23	0.98	1.53
16-18 years	2.07	2.00	2.15	1.37	1.31	1.42	3.04	2.91	3.18	1.10	0.92	1.31

Covariates controlled for: The child's gender, birth cohort, number of siblings and number among siblings, the mother's education, her income and employment status at age 10 of the child, her age at birth of the child, whether or not she remained married through the child's first 18 years, the father's education and his income at age 10 of the child.

Table 6. Risk of adverse outcomes by age at moving for children who moved once during childhood. Odds ratios. Sibling fixed-effects model

	Low education (N=168 652)			Low income (N=144 065)			Early parenthood (N=64 165)			Early mortality (N=10 252)		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Never moved	ref			ref			ref			ref		
0-6 years	0.95	0.92	0.99	0.99	0.95	1.04	1.04	0.97	1.12	0.97	0.82	1.14
7-12 years	1.02	0.94	1.10	0.98	0.90	1.07	1.07	0.93	1.25	1.26	0.90	1.77
13-15 years	1.10	0.98	1.23	1.08	0.95	1.22	1.31	1.08	1.60	1.30	0.80	2.11
16-18 years	1.57	1.47	1.68	1.21	1.12	1.30	2.40	2.18	2.64	0.97	0.71	1.32

Covariates controlled for: The child's gender, birth cohort and number among siblings, the mother's income and employment status at age 10 of the child, her age at birth of the child, whether or not she remained married through the child's first 18 years, and the father's income at age 10 of the child.

Cervical cancer and causes of death

As cervical cancer incidence may be an indicator of early unsafe sexual activity, and different causes of death may elaborate more on early mortality, we conducted separate analyses for these factors (not shown in tables). For cervical cancer, the logistic regression model shows that those who have moved 1-3 times, have a slightly higher risk than the never-movers (OR 1.39, CI 1.02-1.90), whereas for the most frequent movers (4+ moves) the risk is quite high (OR 1.95, CI 1.17-3.26). The risk is particularly elevated for the ones who have moved during high school age (OR 2.68, CI 1.39-5.17), whereas for the other age groups the results are not significant. The risks of accidents, suicide and drug abuse or related mental illnesses increase with the number of moves. The highest increase is for drug abuse and related mental illnesses (OR 1.51, CI 1.26-1.81 for those who have moved 1-3 times, and OR 2.48, CI 1.92-3.19 for the most frequent movers). The analyses of age at moving are ambiguous: Those who moved at age 0-6 have a slightly and significantly higher risk of dying from accidents or suicide, whereas moving after age 13 is associated with higher risk of death from drug abuse or related mental illnesses (OR 2.06, CI 1.09-3.89 for moves at age 13-15 and OR 2.30, CI 1.42-

3.73 for moves at age 16-18). The sibling fixed-effects model gives no significant results in these analyses, apart from one: Mortality from drug abuse or related mental illnesses is significantly higher (OR 2.10, CI 1.07-4.13) for those who have moved 4 times or more.

Differences across subgroups

To assess possible effect modification, we have added interaction terms between number of moves and all other covariates. Of particular interest is whether moves associated with parental break-ups are more harmful than moves involving the entire family, as this has been suggested previously (see for instance Tucker *et al.*, 1998). Interaction terms do not, however, show such a pattern. Additional stratified analyses based on mothers' marital status through childhood show overlapping confidence intervals for the majority of the outcomes (see Table A). The only exception here is that early parenthood is somewhat more common among the most frequent movers with married parents, whereas cervical cancer is more common among women who have experienced a parental break-up.

Another interesting finding is that frequent moves have a different impact on children depending on whether their parents are college educated or not. For low income and high school drop out, the differences between movers and stayers are substantial for children of parents without college education. For children with higher educated parents, however, we found no significant disadvantages for movers on these outcomes. Beyond that, we observe no consistent pattern of effect modification for different combinations of interaction terms (not shown, available upon request).

4. Discussion

As mentioned, there are reasons to believe that moving can be beneficial for a child, as well as explanations for why it might be detrimental. Our results confirm that, in general, children who move a lot are worse off than the ones who stay. These results remain even after controlling for a number of observable characteristics as well as after controlling for time-invariant non-observable family characteristics in sibling fixed-effects models. In general, more moves and later moves appear to increase these risks.

The results from the traditional logistic regression model are very similar to the results from the sibling fixed-effects model, which exploited within-family variation between movers and non-movers. This suggests that the two approaches in our case eliminate many of the same biases.

Number of moves and age at moving

Why could moving be detrimental? Loss of social capital may be one explanation; broken ties with significant others may have lasting adverse effects on a child. Social capital theory distinguishes between ‘inter-family’ and ‘intra-family’ networks. Since our results suggest that moving is most harmful for adolescents who normally have large external networks, and not particularly harmful for children below six years, this may indicate that the intra-family ties are not so severely affected by residential relocation. This conclusion is in line with South *et al.*(2005), who studied residential mobility and early sexual activity and found ‘no evidence that the quality of parent-child relationship or parents involvement in their children’s social networks can explain the higher rates of premarital sex among mobile youth’.

Another factor that may explain why moving is more harmful for teenagers than pre-school children is that adolescence may be a period of many stressful events. Moving can add one more stressful factor, and could make the cumulative stress too large to handle.

Also, in the teenage period, friend groups may be more settled. This could increase the risk for a newcomer of ending up with no friends or bad friends.

The increasing risk by number of moves may be explained by several factors. Loss of social capital, reduced coping and psychological distress may be no easier at each new move, no matter how many previous times the child has moved. Our results indicate neither a diminishing effect of moving due to for instance ‘inoculation’ against the stressors of moving, nor a threshold under which moving has no adverse effect.

The outcomes

Our results about the adverse relationship between residential mobility and *education* are in line with several other studies (see for instance Scanlon and Devine 2001, Astone and McLanahan 1994, Crowder and Teachman 2004, Temple and Reynolds 1999).

The association between childhood residential mobility and *adult income* has not, to our knowledge, been extensively studied before.¹³

¹³Ziol-Guest and Kalil (2013) are working on a study which examines the relationship between childhood moves and adult earnings, work hours and education. Their results seem to confirm our findings regarding frequency of moves, but not age at moving.

Our results are also in line with some previous research on *early parenthood* (Stack 1994, Crowder and Teachman 2004, South *et al.*2005). Early parenthood may be prevented in three ways, either by abstaining from sex, by practicing safe sex or by an induced abortion. Our findings show that for frequently moving children, early parenthood is more common among those with married parents, whereas cervical cancer is more common among those who have experienced a parental break-up. Further research is clearly needed to distinguish possible mechanisms or underlying causes.

Other studies on effects on *mortality* have also found associations between moving and higher mortality risks, at least for some groups (Oishi and Schimmack, 2010). Although there have been studies on the relation between childhood moves and risks of suicidal behaviors (Juon and Ensminger 1997, Dong *et al.*2005), major depression (Gilman *et al.*,2003) and drug use (DeWit, 1998), no other study has compared moving's association with different types of mortality. Our results show that moving, and in particular moving in adolescence, increases the risk of death from drug abuse (or related mental illnesses) more than it increases the risk of suicide or death from accidents. This may indicate that residential mobility promotes risky behavior in some areas more than in others.

Methodological considerations, limitations and future research needs

The validity and completeness of data on residential moves across Norwegian municipalities is assumed to be good for families with children, as residential notifications to the state are required to gain access to kindergartens and public elementary and middle schools. On the other hand, also moves within municipalities may entail changing kindergarten and/or school, but such moves are not available in our data. Some of the never-movers in our study may thus have moved within their municipalities, or may even have changed kindergarten or school without changing residence, and may have had some similar experiences to that of those classified as 'movers'. This could lead to an underestimation of possible adverse effects of childhood relocations. Unfortunately, we cannot account for this here.¹⁴

Although our methods enable us to control for a wide range of observable and non-observable characteristics between the movers and the stayers, there may still be differences between the two groups that we have not controlled for. These potential differences may be hypothesized to be largest

¹⁴ Moves outside of Norway are not recorded for those who move to a different country. Such moves are thus counted as only two – one when you move from Norway to a different country and one when you return to Norway. One might, however, have moved multiple times in between, but this would not be recorded and could thus result in an overestimation of the effect of multiple moves. Fortunately, this pertains to a limited number of Norwegian born children, so it is unlikely that it will have influenced our result in any way.

for the oldest age groups, where moving is a rarer event (as shown in Figure 1). For the adolescents, i.e. persons aged 16 to 18, some other considerations should also be kept in mind: First, for the early unsafe sex and to some extent early mortality, the outcome is measured relatively short time after the moving. That makes it difficult to isolate the effect of age at moving from the effect of duration since moving. Second, around half of the moves of these adolescents are moves where they leave their parental homes.¹⁵ Such moves, independent of their parents, could have a different impact than moves that are undertaken together with the family. However, a robustness check where we examined the estimates for movers who moved with and without their parents showed that the effects were fairly similar with regards to the outcomes studied here, and it should thus not have biased our results significantly.

To ensure complete relocation histories of the children, only Norwegian-born children were included, as we do not know the foreign-born children's moving history before entering Norway. In the late 1990s and the early 2000, around 3% of Norway's inhabitants born in the period 1965-1980 were born outside the country. Although the effects may be different depending on one's country of origin, our results nevertheless pertain to the large majority of young adults in Norway.

Some individuals may still be enrolled in educational institutions at age 28. For these individuals, income will be underestimated and not representative of their future income potential. To help capture income potential, we have tried including educational level as a control variable in models on income. The results were not substantially different in models with and without control for education, which can be taken to indicate that the exact age at which we measure income is not seriously affecting our results.

An important limitation of the study is that we do not know why families move.

Movers are a large and heterogeneous group, and there are myriads of reasons why they move. Some moves may be motivated by the hope that the family will get a better life in a different municipality, and thus entail relocation to a *better* residential area, school and labor market. Other moves may be different. For instance, they may result from a need to reduce living costs or seek employment opportunities, for example due to parental health problems or divorce. Further research appears warranted to distinguish possible differential effects based on the motivation behind the relocations.

¹⁵ Moves children undertake on their own after age 16 to go to high school, college or universities, are not supposed to be recorded as residential moves for the cohorts included here as they gain a 'student status' with their permanent home address being that of their parents.

Norway also has a fairly compressed wage structure, relatively generous welfare benefits to economically challenged families, and thus a lower degree of social inequality than many other countries.¹⁶ Moreover, there are virtually no private primary schools in Norway, and almost all public kindergartens and schools are considered of similarly high quality, irrespective of geographic location. The adverse effects of negative experiences may thus be expected to be mitigated somewhat by these societal structures. The fact that our findings on relocations in childhood nevertheless is associated with adverse outcomes, makes it plausible that these effects are even more pronounced in societies and cultures with less welfare security and a larger degree of social inequality.

5. Summary

In this study, we have aimed at addressing three questions:

- Is childhood moving harmful?
- What effect does the **number** of childhood moves have?
- At **what age** does moving impact most strongly?

Using register data on complete cohorts of children born in Norway between 1965 and 1980 and all their childhood moves (age 0-18) between Norway's municipalities, we have found that childhood residential mobility seems to increase the risk of not completing high school, of having low income at age 28, of early unsafe sex and parenthood before age 20 and of death between age 15 and 28, particularly death due to drug abuse or related mental illnesses. Even after controls for various observable and non-observable differences between movers and non-movers, moving remains adversely associated with these outcomes.

We have also found that each additional move during childhood means, in general, increased risks for all the outcomes mentioned above. The relative risk increases monotonically with the number of childhood moves, indicating no diminishing risk or threshold under which moving entails no adverse risk.

Finally, age at moving seems to be crucial. While children who moved before elementary school do not have severe long-term outcomes compared with children who did not move at that age, children

¹⁶ The United States Central Intelligence Agency (CIA) states that the Gini coefficient for Norway was 25.0 (2008), as compared with for instance 45.0 (2007) for the United States.

who moved during highschool years perform significantly worse in adulthood than children who did not move during high-school.

To the extent that our findings reflect causal effects, parents should take this information into account if they consider voluntary relocations, to better prepare for smooth transitions. The information might also be helpful for teachers as well as health and welfare workers in schools and youth clinics who should be aware that teenagers might be extra vulnerable in association with relocations.

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Appendix

Table A. Risk of adverse outcomes by number of moves, stratified by mother's marital status through childhood. Odds ratios. Standard logistic regression model

	Mother married throughout childhood			Mother not married throughout childhood		
	OR	95% CI		OR	95% CI	
Low education (never moved=ref)						
1-3 moves	1,21	1,19	1,23	1,20	1,18	1,22
4+ moves	1,59	1,53	1,66	1,65	1,61	1,70
Low income (never moved=ref)						
1-3 moves	1,17	1,15	1,19	1,15	1,13	1,17
4+ moves	1,44	1,39	1,50	1,44	1,40	1,49
Early parenthood (never moved=ref)						
1-3 moves	1,44	1,40	1,47	1,25	1,21	1,28
4+ moves	1,94	1,82	2,07	1,75	1,68	1,83
Cervical cancer (never moved=ref)						
1-3 moves	1,09	0,72	1,64	2,00	1,19	3,37
4+ moves	1,58	0,62	4,01	2,63	1,34	5,14
Early mortality (never moved=ref)						
1-3 moves	1,16	1,08	1,23	1,14	1,06	1,22
4+ moves	1,30	1,10	1,55	1,27	1,14	1,41

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