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Child welfare clients have higher risks for teenage childbirths: which are the major confounders?

Lars Brännström¹, Bo Vinnerljung¹, Anders Hjern²

¹ Department of Social Work, Stockholm University, Stockholm, Sweden

² Centre for Health Equity Studies, Stockholm University/Karolinska Institutet, Stockholm, Sweden

Correspondence: Lars Brännström Department of Social Work, Stockholm University, SE-106 91 Stockholm, Sweden, Tel: +46 (0) 8 16 48 59, Fax: +46 (0)8 674 75 55, e-mail: lars.brannstrom@socarb.su.se

Background: Aiming to support effective social intervention strategies targeting high-risk groups for teenage motherhood, this study examined to what extent the elevated crude risks of teenage childbirth among child welfare groups were attributable to the uneven distribution of adverse individual and family background factors. **Methods:** Comprehensive longitudinal register data for more than 700 000 Swedish females born 1973–1989 (including around 29 000 child welfare clients) were analysed by means of binary logistic regression. The Karlson/Holm/Breen-method was used to decompose each confounding factor's relative contribution to the difference between crude and adjusted odds ratios (ORs). **Results:** Elevated crude risks for teenage childbirth are to a large extent attributable to selection on observables. Girls' school failure was the most potent confounder, accounting for 28–35% of the difference between crude and adjusted ORs. **Conclusion:** As in majority populations, girls' school failure was a strong risk factor for teenage childbirth among former child welfare children. At least among pre-adolescents, promoting school performance among children in the child welfare system seems to be a viable intervention path.

Introduction

Teenage childbirth is considered a public health problem. Apart from adverse health effects related to pregnancy and childbirth complications, teenage childbirth can have deteriorating effects on the transition into adulthood.¹ Since adolescent pregnancies and childbirths have declined for more than a decade, prevention efforts have increasingly begun to target high-risk groups, including child welfare youth.^{2,3} For these groups, there is limited information available for identifying successful prevention strategies.

Sweden, the focus of this study, has one of the lowest teenage childbirth rates in the Western world, 2.6% in 2013.⁴ But as in other countries, teenagers involved with the child welfare system have far higher crude rates than peers, roughly comparable with national population rates in the US.⁵ Yet there is heterogeneity between subgroups with child welfare experiences. In a national cohort study, one in six girls placed in out-of-home care (OHC) during adolescence became a mother before age 20, compared with one in 35 among majority population girls. Risks for young women involved with child welfare authorities at an earlier age were lower.⁵ The highest rates (28%) have been observed for girls placed in societal care due to behavioural problem,⁶ confirming that teenage childbirths are strongly associated with conduct problems.⁷

Studies of risk factors for teenage childbirths among child welfare youth have produced a variety of results, mostly based on small sample studies. Some have reported factors that are highly

frequent in this subgroup, like adverse family background (often coupled with poverty), experiences of child maltreatment and characteristics of OHC environments.⁸ Others have had a stronger focus on risk factors commonly found in studies of teenage childbirth among majority population peers, like school failure, intergenerational transmission of teenage parenthood, low family socioeconomic status and family disruption.⁵ A national cohort study on the use of hormonal contraceptives showed that female child welfare clients had much higher usage rates up to age 17, in comparison with majority population peers. But at age 18–19 this pattern was reversed.⁹ This may suggest that many Swedish child welfare girls in their upper teens actually plan early pregnancies.¹⁰ After adjusting analyses of population samples for the strong selection factors that characterises child welfare youth, high crude risks for teenage childbirths are usually substantially reduced but not obliterated.^{5,11}

Research into effective social prevention strategies are often interested in assessing the extent to which associations between modifiable risk factors and outcome are confounded by other variables.¹² Using longitudinal register data for more than 700 000 Swedish females born 1973–1989 (including around 29 000 child welfare clients), and a novel decomposition method developed for non-linear regression models,¹³ this study extends previous research by asking to what extent the observed elevated risk of teenage childbirth among child welfare groups is attributable to the uneven distribution of adverse individual and family background factors.

Methods

Population and outcome

The study population was identified in the Medical Birth Register (covering all births in the country) and the Total Population Register. It consisted of all females born in Sweden 1973–1989 without records of emigration/immigration before age 18, alive and residing in Sweden, 31 December 2008. The sample was limited to Swedish born cohort members to avoid high confounder attrition, which is a problem when foreign-born persons are included in national register studies. Rates of teenage childbirths among immigrant cohort members did not deviate from the majority population. We excluded cohort members who received disability pension at age 23 (according to the Income and Enumeration Survey). Disability pension at such a young age is an indication of serious impairment, which for most probably had antecedents during the years in compulsory school that affected their school performance (a hypothesised risk factor in our analyses). In this group, teenage childbirths were less common than in the majority population. We also excluded 813 female Swedish born adoptees (0.1% of the sample) since many had been in long-term OHC and were difficult to categorize. After these delimitations we had a crude sample of 728 948 women.

In the next step, we excluded all girls who had given birth to their first child before their 17th birthday ($N = 1752$; 8.3% of all cohort girls who became a parent during their teens). While the girls still were in compulsory school (age 7–16), childbirth at such an early age could have causal links to school performance, and could also trigger child welfare involvement. After these delimitations the study population consisted of 727 196 girls, whereof 19 208 (2.6%) had given birth to their first child at age 17–19.

Cohort members were categorized in five groups, using data from the Child Welfare Register spanning the entire childhood from birth to age 18. Since an earlier register study had found considerable variation within the child welfare population,⁵ we were aware of the necessity to address issues of heterogeneity. Here, we were guided by experiences from a long row of other national cohort studies, where the following categorization had shown good discriminatory capabilities.¹⁴

The majority population refers to girls having no registered child welfare intervention ($N = 697 871$). *In home care* are girls having received in-home care, but no registered OHC ($N = 8244$). Due to limitations in the Child Welfare Register, only provision of respite care is noted in the national data base. *Short OHC* represents <5 years OHC in total before age 18, first placement before age 13 ($N = 5690$). *Long OHC* consists of girls with least 5 years OHC in total before age 18, first placement before age 13 ($N = 3982$). *Teen placement* denotes girls with their first placement in OHC after 13th birthday, regardless of time in OHC, C ($N = 11 409$).

Outcome measure was the first childbirth between the 17th and 20th birthday.

Independent variables

The choice of confounders was guided by previous research, but was also constrained to population data that are recorded in the national registers. The latter is an avoidable restriction when working with register data for an entire national population data.

Analyses were adjusted by girls' year of birth (year dummies) and maternal birth country (retrieved from the Total Population Register), categorized as Sweden, other Nordic country (Finland, Denmark, Norway or Iceland), other non-Nordic European country or a non-European country. Adjustments for maternal birth country were included since there is a crude overrepresentation of children with foreign-born parents in the child welfare population.¹⁵

We utilize a number of binary variables as socioeconomic markers of childhood adversity. Several studies have found intergenerational transmission of teenage parenthood, also in Sweden.¹⁶ Here, this was indicated if the mother of the index girls also was a teen mother, according to the Multi-Generation Register. Maternal civil status (single parenthood) has been reported as a risk factor in a number of studies.¹⁷ Identified through the Income and Enumeration Survey performed with taxation data annually by Statistics Sweden, single parenthood was measured as whether the mother of the index girl was single when the girl was 17 years old.

Maternal poverty and maternal employment status were used as indicators of household economic adversity, a factor linked to teenage childbirths in numerous studies and a highly prevalent background factor among child welfare girls.¹⁵ Maternal poverty was measured as whether index girls' mothers received extensive means-tested social assistance (>50% of disposable income the year the index girl turned 17). Maternal employment refers to whether the index girls' mothers were not gainfully employed (on November 1 the year the index girl turned 17).

Low maternal education has also been associated with a higher risk of teenage child bearing in off-spring.¹⁷ Maternal education refers to educational attainment when the index girl was 17 and was retrieved from the Register of Educational Attainment, classified as compulsory school (7–9 years), completed secondary (2–3 years after compulsory school) or post-secondary education (university/college degree).

We also included a set of variables related to parental substance abuse, mental health and criminality, all being associated with elevated risks for teenage child bearing.⁷ These variables are also crude indicators of childhood adversity.¹⁸ For indications of parental substance abuse we used a combination of data from several registers: death with a substance abuse related cause, or at least one hospitalization with a substance abuse-related diagnoses or having been convicted of a drug-related crime. Indications of severe parental mental health problems were measured as either death from suicide or at least one hospitalization with a psychiatric diagnose or for a suicide attempt. Indications of parental criminality were constructed as at least one sentence to prison, probation or forensic psychiatric care (as opposed to fines, community service and suspended sentences), thus indicating severe or repeated offending.

For these latter variables, we used an extended observation time (from 1973 to 2008). They were accordingly constructed from observations before, during and after the cohort members' childhood years. This approach has been frequently used in Scandinavian register studies.^{15,19,20} The vast majority of medical interventions for psychiatric disorders and addiction is delivered in out-patient care, and not noted in the Hospital Discharge Register. Hospitalizations for psychiatric disorders are usually reserved for serious or life-threatening mental health conditions with earlier antecedents of out-patient care. Death and hospitalizations due to addiction-related causes usually represent cases of long-term substance abuse.¹⁹ The same logic applies to crime records, where sentences to probation, prison or forensic psychiatric care usually are preceded by milder sanctions. These three variables were entered into the analyses separately for the mother and the father, since they could also be crude markers of genetically related vulnerabilities, affecting the risk of antisocial behaviour in offspring. Adolescent antisocial behaviour is strongly associated with teenage parenthood for both sexes.¹⁷

Lastly, we included a binary variable reflecting index girls' school failure, a consistent risk factor in all studies of teenage childbirth. School failure, here conceptualized as poor school performance, was defined as mean average grade of <(mean – one standard deviation) from the last year of compulsory school, according to data from the National School Register, or that the person had no or incomplete grades in three "key subjects" (math, English, Swedish). Incomplete grades in these subjects make a student ineligible for entry into secondary education. Roughly nine of ten Swedish youths enter

secondary education.²¹ In our categorization, the girl thus belonged to the 1/6 in her peer group (both sexes) with the lowest school performance in the country the year she left compulsory school.

Statistical analyses

Binary logistic regression models based on the Karlson/Holm/Breen (KHB) method were used to estimate odds ratios (ORs). The KHB method ensures that the crude and adjusted coefficients presented are measured on the same scale.²² It also extends the decomposition properties of linear models to logistic regression models.¹³ Thus, it is unaffected by the rescaling bias that arise in cross-model comparisons of non-linear models. This method also shows the degree to which a control variable explains the relationship between a hypothesized risk factor and a latent outcome variable underlying the non-linear probability model.²³

Since the prevalence of teenage childbirth in our sample was <10%, estimated ORs may be interpreted as risk ratios.²⁴ But relative measures such as the OR may exaggerate differences if the underlying risks are low. Therefore, we also report average partial effects (APE), which describe differences in predicted probabilities, i.e. risk differences, between child welfare girls and majority population peers.

Stata version 13.1 was used for all analyses, and the KHB-command with robust standard errors was utilized for the logistic regression and decomposition analyses.²³

Results

Prevalence rates

Table 1 shows descriptive statistics of variables and related rates of teenage childbirths in the sub-populations. The figures illustrate that

child welfare children are a highly selected group, characterized by far higher rates of childhood adversity than their peers in the majority population. The majority of girls with experiences of long-term societal care (OHC >5 years) had a mother and a father with indications of substance abuse (53 and 61%, respectively), a mother with severe mental health problems (56%) and 41% had poor school performance, compared with 10% among majority population peers. Crude rates of childbirth were 4–6 times higher in the child welfare groups (8.6–14.4%) compared with the majority population (2.3%).

Multivariate analyses

In table 2, results from logistic regression analyses based on the KHB method are reported, as are the confounding effects of various independent variables. Crude ORs were almost 4–7-fold, in comparison with majority population peers. These elevated risks correspond to 5–11 percentage point risk difference (APE = 0.05–0.11). As expected from earlier studies, girls placed in OHC during adolescence had the highest risk. After adjusting the analyses for a host of selection factors, remaining risk were substantially lower. For two subgroups—in-home care and short OHC—adjusted risk were moderately elevated in comparisons with peers (OR = 1.48 and 1.30, APE = 0.01 and 0.01). For girls that had been in long-term OHC, the almost 5-fold crude elevated risk in the unadjusted model was obliterated (OR = 0.93, APE = –0.00). A high adjusted risk remained only for girls that had entered OHC in adolescence (OR = 2.10). However, since the underlying risks are low, this refers a two percentage point risk difference (APE = 0.02).

Looking at the lower part of table 2, we see that the confounding effects of the unadjusted risk were very strong, ranging from 63.3 (teen placements) to over 100% for the long-term OHC groups. As

Table 1 Sample properties: descriptive statistics by majority population and child welfare client subgroups

Variable	Operationalization	Range	Majority population N = 697 871 Mean (SD)	In-home care N = 8244 Mean (SD)	Short OHC N = 5690 Mean (SD)	Long OHC N = 3982 Mean (SD)	Teen placement OHC N = 11 409 Mean (SD)
Teenage childbirth	First childbirth age 17–19	0–1	0.023	0.086	0.107	0.101	0.144
Girl's birth cohort	Birth year	1973–1989	1981.13 (5.06)	1982.17 (4.67)	1980.76 (5.15)	1980.88 (5.12)	1982.21 (4.88)
Maternal birth country	Sweden	0–1	0.908	0.856	0.810	0.851	0.847
	Nordic countries	0–1	0.045	0.078	0.099	0.111	0.085
	Europe	0–1	0.031	0.034	0.054	0.025	0.039
	Non-Europe	0–1	0.016	0.033	0.037	0.013	0.029
Intergenerational transmission	Teenage mother	0–1	0.043	0.106	0.159	0.165	0.121
Maternal civil status	Single mother	0–1	0.097	0.471	0.422	0.278	0.314
	Missing data	0–1	0.016	0.054	0.081	0.083	0.053
Household economic adversity	Mother not gainfully employed	0–1	0.135	0.410	0.536	0.755	0.424
	Maternal social assistance reciprocity	0–1	0.024	0.172	0.256	0.331	0.215
Maternal educational attainment	Post-secondary school	0–1	0.309	0.149	0.097	0.029	0.141
	Secondary school	0–1	0.491	0.514	0.469	0.352	0.504
	Compulsory school	0–1	0.190	0.298	0.368	0.446	0.296
	Missing data	0–1	0.010	0.039	0.066	0.172	0.059
Parental substance abuse	Maternal substance abuse	0–1	0.024	0.139	0.320	0.532	0.173
	Paternal substance abuse	0–1	0.114	0.404	0.464	0.613	0.374
Parental mental health problems	Maternal mental health problems	0–1	0.061	0.264	0.445	0.559	0.268
	Paternal mental health problems	0–1	0.058	0.226	0.246	0.345	0.186
Parental criminality	Maternal criminality	0–1	0.008	0.074	0.192	0.379	0.089
	Paternal criminality	0–1	0.078	0.376	0.434	0.576	0.333
Girl's school failure	Poor school performance	0–1	0.099	0.355	0.399	0.409	0.573

Note: OHC, Out-of-home care; SD, standard deviation. Total sample size = 727 196.

Table 2 Decomposition of crude associations of child welfare subgroups on teenage childbirth

		b-coef.	SE	OR (95% CI)	APE (95% CI)
Majority population (ref.)					
In-home care	Crude	1.34	0.04	3.80 (3.49–4.14)	0.05 (0.05–0.06)
	Adjusted	0.39	0.05	1.48 (1.35–1.61)	0.01 (0.01–0.01)
Short OHC	Crude	1.60	0.05	4.91 (4.47–5.40)	0.07 (0.06–0.08)
	Adjusted	0.28	0.05	1.30 (1.17–1.43)	0.01 (0.00–0.01)
Long OHC	Crude	1.60	0.06	4.91 (4.38–5.40)	0.07 (0.06–0.08)
	Adjusted	–0.03	0.06	0.93 (0.82–1.05)	–0.00 (–0.00 to 0.00)
Teen placements	Crude	2.00	0.03	7.44 (7.00–7.91)	0.11 (0.10–0.11)
	Adjusted	0.74	0.03	2.10 (1.95–2.23)	0.02 (0.02–0.03)
Relative measures					
Confounding percentage					
In-home care		71.1%	–	–	–
Short OHC		82.6%	–	–	–
Intermediate/long OHC		101.4%	–	–	–
Teen placements		63.3%	–	–	–
via Girl's school failure					
In-home care		28.5%	–	–	–
Short OHC		27.9%	–	–	–
Intermediate/long OHC		28.8%	–	–	–
Teen placements		35.1%	–	–	–
via Maternal educ. level					
In-home care		10.1%	–	–	–
Short OHC		11.3%	–	–	–
Intermediate/long OHC		10.2%	–	–	–
Teen placements		6.2%	–	–	–
via Household econ. advers.					
In-home care		4.6%	–	–	–
Short OHC		6.0%	–	–	–
Intermediate/long OHC		7.9%	–	–	–
Teen placements		3.9%	–	–	–
via Intergen. transmission					
In-home care		3.3%	–	–	–
Short OHC		5.0%	–	–	–
Intermediate/long OHC		5.3%	–	–	–
Teen placements		2.7%	–	–	–
via Parental substance abuse/mental health problems					
In-home care		10.3%	–	–	–
Short OHC		13.6%	–	–	–
Intermediate/long OHC		19.9%	–	–	–
Teen placements		6.6%	–	–	–

Results from binary logistic regression analyses based on the KHB-method ($N=727\ 196$).

KHB, Karlson/Holm/Breen; OHC, out-of-home care; SE, robust standard error; OR, odds ratio; APE, average partial effect; CI, confidence interval.

Adjusted model includes dummies for missing data and controls for girl's birth year, girl's school failure, maternal birth country, intergenerational transmission, maternal civil status, household economic adversity, maternal educational level, parental substance abuse, parental mental health problems and parental criminality (see table 1). Confounding percentage refers to the percentage difference between crude and adjusted b-coefficients. The confounding percentage via specific confounders shows how much of the total confounding is due to the respective confounder.

the confounding percentage refers to the difference between crude and adjusted b-coefficients, a confounding effect exceeding 100% was reasonable as the sign of the b-coefficient has changed. Most prominent of the confounding factors was poor school performance (27.9–35.1%). Also for three of four subgroups, parental mental ill-health/substance abuse accounted for a considerable part (10.3–19.9%), as did parental education (10.1–11.3%)—but less so for the risk in the teen OHC group (6.6 and 6.2%). Parental poverty and intergenerational transmission had modest confounding effects for all subgroups.

Discussion

Utilizing longitudinal register data for more than 700 000 Swedish females born 1973–1989 (including around 29 000 were child welfare clients), this study extended previous research by examining to what extent the elevated crude risk of teenage childbirth among child welfare groups was attributable to the uneven distribution of adverse individual and family background factors. To our

knowledge, this is the first attempt to make a structured analysis of the confounder effects on teenage childbirth among child welfare girls, for decades recognized as high-risk group for teen parenthood.

Our results were consistent for the addressed child welfare subgroups. Firstly, we found strong confounding effects, showing that elevated crude risks for teenage child bearing to a large extent can be explained by selection bias. Secondly, poor school performance was by far the most potent confounder, indicating that this is a strong risk factor for teenage childbirth in child welfare populations, as it is in majority population samples.^{11,17} Lastly, indications of parental mental ill-health and/or parental substance abuse also had a substantial confounding effect as did socioeconomic background (maternal educational attainment). Intergenerational transmission of teenage childbirth and indications of poverty had more modest confounding influences.

Girls who entered OHC during adolescence tended to deviate some from the general pattern. School failure was a stronger confounder than for other subgroups, while indications of parental psychopathology and socioeconomic background had clearly weaker confounding effects. In the fully adjusted model a 2-fold elevated risk

remained. In the Scandinavian countries, a large proportion of older children entering the child welfare system do so due to antisocial or harmful high-risk taking behaviour (e.g. juvenile substance abuse or offending).²⁵ The links between these factors and teenage childbirth are well-known in international research.²⁶ This is a probable explanation for the partly different confounding pattern for the teen group in our results.⁶

A number of longitudinal studies on children's development over time have found that school performance is a potent mediator of other risk factors.^{27,28} Studies from different countries have also affirmed that child welfare children do poorly in school.^{21,29} The reasons behind most likely include different mechanisms, e.g. low expectations from carers and teachers.³⁰ Conduct problems are common in child welfare groups.³¹ Such behaviour usually leads to poor educational performance.³² But this is a two-way street. School failure can cause reduced school connectedness and increased affiliations with deviant peers, increasing the probability of a path towards risk-taking behaviour.^{33,34}

But Scandinavian research has found that children involved with the child welfare system tend to perform substantially below their cognitive capacity, in comparisons with peers.^{21,35} In addition, they do not have radically different educational aspirations.³⁶ This could, at least in theory, constitute an opportunity for interventions. A growing body of studies suggest that it is possible to improve these children's school performance through interventions.³⁰ Pre-school-based programs, targeting early literacy/numeracy and providing training in self-regulation skills, hold great promise.³⁷ Of course we do not know if better school performance would lead to lower rates of teenage child-births, but US studies of other disadvantaged populations suggest that this is a viable path towards improvement.³⁸

Strengths and weaknesses

Strengths of this study included the massive sample size (virtually the entire Swedish female population born in these years) which increased the precision (i.e. yielding narrower confidence intervals) of our estimates. This was particularly valid for the child welfare subgroups, which usually have been underpowered in earlier research. We also applied a novel regression and decomposition method which was unaffected by the rescaling bias that arise when comparing crude and adjusted coefficients in non-linear models.

Like other observational studies exploiting secondary data sources, this study also had a number of inherent limitations. Perhaps the most important drawback was the lack of data on behavioural issues, and on the time of emergence of such problems. In longitudinal population studies, individual risk factors are usually stronger predictors of compromised development in children/youth than family-related risk factors.³⁹ However, this pattern is far less pronounced in samples of children from marginalized childhood backgrounds.⁴⁰

Data on children/youth who had received in-home care were limited in the registers, resulting in an underestimation of the size of this group. Moreover, we did not have information on other factors that may have influenced school performance and teenage child birth rates, e.g. residential/placement stability, other service-related experiences and OHC environment characteristics.

Conclusions

The results show that school failure is a heavy risk factor for teenage child-births, also among child welfare youth. But there are hopeful indications from intervention studies that this risk factor can be influenced through interventions. Henceforth, systematic promotion of child welfare children's school performance seems to be a promising—and feasible—pathway towards reducing rates of teenage child-births in this extremely disadvantaged group.

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Conflicts of interest: None declared.

Key points

- Teenage motherhood among child welfare clients is substantially higher compared with peers.
- There is limited information available for identifying successful social prevention strategies.
- Girls' school failure was the most potent confounder.
- Supporting school performance seems to be a viable intervention path.

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The rate of country-level improvements of the infant mortality rate is mainly determined by previous history

Sven G. Bremberg

Department of Public Health, Karolinska Institute, Stockholm, Sweden and Public Health Agency of Sweden, Stockholm, Sweden

Correspondence: Sven G. Bremberg, Department of Public Health, Karolinska Institute, Stockholm, Sweden and Public Health Agency of Sweden, Färgargårdstorget 52, 116 43 Stockholm, Sweden. Tel: +46 706899753, Fax: 08-32 83 30, e-mail: sven.bremberg@mac.com

Background: Studies of country-level determinants of health have produced conflicting results even when the analyses have been restricted to high-income countries. Yet, most of these studies have not taken historical, country-specific developments into account. Thus, it is appropriate to separate the influence of current exposures from historical aspects. **Methods:** Determinants of the infant mortality rate (IMR) were studied in 28 OECD countries over the period 1990–2012. Twelve determinants were selected. They refer to the level of general resources, resources that specifically address child health and characteristics that affect knowledge dissemination, including level of trust, and a health related behaviour: the rate of female smoking. **Results:** Bivariate analyses with the IMR in year 2000 as outcome and the 12 determinants produced six statistically significant models. In multivariate analyses, the rate of decrease in the IMR was investigated as outcome and a history variable (IMR in 1990) was included in the models. The history variable alone explained 95% of the variation. None of the multivariate models, with the 12 determinants included, explained significantly more variation. **Conclusion:** Taking into account the historical development of the IMR will critically affect correlations between country-level determinants and the IMR.
