Do adolescent births and abortions mediate the pathway from parents' to own socioeconomic position?

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Abstract

Studies have shown one's socioeconomic status is associated with that of their parents in Finland and elsewhere. However, few studies examine the extent to which teen fertility behaviour mediates this association. Instead, most studies on teenage motherhood focus on the causal association between early childbearing and socioeconomic position. This study shows that a part of the association between parents' and individuals own socioeconomic status in Finland is due to fertility behaviour in adolescence even when taking into account that teenage mothers often come from less advantaged backgrounds than those who postpone childbearing. Unlike most previous research on the topic, this paper also examines the socioeconomic outcomes of those who had an abortion as a teenager and shows that it did not mediate the association from parents' to own socioeconomic status. A set of register data of three cohorts of Finnish women (N=274,908) was analysed using a recently developed Karlson-Holm-Breen mediation method. Up to nine percent of the total association between parents' socioeconomic status and own education was explained by having had a teen birth, but teen abortions were not important mediators. Furthermore, educational attainment and further births in early 20s were important predictors of these women's income level and probability of unemployment at age 30. These associations may be due to accumulation of disadvantage and unobserved characteristics affecting both timing and outcomes of pregnancies and educational attainment. In order to break the cycle of disadvantage, policy-makers should help young mothers in completing education.

Keywords: *teenage pregnancy; induced abortion; Finland; mediation; register data; intergenerational transmission*

Introduction

Studies in many countries have shown that there is an association between having become a teenage mother and low socioeconomic position later in life (Hoffman, 1998; Olausson et al., 2001; Lawlor and Shaw, 2002; Paranjothy et al., 2009; Taylor, 2009; Kane et al., 2013; Assini-Meytin and Green, 2015). Research on this topic often focuses on establishing whether there is a causal link in between having experienced a teen birth and women's socioeconomic outcomes (e.g. Geronimus and Korenman, 1992; Hoffman et al., 1993; Kane et al., 2013; Lee, 2010). The task is difficult, as teenage pregnancies are not randomly distributed within the population. Teen mothers typically come from less advantaged backgrounds than those who postpone their motherhood, and thus they would have had a high likelihood of low socioeconomic status even if they had not become young mothers.

Instead of focusing on whether entering parenthood before age 20 has a *causal* effect on later socioeconomic position, I approach the issue from a different perspective. Using an analytic strategy more familiar from the rich international literature on intergenerational transmission of socioeconomic position and its mediators[1] (e.g. Anger, 2012; Björklund and Jäntti, 2009, 2009; Blanden and Machin, 2004; Bowles and Gintis, 2002; Devine and Li, 2013; Erola, 2009; Karlson and Holm, 2011; Mood et al., 2012; Sirniö et al., 2013), I study whether having become a teen mother mediates the pathway from parents' socioeconomic status to that of the women's own in three birth cohorts of Finnish women. If such an association was found, it would indicate that becoming a young mother contributes to socioeconomic achievements of women at the population level. The study is exceptional also in that it compares teenage mothers not only to those who did not experience a pregnancy before age 20, but also to those

[1] An association between the explanatory variable of interest (parents' socioeconomic status) and the outcome (own socioeconomic status) through a third variable is called mediation or an indirect effect. 'Direct effect' is the part of the association from the explanatory variable to the outcome that does not travel through the third (i.e. the mediator) variable.

who experienced an abortion as a teenager. This provides more nuanced information than only comparing young mothers to those who did not have a child in adolescence. Among pregnant Finnish teenagers those from less advantaged backgrounds are more likely to give birth than terminate the pregnancy (Väisänen and Murphy, 2014). Thus, adolescent women who have an abortion are likely to share a range of (unobserved) characteristics which make them more likely to experience an unintended pregnancy with adolescent mothers, but are more similar, on average, in their socioeconomic backgrounds to those who had no teen pregnancy than teenage mothers.

The study uses an innovative method called Karlsson-Breen-Holm (KHB) to study mediation (see Methods section for more information). In the past KHB has been used to estimate, for instance, whether education contributes to the reproduction of social inequality in the labour market (Triventi, 2013), and school mobility (Fiel et al., 2013), but this is the first time the method is applied in a study of teen pregnancy outcomes and their association with women's socioeconomic status.

The data of the study were extracted from Finnish population registers. These data are excellent in longitudinal research of topics, which are rare or typically underreported such as teen pregnancies and abortion, due to lack of attrition, underreporting, and recall bias (see Data section for more information). However, as the data come from administrative registers, certain types of variables, such as information on attitudes or religion, are not available. Thus, the advantages of using register data lie in detailed description of events that are difficult to capture using surveys rather than in theory building or testing causal relations.

Theoretical framework

This study draws from two bodies of literature: studies of the socioeconomic position of young mothers and research on intergenerational transmission of socioeconomic position. The

possible mechanisms behind both phenomena are discussed below. As the purpose of this study is to test whether the association between parents' and own socioeconomic position is mediated by teenage births or abortions using an exceptionally reliable large-scale longitudinal dataset, rather than theory building, this section is kept concise.

Previous studies have found associations between the occupational position, education and income level of parents and their children in many countries, including the US, the UK (e.g. Björklund and Jäntti, 2009; Blanden and Machin, 2004; Devine and Li, 2013) as well as the in Finland (e.g. Erola, 2009; Sirniö et al., 2013). This may be due to, for instance, parents using their networks to make sure their children are able to enter good schools and jobs, the culture within the family encouraging children to attend education and pursue career, and parents using their financial and other resources to ensure their children will do well in socioeconomic terms (Bowles and Gintis, 2002; Goldthorpe, 2000). A part of the association from parents' to own socioeconomic status may travel through mediating factors, such as individuals' intelligence and personality (Anger, 2012; Mood et al., 2012), or parenting resources and styles (Björklund et al., 2007). The strength of the association between parents' and own socioeconomic status varies by institutional context: parents' economic resources matter more in settings where education is expensive and thus countries like Finland, where education is free of charge at all levels, typically show higher levels of social mobility than countries where education is expensive (Björklund et al., 2012).

Teenage mothers typically come from less advantaged backgrounds, end up having lower education and income, and are more likely to experience unemployment later in life than their childless peers or older mothers (Hoffman, 1998; Olausson et al., 2001; Lawlor and Shaw, 2002; Paranjothy et al., 2009; Taylor, 2009; Kane et al., 2013; Assini-Meytin and Green, 2015). The few studies that have been able to compare socioeconomic outcomes of teens who

had an abortion with those who had a birth and those with no pregnancy showed that those who had an abortion before age 20 (Fergusson et al., 2007 in New Zealand) or 25 (Olsson et al., 2014 in Australia) had better income and/or education later in life than those who had a child, but their socioeconomic achievements were lower than those who had no pregnancy in adolescence even after parents' socioeconomic characteristics were controlled for.

Distinguishing the effect of teenage childbearing or abortions from the disadvantaged position of the teenagers at higher risk of becoming pregnant is difficult, because the same factors that affect the likelihood of teenage pregnancy affect socioeconomic characteristics later in life (Hoffman, 1998; Kane et al., 2013). For instance, adolescents who perceive their chances of entering higher education low, might see starting their own family as a legitimate way of transitioning into adulthood (Smith and Roberts, 2011). On the other hand, these women may be children of young mothers and the mechanism behind early entry to motherhood may be the intergenerational transmission of age at first birth (Barber, 2001; Murphy and Knudsen, 2002). However, some studies have found a causal link from teenage childbearing to lower socioeconomic status (SES)[2] using quasi-experimental methods such as propensity score matching (e.g. Lee, 2010), sibling fixed effects (Geronimus and Korenman, 1992; Hoffman et al., 1993), or discrete factor models of treatment effect using semi-parametric maximum-likelihood estimation (Kane et al., 2013) indicating that teenage childbearing plays a causal role in reducing the chances of obtaining good education and well-paid stable employment.

Context of the study

Finland is an interesting country to study not only because of the high-quality register data available to researchers. Comprehensive family planning policies and sex education have been widely available since the 1970s (Ritamies, 1993; Kontula, 2010; Keski-Petäjä, 2012;

[2] Socioeconomic status is defined here as level of education or income, occupational status, being employed or unemployed; or a combination of these characteristics.

Sydsjö et al., 2009), generous financial and other help to families reduce the costs of childbearing (Haataja, 2006; Vikat, 2004) and parents' socioeconomic position is less strongly associated with that of the individuals' than in most other countries (Erola, 2009; Sirniö et al., 2013). Although there were improvements in benefits provided to families throughout the 1980s and 1990s, free education and paid parental leave were put in place already in the first half of the 1970s (Haataja, 2006; Vikat, 2004). Most people in Finland complete at least upper secondary education, which is typically completed on the year adolescents turn 19. For instance, in 1985 around 70 percent of women aged 30-34 had at least upper-secondary education, and the proportion increased to 85 in 1995 and 90 in 2005 (Official Statistics of Finland, 2015). Finnish abortion legislation has been liberal since 1970 (Knudsen et al., 2003).

Teenage pregnancy rates are relatively low in all Nordic Countries (e.g. five times lower than in the US (Wilkinson and Pickett, 2009)) and among these countries, Finland has had one of the lowest teen childbearing rates and the lowest abortion rate since the mid-1980s (Bender et al., 2003; Leppälahti et al., 2012). From the mid-1970s until the mid-1980s teenage abortion rate in Finland was 20 per 1000 women aged 15-19. It declined to 10 in mid-1990s but has been around 14 since the end of the decade (Leppälahti et al., 2012; Vuori and Gissler, 2013; Gissler and Heino, 2011). Teenage birth rate declined quite steadily from 27 in 1975 to 10 in 1999 and 8.5 in 2009 (Gissler and Heino, 2011).

Given that Finland is a country where social mobility is higher than in many other European countries, and where teen pregnancy rates are low, finding a mediating association between parents' and own socioeconomic status through teen motherhood may indicate that the associations in countries with higher teen pregnancy rates and less financial and other support from the state, may be even stronger. On the other hand, there may be more selection into

teenage motherhood involved in Finland than in countries where teen motherhood is more common, meaning that the associations between teenage childbearing and low socioeconomic position may appear stronger in Finland than elsewhere.

Hypotheses

Based on the literature summarised above, I have formulated the following hypotheses.

1. I expect teenage childbearing to mediate the association from parents' to own socioeconomic status not only because it is concentrated among women from low socioeconomic background, but also because it makes finishing school increasingly difficult due to childcare responsibilities. Low education in turn increases the risk of unemployment and having low income.
2. I expect having an abortion as a teenager not to mediate the association between parents' and own socioeconomic position to a great extent. The association between teen abortion and lower socioeconomic position in adulthood observed in earlier studies (Fergusson et al., 2007) may be due to unobserved individual characteristics and attitudes associated with both higher likelihood of teenage pregnancy and lower educational attainment (Hoffman, 1998; Kane et al., 2013).
3. I expect births in early 20s to be on the pathway from parents' to own socioeconomic status as well. I focus on fertility behaviour before age 25, since typically women of that age who wish to achieve higher education are still studying and only starting to establish their socioeconomic position (Driscoll, 2014). Perhaps teen mothers who postpone subsequent childbearing until having finished education and found stable employment end up with higher SES than those who continue childbearing in their early 20s. Furthermore, those who have an abortion in adolescence may enter parenthood on average earlier than those who had no teen pregnancy, which could explain the socioeconomic gap between these two groups later in life.

Figure 1 shows the pathways examined in this study and lists in which table the results of each pathway is shown and whether it forms the direct or indirect effect (see Data and Methods sections for more information on the variables and analytic strategy).

Data and methods

Data

A reliable large-scale set of register data of three cohorts of Finnish women (born in 1955-59, 1965-69 and 1975-79) was used in this study. These data were obtained from the Registry of Induced Abortions, the Medical Birth Registry and the Population Registry of Finland. First, an 80 per cent random sample of all the women of the above mentioned cohorts, who had had at least one abortion within the fertile period of their life (assumed to be ages 15-50) were collected (N=91,636). Second, a comparison group, twice the size of the study group, of women from the same cohorts who had not had an abortion, were selected using random sampling (N=183,272). In the statistical analysis weights were used to control for this design. Overall the unweighted sample includes almost half of Finnish women of these three cohorts. A more comprehensive description of the dataset is available elsewhere (Väisänen, 2015; Väisänen and Murphy, 2014).

Variables

Women's socioeconomic position was measured using three indicators: whether she had higher (i.e. tertiary) education, her annual taxable income in Euros (top coded at €200,000 and transformed into the value of Euros in 2009), and whether she was unemployed (measured based on economic activity in the last week of the year, the other possibilities being employed, student, or "other" such as a stay-at-home mother). These variables were measured at age 30 or the nearest year possible, because before year 1987 this information was only available in population registries every five years. Education, income and unemployment

were chosen as the outcomes of interest, because they represent a wide range of socioeconomic characteristics. Tertiary education was chilsen as the level of interest due to the high proportion of Finnish women having at least upper-secondary education (Official Statistics of Finland, 2015).

Parents' socioeconomic status was based on the highest occupational status of the adult members of the household 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 before the dataset was handed out to me. 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; or other[3], where upper-level employee was regarded the highest status followed by lower-level employees and manual workers. The "other" category is difficult to fit into this hierarchical order. Most people in this category were relatively underprivileged (students, long-term unemployed, pensioners, those outside workforce), whereas some farmers or self-employed people may be relatively wealthy. Other measures of parents' characteristics or women's childhood circumstances were unfortunately not available.

Methods

Linear regression models can be used to study mediation in a straightforward way by comparing the estimates of two nested models: one where the main explanatory variable is regressed against the outcome and another one where all mediators have been added. The two models, the full model (including direct and indirect effects) and the reduced model (including only direct effects), may be expressed as follows:

[3] 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. "Other" category includes farmers, self-employed, students, long-term unemployed, pensioners, those outside workforce, such as stay-at-home-moms, and those, who do not belong to any of the other categories (Official Statistics of Finland, 2013).

$$Y = \alpha_F + \beta_F X + \gamma_F Z + \epsilon \quad (1)$$

$$Y = \alpha_R + \beta_R X + \epsilon \quad (2)$$

Where (1) is the full and (2) the reduced model, Z is the mediator, and X the explanatory variable of interest (that is "the key variable") and ϵ is an error term. The indirect effect (β_I) is the difference between the total (β_R) and the direct (β_F) effect (Kohler et al., 2011).

However, if the outcome of interest is binary, ordinal or categorical and needs to be examined using a model from the generalised linear models' family, it is not possible to compare estimates between two nested models in the same straightforward way. This is because the estimates do not only change due to the mediators being added to the model, but also because of rescaling (Breen et al., 2013). Karlson, Holm, and Breen developed a method called KHB (after the names of the developers) to correct for the rescaling to make two nested nonlinear models comparable (Breen et al., 2013; Karlson and Holm, 2011; Kohler et al., 2011). There are other methods developed for this purpose too, such as a decomposition method suggested by Buis (2010), but KHB has been shown to perform equally well or better than the Buis's method (Karlson and Holm, 2011) and was thus used in this study.

When mediation is studied using a logistic regression model, KHB extracts the information of the mediator variable Z not contained by the explanatory variable X by calculating the residuals of a linear regression of Z on X. Residual R is then used as a covariate in the reduced model (Kohler et al., 2011):

$$Y^* = \tilde{\alpha}_R + \tilde{\beta}_R X + \tilde{\gamma}_R R + \epsilon \quad (3)$$

Where Y* is a latent variable measured in binary form (0/1), and the only difference between R and Z is the part of Z correlated with X. The indirect effect can then be calculated without

the problem of rescaling, since the residuals of the full model and the restricted model estimated with R have the same standard deviation (Kohler et al., 2011).

The KHB method allows studying multiple mediators at the same time, and including control variables which are not on the indirect or direct pathway of the model. KHB also estimates whether the mediating effects are statistically significant (see Breen et al., 2013; Kohler et al., 2011 for more information). The method produces an estimate of the proportion of the total effect mediated by Z. This estimate is called *confounding percentage* (Breen et al., 2013; Karlson and Holm, 2011; Kohler et al., 2011). It can be used to compare mediation patterns between groups, since results are scale free due to the scaling factor cancelling out when it is calculated (Breen et al., 2013).

Analytical strategy

Women who had more than one pregnancy as a teenager, that is between ages 15 and 19, were not included in the analyses (N=5791, about two percent of the sample) in order to create an explanatory variable including three mutually exclusive categories: no pregnancy[4], one abortion, or one birth as a teenager. Since one would expect the associations to be stronger among those who had more than one pregnancy, this strategy will result in conservative estimates of the mediating effect of teen pregnancy. The age range of 15-19 was chosen, since there was no information about the fertility history of these women before age 15 in my dataset and because many studies of teen pregnancy have focused on this age range.

Overall 245,843 women were included in the analyses after excluding those with crucial information, such as parents' socioeconomic status, missing, and due to some women emigrating or dying before age 30. Only women who were born in Finland and who spoke

[4] Miscarriages or stillbirths were not included in the data.

one of the official languages of the country, Finnish or Swedish, as their native language, were included in the analyses.

The KHB-method was used to examine whether the association from parents' socioeconomic status to one's education, likelihood of unemployment, and level of income was mediated through teenage births or abortions. The method decomposes the contribution of each mediator while holding the others constant (Breen et al., 2013). Thus, the results show how much teen births and abortions contributed to the associations separately.

The outcomes of having higher education and being unemployed were studied using logistic regression within the KHB analyses, and income using linear regression. Natural logarithm of income was used as the outcome in order to improve the normality of the distribution of this outcome variable and because the model diagnostics showed that the fit of the model improved compared to using absolute income as the outcome (diagnostics available on request). Before making the logarithmic transformation, a value of 1 was added to all observations of income in order to avoid losing those who had no taxable income from the analyses.

In the first set of models, parents' socioeconomic status was entered as the key variable and teen fertility history (having experienced an abortion or a birth before age 20) as mediators against each of the three outcomes: education, unemployment and income at age 30.

The second set of models examined whether the direct effect of teen pregnancy to education was mediated by births or abortions in ages 20 to 24; and whether births or abortions in ages 20 to 24 and education at age 30 mediated the pathway to unemployment or income. The number of births and abortions between ages 20 and 24 were included as continuous explanatory variables. Preliminary analyses explored each parity and number of abortions as dummy-variables, but as they were linearly associated with the outcomes, the more

parsimonious strategy was chosen. Parents' socioeconomic status was controlled for in these models. A series of sensitivity analyses, where women from each parental SES background were analysed separately, were conducted in order to study whether these mediation patterns varied depending on parents' SES. As the patterns were relatively similar for all groups, the more parsimonious model including women from all backgrounds and controlling for parents' SES was chosen (results available on request).

When education was used as a mediator, it was measured at the same time as the outcomes (unemployment and income) at age 30, since I assumed that in most cases the level of education had been achieved before it was measured at age 30 and thus treating it as a mediator was possible. Age of the youngest child was included as a mediator in the income model as a robustness check, because having young children and being on maternity leave typically has a negative impact on women's income (results available on request). It did not change the interpretation of the models and thus the more parsimonious model was included here. This may be due to the generous financial help to mothers from the government in Finland (Vikat, 2004) ensuring that income does not drop dramatically during maternity leave.

The results based on logistic regression models are presented as average partial effects (i.e. fitted probabilities), because the interpretation of logarithmic coefficients in logistic models is less intuitive than that of probabilities. The results based on linear regression models are presented as exponentiated regression coefficients, because the outcome in those models was the logarithm of income. Exponentiating the estimate values shows the percentage change in income associated with the covariates. A model including data for all cohorts was conducted in order to confirm that the cohorts differ from each other statistically significantly. The dummy-variable representing cohort effects showed that the categories were significantly

different from each other ($p<0.001$) in all models. The results shown here were conducted separately for each cohort, which is essentially the same as conducting the analysis for all cohorts and interacting all effects with cohort.

Figure 1 shows a visual representation of the studied pathways. All models were conducted in Stata 13 using the *khb* command (see Kohler et al., 2011). Although using *khb* command is not required when mediation is studied using linear regression (such as the income models in this study), it gives the same results as conducting these analyses using nested models with the *regress* command in Stata.

Results

Descriptive statistics

Approximately five percent of women in the study sample born in years 1955-59 had an abortion and seven-and-a-half percent a birth, whereas corresponding percentages for women born in 1965-69 were six and three, and for women born in 1975-79 three-and-a-half and two, respectively (not shown). Out of first pregnancies (excluding miscarriages) before age 20, 59 percent ended in childbirth and 41 percent in abortion among the 1950s cohort, whereas abortions were more common than births in the other two: 66 percent ended in abortion in the 1960s cohort and 61 percent in the 1970s cohort (not shown).

Women from manual worker background had completed tertiary education less often, were unemployed more often, and had lower annual income at age 30 than other women, in particular those from upper-level employee background in all cohorts. However, the results varied depending on whether they had experienced a teen birth, abortion or no pregnancies before age 20. Typically those who had had a birth as adolescents had lower socioeconomic position than those who had an abortion or no pregnancy. For instance, in all but one category (upper-level employee background in the 1950s cohort), those who had a birth as a teenager

had lower income at age 30 than any other women regardless of their parents' socioeconomic status. Those who had had an abortion as a teenager, had higher SES than those who had a birth, but were less often highly educated, more often unemployed and had lower income than women from corresponding family background who did not have a pregnancy before age 20 (Table 1).

Mean age at first birth by parents' socioeconomic status and teen pregnancy group was studied to find out whether entry into motherhood varied between the two groups of women who did not become teen mothers. On average women, who did not have any teen pregnancy, were a year older at the time of their first birth than those who had an abortion as a teenager. Both groups entered parenthood on average in their mid-twenties. Those who had a birth as a teenager entered parenthood on average at age 18 (Table 1).

Parity at age 30 varied by women's backgrounds too. Those who had a child before age 20 had on average two to three children at age 30 regardless of their parents' socioeconomic status. Those with no pregnancy as a teenager had on average less than one child at age 30. The average parity of those who had an abortion as a teenager was between these two groups. Parents' socioeconomic status was associated with parity, as those from upper-level employee background typically had the lowest average number of children compared to other women in their respective teen pregnancy group (Table 1).

The pathway from parents' to women's own SES

Table 2a (upper panel) shows the results of the education model as average partial effects. Those from the reference group of upper-level employee background were the most likely to pursue higher education followed by those from lower-level employee, "other", and manual workers' backgrounds. For instance, the probability of achieving higher education was 29 percentage points lower among those from manual worker backgrounds compared to those

from upper-level employee backgrounds in the 1975-79 cohort. Teen births played a small but significant role in mediating this association. Of the difference described above, 1.4 percentage points were associated with having had a child, whereas only 0.4 percentage points were associated with having had an abortion before age 20. Thus, teenage births had larger mediating effect on educational attainment than abortions.

Comparing confounding percentages (i.e. the proportion of total effect mediated through teen births and abortions) across cohorts reveals that a larger proportion of the effect was mediated through teen births in the earliest cohort than in the other two (Table 2a, lower panel). For instance, nine percent of the effect from parents' socioeconomic status to own education was mediated through teen births among those from manual worker and "other" backgrounds in the 1950s cohort compared to five to six percent in the other cohorts. A smaller proportion of the total effect was mediated through teen births among those from lower-level employee backgrounds: six percent in the 1950s cohort and four percent in the other two cohorts.

Those from the reference group of upper-level employee background were the least likely to experience unemployment, followed by lower-level employees and then the other two groups of parental SES (Table 2b, upper panel). Mediation through teen pregnancies was statistically significant, but the size of the effect was modest. For example, out of the 3.6 percent higher probability of experiencing unemployment among women from manual worker background in the 1950s cohort, only 0.2 percentage-points was mediated through teen childbearing and 0.02 percentage-points through teen abortion.

Income was analysed using its logarithm as the outcome in the linear regression models, therefore the covariate estimates were exponentiated (Table 2c, upper panel). Again, those from upper-level employee background had on average the highest income, followed by lower-level employees and the other two groups of parental SES. For instance, in the 1960s

cohort those from the lower-level employee background had on average seven percent lower income than those from upper-level employee background, and the difference between those from manual worker background and the reference group was 14 percent. Teen births mediated a small but statistically significant proportion of the total effect: the confounding percentages show that between four and seven percent of the total effect was mediated through teen births, and a more modest proportion through teen abortions (Table 2c lower panel).

The pathway from teen pregnancy to own socioeconomic position

In all cohorts, the likelihood of completing higher education was lower for women who had either an abortion or a birth as a teenager than for those who did not have a pregnancy before age 20 (Table 3a, upper panel). However, the strength of the association varied: in the 1970s cohort women who had a child had 55 percent lower probability of completing higher education than women who did not experience a pregnancy before age 20, whereas in the 1960s cohort the difference was 42 percent and in the 1950s 25 percent. Sixteen percentage-points of the difference was mediated through births in ages 20 to 24 in the 1970s, eight percentage-points in the 1960s, and three percentage-points in the 1950s cohorts.

Women in the 1970s cohort, who had an abortion as a teenager, had around 27 percent lower probability of completing higher education compared to women who did not experience a teen pregnancy of which six percentage-points was mediated through births in ages 20 to 24 and two percentage-points through abortions in ages 20 to 24. The differences were somewhat smaller, but in the same direction in the other two cohorts.

The confounding percentages show that the mediation patterns changed over cohorts among women who became mothers before age 20. In the 1950s cohort, 12 percent of the total effect from teen birth to educational attainment at age 30 travelled through births in ages 20 to 24,

but the proportion increased to 20 percent in the 1960s cohort and further to 29 percent in the 1970s cohort (Table 3a, lower panel). Thus, it seems that additional births in ages 20 to 24 were more important in reducing the likelihood of teenage mothers to obtain high education in the later than the earlier cohorts. The mediation patterns did not change much among women who had an abortion in adolescence: births in ages 20 to 24 mediated 22 to 24 percent of the total effect in all cohorts.

Women who had a teen birth were more likely to experience unemployment than those who did not have a teen pregnancy (Table 3b, upper panel). The association was more modest in the earliest (2.5 percent higher probability) and the latest (5.7 percent higher probability) than the middle cohort (10.0 percent higher probability). Of these total effects, up to 1.9 percentage-points were mediated through births in ages 20 to 24 and up to one percentage-point through education (depending on cohort). Mediation through abortions in ages 20 to 24 was modest. The confounding percentages (Table 3b, lower panel) show that mediation through births in ages 20 to 24 (12 to 23 percent of the total effect depending on cohort and teen pregnancy group) was more important than mediation through education (8 to 18 percent of the total effect) in the two earliest cohorts, but that the order reversed in the latest cohort where births in ages 20 to 24 mediated a lower proportion of the effect than education. A higher proportion of the total effect was mediated in the teen abortion than in the teen birth group: adding up the confounding percentages within each teen pregnancy group and cohort shows that, for instance, 22 percent of the total effect was mediated in the teen birth group, whereas the corresponding figure in the teen abortion group was 37 percent in the 1950s cohort. The two proportions were roughly equal in the 1970s cohort.

The exponentiated coefficients in the income model show that teen mothers had on average 15 to 25 percent lower income than those who did not experience a teen pregnancy

(depending on cohort), whereas those who had a teen abortion had on average four to 13 percent lower income than the reference group (Table 3c, upper panel). The effect was strongly mediated by later fertility behaviour and education. From a fifth to a quarter of the total effect was mediated through births in ages 20 to 24 and education in the two earliest cohorts among teen mothers (Table 3c, lower panel). In the latest cohort 22 percent was mediated through births in early 20s and almost a half was mediated through education. Mediation was even stronger in the teen abortion group, where the direct effect from teen abortion to income was not statistically significant for the earliest and the latest cohorts. Education was the most important mediator in the two latest cohorts and equally important to births in ages 20 to 24 in the earliest cohort.

Discussion

Teen births and socioeconomic outcomes

The results of the study show that teen births mediate the association from socioeconomic background to education at age 30. Up to nine percent of the total association was explained by having had a teen birth at the population level. Mediation was not stronger perhaps because only a small minority of women gave birth before age 20, but the fact that it had a significant effect at the population level suggests that it is an important part of the pathway from parents' to own socioeconomic position.

Researchers have suggested that women who perceive their chances of attending higher education low may decide to start childbearing early (see e.g. Smith and Roberts, 2011 in UK). This type of selection into early parenthood may explain why teen births had the mediating role. Accumulation of disadvantage may also play a role. Women from lower socioeconomic background are more likely to start childbearing early, which makes attending

education more difficult and eventually leads to a higher chance of unemployment and lower income (see e.g. Taylor, 2009 in US).

Interestingly, teen births mediated a smaller proportion of the association between parents' SES and own education in the later than earlier cohorts. It may be due to teen pregnancies having become less common over time. These associations also varied by socioeconomic background, notably by teen births being less important mediators for those from lower-level employee backgrounds than for those from manual worker or "other" backgrounds. It may be that those from more advantaged backgrounds received more resources from their parents and were thus able to finish education regardless of early childbearing. Unobserved factors may have played a role too.

Mediation through teen births was modest when the other two outcomes of socioeconomic position, unemployment and income, were studied. Women from lower socioeconomic backgrounds were more likely to experience unemployment and have lower income, but albeit mediation through teen births being statistically significant, the size of the effect was small. This indicates that the mechanism through which teenage childbearing is associated with low income and unemployment has more to do with the socioeconomic background of teen mothers than with the early start of childbearing. Interestingly, the probability of unemployment was higher in the 1960s cohort than in the other two. It may be because they were in their thirties during the severe economic depression of the 1990s which increased unemployment markedly in Finland (see e.g. Honkapohja and Koskela, 1999).

Teen mothers had lower SES than their childless peers from similar backgrounds and the pathway from teen birth to lower socioeconomic position was mediated by births in ages 20 to 24 and education (when studying unemployment and income). This indicates that accumulation of disadvantage is a plausible explanation of the lower socioeconomic position

of teenage mothers. Starting childbearing early leads to difficulties in completing higher education, which in turn is associated with lower salary and a higher chance of unemployment. Having additional births in early 20s seems to further accumulate this disadvantage. Education mediated a higher proportion of the total associations of income and unemployment with teenage childbearing in the later than in the earlier cohorts indicating that its importance in explaining these associations grew over time.

Teen abortions and socioeconomic outcomes

As expected, teen abortion was not an important mediator between parents' and own SES. Some teens may have chosen to terminate their pregnancy in order to be able to finish their education and get a stable employment before starting childbearing (see e.g. Ekstrand et al., 2009 in Sweden).

Births in ages 20 to 24 strongly mediated the association between having had a teen abortion and lower education. The remaining direct association may have been due to unobserved characteristics affecting both the likelihood of teen pregnancy and educational attainment. Births in ages 20 to 24 and education mediated a large part of the association from teen abortion to lower income and to the risk of unemployment. These results indicate that—similarly to teen births—the mechanism behind the association of having a teen abortion and lower SES may be accumulation of disadvantage. Women who experience a teen pregnancy more often come from a lower socioeconomic background than those who had no teen pregnancy. Even those who chose to have an abortion and thus did not start childbearing before age 20, entered parenthood on average earlier than those who had no teen pregnancy during the period of life when higher education is typically obtained. Lower education, again, led to lower income and a higher risk of unemployment. This pattern of mediation was clear particularly when income was studied: the direct effect from teen abortion to lower income

was not statistically significant in two out of the three cohorts indicating that the association was entirely mediated through education and births in early 20s.

Limitations, strengths and implications of the study

There were limitations in this study. A part of the association between fertility behaviour and social mobility may have been due to characteristics which were not measured here. For instance since attitudes towards childbearing and career aspirations were not known, it is likely that a part of the observed association was due to selection of those who did not have plans to attend higher education into early motherhood. It may also be that reducing women's childhood background to one measurement of parents' socioeconomic status does not adequately account for all the relevant characteristics. Moreover, measuring adulthood SES only at one point in time may not give a thorough picture of women's SES over the life course. For instance, measuring unemployment at one point in time does not indicate whether these women experienced frequent unemployment spells or whether that was a short-term one-off experience. Since women who experienced more than one pregnancy as teenagers were excluded from the study, the estimates of mediation through teen pregnancy are conservative. Income was measured at individual rather than household level although the latter might have been a better indicator of the resources available to these women.

Despite these limitations, the strengths of the study ensure that the results are of interest to researchers and policy makers internationally. Since the data were collected from administrative registers, there was no underreporting of abortion which is common in surveys (Jones and Kost, 2007), nor attrition which is common in longitudinal studies. The innovative methodology invites other researchers to conduct this type of studies using mediation analysis. Moreover, it shows that the association between parents' and one's own socioeconomic position might be mediated more strongly by teenage fertility behaviour than previously thought.

Since we know from previous studies that the effect of teenage childbearing on educational attainment is likely to be causal (e.g. Kane et al., 2013), policy-makers should be particularly concerned about facilitating educational enrolment among teenage mothers, who want to continue their education. It would help in breaking the cycle of accumulation of disadvantage. Future studies should investigate which barriers young mothers face in accessing education in Finland using surveys and qualitative data.

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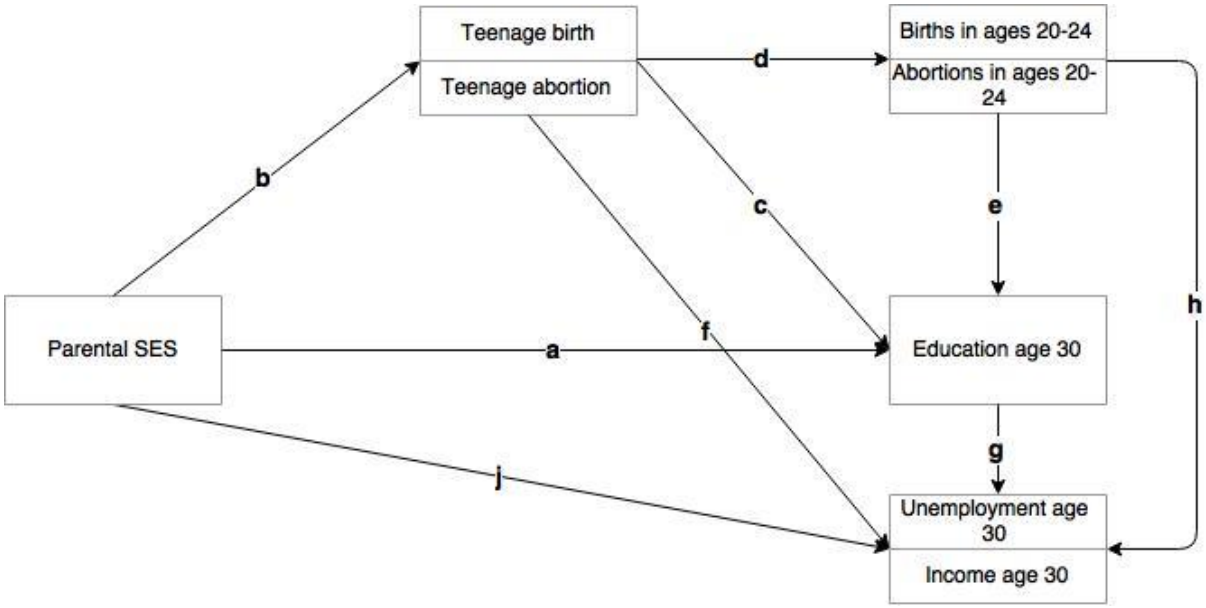
Figure 1. Pathways from socioeconomic background to fertility behaviour and socioeconomic attainment in adulthood.



Notes:

Pathways examined in each table	**Direct**	**Indirect**	**Controls**
Table 2a (outcome: education)	a	b+c	
Table 2bc (outcome: unemployment or income)	j	b+f	
Table 3a (outcome: education)	c	d+e	Parents' SES
Table 3bc (outcome: unemployment or income)	f	c+g and d+h	

Table 1. Weighted % of women having higher education, being unemployed and the mean of annual income in Euros age 30 depdending on parents' SES and teen pregnancy status. Unweighted N.

	Cohort 1955-59			Cohort 1965-69			Cohort 1975-79		
Prental SES	**No pregnancy age<20**	**Abortion age<20**	**Birth age <20**	**No pregnancy age<20**	**Abortion age<20**	**Birth age <20**	**No pregnancy age<20**	**Abortion age<20**	**Birth age <20**
	Higher education (%) age 30								
Upper	35.4	16.1	5.5	37.9	18.8	3.6	66.3	36.1	16.4
Lower	16.6	6.8	1.6	19.8	7.0	1.2	48.8	23.3	10.7
Manual	7.4	2.1	0.5	10.4	3.1	0.6	37.6	16.9	6.1
Other	10.0	4.0	0.6	14.6	4.7	0.2	43.6	22.2	6.1
	Unemployed (%) age 30								
Upper	1.6	2.2	4.6	7.0	13.2	29.9	3.6	7.1	6.5
Lower	2.5	3.7	6.1	10.2	14.8	19.4	5.3	10.1	13.8
Manual	3.9	5.3	6.9	13.5	17.0	27.8	6.7	10.3	15.0
Other	3.9	4.9	6.8	12.3	17.6	26.1	6.4	10.3	16.4
	Mean annual income (€) age 30								
Upper	12,521	11,385	10,288	17,753	15,023	11,347	24,949	22,132	16,982
Lower	11,067	10,431	8,817	15,629	13,950	11,614	22,670	19,450	17,842
Manual	9,974	9,508	8,553	14,083	13,117	11,009	20,855	18,124	16,364
Other	9,818	9,278	8,120	14,418	12,934	11,412	21,507	19,564	15,375
	Mean age at first birth								
Upper	25.9	24.6	18.3	26.5	25.0	18.5	26.9	25.1	18.4
Lower	25.2	24.3	18.4	25.8	24.5	18.4	26.0	24.6	18.5
Manual	24.5	23.5	18.4	25.3	24.1	18.4	25.5	24.1	18.4
Other	24.6	23.8	18.4	25.5	24.2	18.4	25.7	24.5	18.4
	Mean number of children age 30								
Upper	0.96	1.14	2.14	0.80	1.18	2.44	0.70	0.96	2.55
Lower	1.06	1.26	2.25	0.96	1.29	2.44	0.83	1.12	2.59
Manual	1.18	1.38	2.24	1.09	1.38	2.45	0.98	1.33	2.65
Other	1.19	1.41	2.23	1.04	1.33	2.55	0.96	1.24	2.79
N	81,322	7,761	7,685	79,155	8,068	3,183	47,039	4,577	1,638

Table 2. The direct effect from SES background on own socioeconomic status at age 30 with mediation through teenage births and abortions.

	Panel 2a. Outcome: higher education. Logistic regression, average partial effects.			Panel 2b. Outcome: unemployment. Logistic regression, average partial effects.			Panel 2c. Outcome: logarithm of income. Linear regression, exponentiated coefficients.		
Cohort:	**1955-59**	**1965-69**	**1975-79**	**1955-59**	**1965-69**	**1975-79**	**1955-59**	**1965-69**	**1975-79**
PARENTS' SES		**APE (%)**			**APE (%)**			**Exponentiated coefficients**	
Manual worker									
Total effect	-19.5	-22.7	-29.2	3.6	7.8	3.8	0.85	0.86	0.88
Direct effect	-17.5	-20.9	-27.4	3.4	7.3	3.6	0.86	0.87	0.89
Indirect effect									
Teen birth	*-1.8*	*-1.2*	*-1.4*	*0.2*	*0.3*	*0.1*	*0.99*	*0.99*	*0.99*
Teen abortion	*-0.2*	*-0.5*	*-0.4*	*0.02*	*0.1*	*0.05*	*1.00*	*1.00*	*1.00*
Lower-lever employee									
Total effect	-9.9	-12.4	-17.7	1.8	4.2	2.4	0.93	0.93	0.95
Direct effect	-9.2	-11.4	-16.7	1.8	4.0	2.3	0.94	0.94	0.96
Indirect effect									
Teen birth	*-0.6*	*-0.5*	*-0.7*	*0.1*	*0.1*	*0.1*	*1.00*	*1.00*	*1.00*
Teen abortion	*-0.1*	*-0.4*	*-0.3*	*0.02*	*0.1*	*0.03*	*1.00*	*1.00*	*1.00*
Other									
Total effect	-15.7	-17.4	-23.0	3.5	6.7	3.5	0.83	0.86	0.89
Direct effect	-14.2	-16.1	-21.6	3.3	6.3	3.4	0.83	0.87	0.90
Indirect effect									
Teen birth	*-1.4*	*-1.0*	*-1.1*	*0.1*	*0.2*	*0.1*	*0.99*	*0.99*	*0.99*
Teen abortion	*-0.1*	*-0.3*	*-0.3*	*0.01*	*0.1*	*0.03*	*1.00*	*1.00*	*1.00*
Confounding %: Manual									
via teen birth	9.2	5.5	4.7	4.8	3.9	3.8	7.4	5.0	6.1
via teen abortion	1.1	2.2	1.4	0.7	1.7	1.3	0.7	2.0	1.7
Confounding %: Lower-level									
via teen birth	6.0	4.4	3.8	3.1	3.2	2.9	5.6	4.8	7.3
via teen abortion	1.5	3.0	1.5	0.9	2.3	1.4	1.1	3.2	2.8
Confounding %: Other									
via teen birth	9.2	5.8	4.7	4.0	3.7	3.2	4.9	4.1	5.1
via teen abortion	0.5	1.9	1.2	0.3	1.3	1.0	0.2	1.3	1.3

All total, direct and indirect effects were significant at level $p<0.001$; Reference category: Upper-level employee; APE=Average partial effects (Tables 2a and 2b); Coefficients in table 2c exponentiated because the outcome is logarithmic. (a) Direct effect is the association from socioeconomic background to the outcome; the indirect effect is the mediation through teen births and abortions. Total effect is the both of these combined. (b) Confounding % describe the proportion of the total effect.

Table 3. The direct effect from teen pregnancy on SES at age 30 with mediation through births and abortions in ages 20-24 (in all models) and education age 30 (in tables 3b and 3c).

	Table 3a. Higher education. Logistic regression, average partial effects.			Table 3b. Unemployment. Logistic regression, average partial effects.			Table 3c. Outcome: logarithm of income. Linear regression, exponentiated coefficients.		
	Higher education			**Unemployment**			**Mean annual income**		
Teen pregnancy history // Cohort:	**1955-59**	**1965-69**	**1975-79**	**1955-59**	**1965-69**	**1975-79**	**1955-59**	**1965-69**	**1975-79**
Regression estimates of total, direct and indirect effects (a)									
Teen birth									
Total effect	-24.6	-41.5	-55.3	2.5	10.0	5.7	0.85	0.78	0.75
Direct effect	-21.4	-32.1	-36.8	1.9	6.8	3.5	0.92	0.88	0.92
Indirect effect									
Births age 20-24	*-3.0*	*-8.2*	*-15.7*	*0.3*	*1.9*	*0.9*	*0.96*	*0.94*	*0.94*
Abortions age 20-24	*-0.2*	*-1.1*	*-2.7*	*0.1*	*0.4*	*0.2*	*1.00*	*0.99*	*1.00*
Education age 30				*0.2*	*1.0*	*1.0*	*0.96*	*0.95*	*0.87*
Teen abortion									
Total effect	-9.9	-16.4	-27.2	1.1	4.0	3.2	0.96	0.91	0.87
Direct effect	-7.6	-11.6	-19.1	0.7	2.1	2.0	1.02ns	0.98	0.98ns
Indirect effect									
Births age 20-24	*-2.2*	*-4.0*	*-6.1*	*0.2*	*0.9*	*0.4*	*0.97*	*0.97*	*0.98*
Abortions age 20-24	*-0.2*	*-0.8*	*-2.0*	*0.1*	*0.3*	*0.2*	*1.00*	*0.99*	*1.00*
Education age 30				*0.1*	*0.7*	*0.7*	*0.97*	*0.96*	*0.91*
Relative measures of mediation: confounding percentages (b)									
Confounding %: Teen birth									
via births age 20-24	12.2	19.8	28.5	12.4	18.7	16.3	27.2	25.1	21.7
via abortions age 20-24	0.8	2.7	4.9	2.1	3.7	3.8	0.1	3.3	1.5
via high education				7.8	9.8	18.2	23.6	20.6	48.7
Confounding %: Teen abortion									
via births age 20-24	21.7	24.3	22.5	19.2	22.8	11.4	74.0	32.8	17.7
via abortions age 20-24	2.12	4.9	7.4	5.2	6.6	5.0	0.4	6.2	2.3
via high education				12.8	18.2	21.2	65.3	40.5	66.2

All total, direct and indirect effects were significant at level p<0.001 apart from those not significant (ns); Controlling for parents' SES. Reference category: No teen pregnancy. APE= Average partial effects (Tables 3a and 3b); Coefficients in table 3c exponentiated because the outcome is logarithmic. (a) Direct effect is the association from teen births/abortions to the outcome, the indirect effect is the mediation through births and abortions in ages 20-24 (in all models) and education at age 30 (in tables 3b and 3c). Total effect is the both of these combined. (b) Confounding % describe the proportion of the total effect mediated through births and abortions in ages 20-24 (in all models) and education at age 30 (in tables 3b and 3c).