

## RESEARCH REPORT

# Sociodemographic differences in the occurrence of teenage pregnancies in Finland in 1987–1998: a follow up study

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**Study objective:** To analyse sociodemographic differences in the occurrence of pregnancies to 14 to 19 year olds and changes in these differences from 1987 to 1998.

**Design:** Follow up of adolescent survey respondents using registers.

**Setting and subjects:** The dataset includes information on all registered pregnancies (abortions, births, and miscarriages, n=2743) of the female respondents (n=28 914) to the Adolescent Health and Lifestyle Survey (AHLS) from 1987 to 1998. In the AHLS, self administered questionnaires were mailed every second year to independent samples of 12, 14, 16, and 18 year olds representative for Finland.

**Main outcome measure:** Relative risk (hazard) of becoming pregnant at teenage.

**Main results:** Girls from lower socioeconomic background had a higher pregnancy risk. Girls who did not live with both parents at the baseline survey had higher pregnancy risk than those who did, and girls who lived in a stepfamily had a higher risk than those who lived in a one parent family. Swedish speaking girls had a lower pregnancy risk than the Finnish speaking girls. There was no systematic change from 1987 to 1998 in most sociodemographic differentials in the teenage pregnancy risk, however, there was some increase in the differences by family structure. Changes in the sociodemographic structure did not explain the levelling off of the downward trend in teenage pregnancy risk, nor did the regional socioeconomic differences explain regional differentials in teenage pregnancy risk.

**Conclusion:** Although the reduction of socioeconomic and regional differences has been a general objective in Finnish social and health policies, the relative differences in teenage pregnancies have not decreased.

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Finland has a successful track record of reducing unintended pregnancies.<sup>1</sup> The abortion rate among all women of reproductive age halved from the first half of the 1970s to the mid-1990s<sup>2</sup> and teenage abortion and pregnancy rates decreased even more.<sup>3</sup> However, the favourable development stopped in the mid-1990s. From 1994 to 1997 the teenage pregnancy rate remained at the same level and the abortion rate slightly increased. The current levels of the teenage abortion rate (13.5 per thousand in 1999<sup>4</sup>) and fertility rate (9.6 per thousand in 1999<sup>5</sup>) in Finland are relatively low among the countries with reliable data.<sup>6,7</sup>

It is probable that a large proportion of teenage pregnancies in western countries are unplanned, though there is not much research evidence on that. One available estimate is 78% and pertains to the United States.<sup>8</sup> In a Danish hospital study of pregnant women before 20th week of gestation, 52% of all pregnancies among women age under 24 years (n=761) were unplanned, whether accepted or terminated.<sup>9</sup> In women aged under 20, the respective figure was 86% (Vibeke Rasch, unpublished data). Although there are no direct estimates of this proportion in Finland, we can assume that the situation is very much the same. In the European context, the mean age of Finnish women at first birth, 27.4 years, is high, and the contribution of women below age 20 to total period fertility, 2.8%, is low.<sup>7</sup> In such a context the occurrence of adolescent pregnancies reflects adolescent sexual activity and success in preventive activities. Activities aimed at the reduction of adolescent pregnancies would thus contribute to the reduction of abortions and the reduction of unplanned births.

There are studies from other countries that have analysed the incidence of teenage pregnancies (or abortions or births) by sociodemographic background,<sup>10–17</sup> most of them using data

from the United States. Many studies have focused on area level associations of socioeconomic status and teenage pregnancy risk<sup>18</sup> or birth risk,<sup>19,20</sup> and there are a number of studies that analyse the pregnancy risk of teenage mothers by socioeconomic and family background.<sup>21,22</sup> Most of these studies, which use different methodologies, show that girls from a lower socioeconomic background (measured either on individual or area level) or from incomplete or stepfamilies have higher abortion, fertility, or pregnancy rates at adolescence than their counterparts with more favourable background characteristics. However, other examples also exist. In Switzerland, the father's level of education did not differentiate adolescents who had experienced pregnancy and those who had not.<sup>12</sup> In the United States, Moore *et al*<sup>15</sup> found no independent effect of family income after controlling for a number of other variables. Most of the evidence on socioeconomic differences in teenage pregnancy rates pertains to the United States and cannot be directly generalised to Finland or other European countries, because of the differences in the social structures and healthcare systems between these societies.

Finland is a Nordic welfare society that is sparsely populated and has a relatively large geographical area. The northern part of the country is even more sparsely populated, while the southern part is more urbanised and more affluent. Earlier Finnish studies on the regional variation in adolescent health behaviours have found that the regional differences were, to some extent, explained by the socioeconomic structures of the regions.<sup>23,24</sup> Finland has a Swedish speaking population that makes up 6% of the total population and is concentrated in the western and south western coast and the islands as well as in the capital Helsinki and in some locations

in the surrounding Uusimaa region. Earlier studies have revealed that they have higher life expectancy and they remain active in working life longer than their Finnish speaking compatriots, the differences being astonishingly large for a highly monocultural and egalitarian society like Finland.<sup>25–27</sup>

There is an effective and comprehensive registration system of abortions and births in Finland. A recent analysis of these data showed that the levelling off of the trend in teenage pregnancy rates in the mid-1990s started first among older teenagers, and spread gradually to the younger girls.<sup>28</sup> Regional variation in the rates remained the same from 1987 to 1999, with the highest levels observed in the northernmost region of Lapland and in the capital Helsinki.<sup>28</sup> However, there is little direct information on the association of socioeconomic and family background factors with teenage pregnancies and abortions, because the registers do not contain that background information and it is also difficult to obtain data on the population at risk by the sociodemographic background variables. Retrospective surveys could be an alternative way to study this area, however, it has been found that they often fail to provide reliable information on abortions.<sup>29–30</sup> In this study, we overcome many of these measurement difficulties by using a dataset that contains linked information from different sources.

The purpose of the study is

- to analyse sociodemographic differences in the occurrence of pregnancies of 14 to 19 year olds
- to determine whether any sociodemographic differences have changed over time from 1987 to 1998
- to assess whether changes in teenage pregnancy rates over time can be explained by changes in the sociodemographic structure of the teenage population
- to assess whether any regional variations in the teenage pregnancy rate could be accounted for by the socioeconomic differences between the regions.

## METHODS

### Data sources

Our dataset is formed by an individual level linkage of data from the Adolescent Health and Lifestyle Survey (AHLS), and the registers on reproduction (Register of Induced Abortion and Sterilisation, Medical Birth Register, and Hospital Care Register) maintained at the National Research and Development Centre for Welfare and Health (STAKES). The linked dataset includes information from 1987 to 1998 on all registered pregnancies (abortions, births, and miscarriages treated in a hospital) of the girls who were in the AHLS samples in 1987, 1989, 1991, 1993, 1995, and 1997, including the non-respondents. The data linkage was made by Statistics Finland and the identity of the study subjects was not available to us at any stage. The research plan and the data linkage procedure were approved by the ethics committee of the Pirkanmaa Hospital District, and by the Office of the Data Protection Ombudsman.

AHLS is a nationwide monitoring system of adolescent health and health behaviours with samples representing the 12, 14, 16, and 18 year olds in the entire country (excluding the archipelago province of Åland). The samples were independent across survey years, and each individual was included only in one survey. The samples were obtained from the Population Register Centre and were based on selected dates of birth, so that all Finns born on given sample days were included. The mean ages of respondents were 12.6, 14.6, 16.6, and 18.6 years. Self administered questionnaires were mailed in February every second year with two re-inquiries to non-respondents. The timing of the study, sampling and data collection methods were similar throughout the study period. In 1987, 1991, and 1993 adolescents aged 14, 16, and 18 from

**Table 1** Number of respondents and response rate by age, Adolescent Health and Lifestyle Survey 1987–1997

Age at survey	1987	1989	1991	1993	1995	1997	Total
Number of respondents							
12	363	430	395	436	423	*	2047
14	1856	431	2058	2008	1301	1346	9000
16	1968	345	1912	2095	1469	1379	9168
18	2201	354	1685	1929	1116	1414	8699
Total	6388	1560	6050	6468	4309	4139	28914
Response rate (%)							
12	83	82	81	84	85	*	84
14	90	90	87	88	85	84	87
16	89	82	87	87	88	87	87
18	86	80	82	84	86	83	84
Total	88	84	85	86	86	85	86

\*Data on these respondents were not used in this study, because they did not reach age 14 by the end of the follow up period.

smaller provinces were over-sampled in order to obtain representative samples for each province. In the analyses we used data on all the girls who responded to the 1987 through to 1997 rounds of the survey (table 1). As we had information on the pregnancies of the entire samples, it was possible to calculate a pregnancy rate for those girls who did not return a filled questionnaire. This was 71% higher than that of the respondents.

According to an evaluation study, the Finnish Abortion Register includes 99% of abortions performed in the country.<sup>2</sup> The Birth Register is consistency checked with the Population Register and covers virtually all births in Finland (for quality assessments, see references<sup>31–33</sup>). Information on miscarriages was retrieved from the Hospital Care Register and includes only those cases that involved inpatient treatment. According to a Finnish survey, 74% of women who have a miscarriage are treated as inpatients.<sup>34</sup>

### Study variables

The start of any pregnancy measured with the precision of a month is the event under study, and we analyse the intensity (hazard) of the occurrence of this event as the dependent variable. The month of the start of pregnancy was obtained from the register data, using information on the duration of pregnancy at the registered event (abortion or birth). In the case of miscarriage the duration of pregnancy was not available and was assumed to be two months.

Two explanatory variables, current age and calendar year, are time varying covariates with changing values in the course of the follow up. The other explanatory variables are obtained either from the sample data from the Population Register (place of residence and mother tongue) or from the response to the AHLS, and refer to the time of the survey.

Adolescence is a transient stage where it is not self evident how to measure socioeconomic status, because the adolescent girl's own occupation recorded at that age does not reflect her true status. For an adequate measure, information on the status of the parents is needed. We used two measures that represent different dimensions of socioeconomic status: one was the status classified on the basis of occupation and the other was the level of education. Both of them referred to the father if he was present in the family, and to the guardian (most often the mother) if the father was not present. In the following, we present our study variables with the percentage of respondents in each category presented in the parentheses.

- Father's or other guardian's level of education has three categories: high, which is estimated to represent 12 years or more in education (17% of all the respondents), middle,

**Table 2** Number of pregnancies by age and year at the start of pregnancy, and number of person years in the follow up by age and year

Year	Age						Total
	14	15	16	17	18	19	
Number of pregnancies							
1987	3	3	18	27	52	74	177
1988	0	9	15	34	39	67	164
1989	2	5	21	34	58	82	202
1990	1	9	4	39	44	69	166
1991	3	12	21	35	101	120	292
1992	1	10	10	38	40	103	202
1993	3	5	44	31	75	103	261
1994	0	10	17	62	73	136	298
1995	3	7	21	42	124	155	352
1996	0	6	12	34	74	152	278
1997/1998*	1	7	26	40	125	152	351
Total	17	83	209	416	805	1213	2743
Number of person years†							
1987	800	901	846	945	931	1031	5454
1988	182	953	897	1003	940	1095	5071
1989	361	396	1086	1067	1129	1105	5143
1990	215	396	395	1109	1062	1146	4323
1991	1121	1191	1230	1298	1786	1863	8489
1992	198	1290	1191	1381	1290	1905	7254
1993	1066	1168	2197	2183	2214	2175	11003
1994	218	1232	1165	2365	2173	2349	9502
1995	795	832	1882	1850	2819	2671	10848
1996	212	903	830	1993	1842	2873	8652
1997/1998*	772	1178	1497	2004	2581	3338	11370
Total	5938	10441	13216	17198	18767	21549	87108

\*The observation period ends in February 1998 and we present the data for the two first months of 1998 jointly with that for the year 1997. †In the statistical analyses data were used to the precision of month. The person years in this table are rounded to the nearest integer.

representing from 9 to 11 years in education (15%), and low, at most 8 years in education (68%).

- Father's or other guardian's occupation is classified by the status classification of Statistics Finland: upper white collar employee (21%), lower white collar employee (29%), farmer (9%), and blue collar employee (42%).
- Family structure: the adolescent living with both parents (76%), with own parent and stepparent (8%), with one parent (13%), with her own partner (3%), other, that is, not living together with either of own parents nor with a partner (1%). In the 1987 survey the distinction could only be made between the category *living with both parents* and all the others.
- Region: 11 provinces according to the official division of provinces until 1997.
- The urbanisation level of the place of residence is defined by population density: capital city area (the capital Helsinki and the adjoining towns, 11%), larger towns (population over 50,000, 16%), smaller towns and other settlements (including densely populated areas in rural municipalities, 59%), and sparsely populated rural areas (isolated home-steads in rural municipalities, 14%).
- Mother tongue: Finnish (97%), Swedish (3%).

### Statistical analysis

We used intensity (hazard) regression to estimate models of pregnancy risks of teenagers. Regression models were fitted using the GLIM software package.<sup>35</sup> The word *pregnancy risk* is used in this article to connote the intensity of the occurrence of pregnancies. The time reference of the pregnancy is its starting month. The follow up time starts from the month of response to the AHLS or at the 14th birthday for those who answered the questionnaire at age 12, and ends either with the respondent's 20th birthday or at the end of the observation period (28 February 1998). Our dataset includes data on

events that are pregnancy outcomes, whereas we analyse the event of the start of pregnancy. Pregnancies that start after February 1998 may have ended in a birth only in 1999 and are thus not included in the data. Therefore we censor all the observations at the end of February 1998. The time during which a respondent was pregnant is excluded from the follow up time, but respondents re-entered follow up after the end of the pregnancy. The numbers of observed pregnancies and person years of exposure by age and calendar year are presented in table 2. All time related data were analysed at the precision of month.

In the first step of the analysis we fitted separate hazard models for each explanatory variable, controlling only for age. The purpose of these models is to describe the differences in the pregnancy risk by each variable, and they also serve as a baseline contrast to the model with all significant variables. They are labelled as *baseline* models. As a starting point of the second step we fitted a model that included all the variables that were significantly associated with pregnancy risk in the first step and were measured in each round of the survey. A backward stepwise procedure was applied to this model to find the most parsimonious model based on the variables that were measured throughout the study period. This is labelled as *the multivariate model*. The comparison of the estimates of this model with the ones obtained from the baseline models answers to the questions whether some of the change over time or some of the regional variation could be explained by other sociodemographic variables. In the third step, we ran the multivariate model using the subsample when the detailed family composition was measured (this was not measured only in the 1987 survey). This model is denoted as *the family structure model*.

In the fourth step, we checked all the possible first level interactions between the explanatory variables to study the changing effects over time (interactions of each variable with calendar year) and to make sure that any subgroups that would require separate analysis were not omitted. We used the

continuous specification of the calendar year to test for a significant linear change over time in the sociodemographic differences, and the categorical specification (also by using groups of adjacent years as categories) to examine the pattern of relative risks that might display other than a linear change. The interaction estimates were obtained both as adjusted only for age and as adjusted for all the variables in the multivariate model. Our statements about significance are based on the likelihood ratio test at the five per cent level. In addition, we also present results from some other models to show how the relative risks by level of urbanisation changed from one model to another.

## RESULTS

### Sociodemographic differences

#### Socioeconomic status

Differences in pregnancy risk by father's or guardian's occupation and level of education were large (baseline models in table 3). A girl from a blue collar family had 2.5 times the risk of becoming pregnant at teenage compared with a girl from an upper white collar family, and there were significant differences between each of the four occupational statuses. Daughters of farmers had a pregnancy risk that was between that of lower and upper white collar families. Girls whose fathers had less than nine years of education had 2.2 times the pregnancy risk of those whose fathers had 12 or more years of education.

In the multivariate model, the relative pregnancy risks by father's occupation and level of education were smaller than in the baseline models (table 3). This is related to the known correlation between these two variables. When one of them was dropped from the multivariate model, the relative risks of the other were close to the corresponding relative risks in the baseline model. They became smaller only when they were both in a model simultaneously. As father's occupation and level of education retained their significant independent effects they were both kept in the multivariate model to have the best available control for socioeconomic background in the relative risks of the other variables.

#### Family structure

Girls whose family composition in the survey was other than living with both parents had 2.3 times the pregnancy risk of those who lived together with their parents (table 3). When looking at different family types in more detail, four different levels could be distinguished. Those girls who already lived together with their partner and those who belonged to the category *other* had the highest pregnancy risk (table 4). Girls who had a step-parent (both those living with her mother and stepfather and those with father and stepmother) had the next highest pregnancy risk, followed by those living in a one parent family. Girls who lived with both parents had by far the lowest pregnancy risk.

There was very little change in the relative pregnancy risks by family structure from the baseline model to the multivariate model that controlled for all the other significant variables. In particular, it is worth noting that the pregnancy risk of girls who lived with an own parent and a step-parent remained 29% higher than that of girls in one parent families (table 4; the *p* value for this particular contrast was  $<0.01$ ). We also checked for the effect of whether the adolescent's own parent in these families was the mother or the father, and found none. Girls living with only the father had levels of pregnancy risk remarkably close to those living with only the mother, and girls living with father and stepmother, and mother and stepfather also had an equal risk (numerical results available on request).

Given the known age dependency of family structure, particularly the increase with age of the proportion of those not living with their parents and living with a partner, we also

checked for the influence of controlling for age at the survey on the relative risks and tested the interaction of family structure with age at the survey. The interaction was not significant and did not show any pattern.

#### Mother tongue

There was a remarkably large difference between the two language groups in Finland: the Swedish speaking girls had a 39% lower pregnancy risk than their Finnish speaking counterparts (table 3). The difference by mother tongue became smaller especially when the father's occupation and level of education were controlled for, reflecting the fact that Swedish speaking girls come, on average, from higher socioeconomic groups. In our data, 33% of Swedish speaking and 20% of Finnish speaking girls came from upper white collar families. When controlled for all the variables that were present in the multivariate model, the Swedish speaking girls still had a 32% lower pregnancy risk than the Finnish speaking girls.

#### Change over time

The relative pregnancy risks by calendar year showed that there was a decline up to the mid-1990s and a levelling off after that (table 3), which is consistent with the teenage pregnancy trend observed in the total population. There was only very little difference between the relative risk by calendar year estimated from the baseline model and those from the multivariate model, which indicates that change in the sociodemographic structure of the teenage population does not explain the time trend.

We studied whether there was any change in the observed sociodemographic differences over time, by checking interactions of each variable with calendar year (we used both the categorical and continuous specifications of the calendar year and tried several categorical specification by grouping adjacent years). There was some indication that the differences between girls from intact and other families increased over time. In 1987–1989 the relative risk (controlled only for age) of girls who did not live with both parents was 2.01 times that of girls with both parents; this relative risk was 2.04 in 1990–1991, 2.56 in 1992–1994, and 2.37 in 1995–1998. The interaction with the family structure and year as a continuous variable was significant ( $p=0.04$ ) when added to the model that included the main effects of these variables and age. Some variation could be observed also in the relative risks of other variables over the study period, but there was no systematic pattern and the *p* values for their interaction with the calendar year remained above 0.25 at all the different specifications for the calendar year. We conclude that there was no significant change over time in the effects of the other study variables except family structure.

#### Regional differences

When studied by region, the pregnancy risk was the highest in the north of the country and in the capital city area, and lowest in some western coastal regions and in the south east. There was no sign of an overall reduction or increase of regional differences, however, a small change in the relative risks in two provinces could be noted from the baseline model to the multivariate model. Teenage pregnancy risk in the provinces of Uusimaa (in the south of the country, includes the capital Helsinki and its surroundings) and Vaasa (at the western coast) was a little higher in the multivariate model. In the case of Uusimaa this was related to the concentration of people with a higher education and at a higher occupational status around the capital. The percentage of girls from the families of upper white collar employees was 35% in Uusimaa and 18% in the rest of the country and the corresponding percentages of those whose father or guardian had at least 12 years of education were 32% and 14%. In the case of Vaasa this

**Table 3** Relative pregnancy risks estimated from hazard regression models. Respondents to the 1987–1997 surveys

Variable Category	Baseline models: Age+Variable		Multivariate model*	
	Relative risk	95% confidence intervals	Relative risk	95% confidence intervals
Age†				
14	<b>0.05</b>	0.03 to 0.08	<b>0.05</b>	0.03 to 0.09
15	<b>0.14</b>	0.11 to 0.18	<b>0.15</b>	0.12 to 0.19
16	<b>0.28</b>	0.24 to 0.33	<b>0.28</b>	0.24 to 0.33
17	<b>0.43</b>	0.38 to 0.48	<b>0.44</b>	0.39 to 0.49
18	<b>0.76</b>	0.70 to 0.83	<b>0.75</b>	0.68 to 0.82
19	1 (ref)		1 (ref)	
Year				
1987	1 (ref)		1 (ref)	
1988	0.90	0.72 to 1.11	0.93	0.74 to 1.16
1989	1.04	0.85 to 1.27	1.08	0.88 to 1.34
1990	0.92	0.74 to 1.13	0.98	0.78 to 1.22
1991	0.97	0.80 to 1.17	0.98	0.80 to 1.19
1992	<b>0.73</b>	0.59 to 0.89	<b>0.73</b>	0.59 to 0.90
1993	<b>0.67</b>	0.55 to 0.81	<b>0.69</b>	0.56 to 0.84
1994	<b>0.78</b>	0.64 to 0.93	<b>0.82</b>	0.67 to 1.00
1995	<b>0.81</b>	0.67 to 0.96	0.85	0.71 to 1.03
1996	<b>0.73</b>	0.60 to 0.88	<b>0.77</b>	0.63 to 0.94
1997/1998	<b>0.74</b>	0.62 to 0.89	<b>0.79</b>	0.66 to 0.96
Father's or guardian's occupation				
Upper white collar	1 (ref)		1 (ref)	
Lower white collar	<b>1.90</b>	1.66 to 2.18	<b>1.27</b>	1.08 to 1.50
Farmer	<b>1.53</b>	1.27 to 1.84	1.12	0.90 to 1.40
Blue collar	<b>2.46</b>	2.16 to 2.79	<b>1.61</b>	1.35 to 1.90
Father's or guardian's level of education				
12 or more years	1 (ref)		1 (ref)	
9–11 years	<b>1.39</b>	1.16 to 1.65	1.15	0.94 to 1.40
Not more than 8 years	<b>2.21</b>	1.92 to 2.54	<b>1.63</b>	1.36 to 1.95
Living with both parents				
Yes	1 (ref)		1 (ref)	
No	<b>2.29</b>	2.12 to 2.47	<b>2.24</b>	2.06 to 2.44
Mother tongue				
Finnish	1 (ref)		1 (ref)	
Swedish	<b>0.61</b>	0.46 to 0.80	<b>0.68</b>	0.50 to 0.93
Urbanisation				
Sparsely populated rural areas	1 (ref)			
Towns and other settlements	<b>1.19</b>	1.06 to 1.33		
Larger towns	<b>1.22</b>	1.06 to 1.41		ns
Capital city area	1.15	0.98 to 1.35		
Region (province)				
Central and western:				
Central Finland	1 (ref)		1 (ref)	
Vaasa	0.96	0.79 to 1.17	1.05	0.86 to 1.28
South:				
Uusimaa	0.96	0.81 to 1.14	1.05	0.88 to 1.25
Kymi	<b>0.79</b>	0.64 to 0.97	<b>0.75</b>	0.61 to 0.93
Southwest:				
Turku	1.02	0.85 to 1.23	1.02	0.85 to 1.22
Häme	1.00	0.83 to 1.21	1.00	0.83 to 1.20
East:				
Mikkeli	0.89	0.72 to 1.10	0.87	0.71 to 1.08
North Karelia	1.11	0.90 to 1.37	1.09	0.89 to 1.35
Kuopio	1.11	0.92 to 1.35	1.09	0.90 to 1.32
North:				
Oulu	1.17	0.97 to 1.41	1.20	1.00 to 1.44
Lapland	<b>1.32</b>	1.09 to 1.60	<b>1.29</b>	1.07 to 1.56

\*Multivariate model = Age + Year + Occupation + Education + Both parents + Mother tongue + Province.

†The relative risks presented for age in the baseline model (first column) are estimated from a model that contains only age. Those relative risks that differ significantly from the reference category at 95% confidence level are in bold type.

was related to the fact that this province had the highest proportion of adolescents living in intact families (82% compared with 76% in the rest of the country) and the highest share of Swedish speaking adolescents (13% v 2%), both these groups having a relatively low teenage pregnancy risk.

Pregnancy risk increased by level of urbanisation, though the differences between the types of urban areas were not significant in the baseline model (table 3). Girls living in sparsely populated rural areas had the lowest pregnancy risk. When all the other variables were in the model, the level of urbanisation

was not significant (multivariate model in table 3). However, the relative risks by level of urbanisation and the significance of the variable varied considerably across different models (table 5). Controlling for socioeconomic status changed both the size and the pattern of the differences by level of urbanisation. The capital city area became distinguished as the area with the highest pregnancy risk. However, the size of the differences was again reduced after controlling additionally for other variables, of which the inclusion of living with both parents was critically important.

**Table 4** Relative pregnancy risks by family structure, estimated from hazard regression models. Respondents to the 1989–1997 surveys

Family structure	Baseline model = Age + Family structure		Multivariate family structure model*	
	Relative risk	95% confidence intervals	Relative risk	95% confidence intervals
Both parents	1 (ref)		1 (ref)	
Parent and step-parent	<b>2.59</b>	2.27 to 2.96	<b>2.50</b>	2.16 to 2.89
One parent	<b>1.96</b>	1.74 to 2.22	<b>1.94</b>	1.69 to 2.22
Living with her own partner	<b>5.13</b>	4.29 to 6.15	<b>4.29</b>	3.49 to 5.27
Other (not living together with either of own parents nor with a partner)	<b>4.34</b>	3.12 to 6.02	<b>4.65</b>	3.28 to 6.59

\*Family structure model = Age + Year + Occupation + Education + Family structure + Mother tongue + Province. Those relative risks that differ significantly from the reference category at 95% confidence level are in bold type.

**Table 5** Relative pregnancy risks by level of urbanisation, estimated from hazard regression models. Respondents to the 1987–1997 surveys

	Variables in the model in addition to the level of urbanisation					
	Age	Age+Year	Age+Year+ Occupation+ Education	Age+Year+ Both Parents	Age+Year+ Occupation+ Education+ Both Parents	Age+Year+ Occupation+ Education+ Both Parents+ Province
Sparsely populated rural areas	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)
Towns and other settlements	<b>1.19</b> 1.06 to 1.33	<b>1.19</b> 1.06 to 1.33	<b>1.16</b> 1.02 to 1.33	1.08 0.96 to 1.21	1.09 0.96 to 1.25	1.10 0.96 to 1.25
Larger towns	<b>1.22</b> 1.06 to 1.41	<b>1.23</b> 1.07 to 1.41	<b>1.28</b> 1.09 to 1.50	1.06 0.92 to 1.22	1.15 0.98 to 1.35	1.18 1.00 to 1.38
Capital city area	1.15 0.98 to 1.35	1.16 0.99 to 1.36	<b>1.40</b> 1.17 to 1.68	0.96 0.81 to 1.12	1.19 1.00 to 1.43	1.26 0.99 to 1.61

Those relative risks that differ significantly from the reference category at 95% confidence level are in bold type.

In addition, we found a significant interaction between the level of urbanisation and father's occupation. Socioeconomic differences in pregnancy risk increased with the level of urbanisation of the place of residence and were particularly large in the capital city area (fig 1). It seems that the high level of teenage pregnancy in the capital applies first and foremost to girls from blue collar families.

## DISCUSSION

The main findings of our study can be summarised as follows:

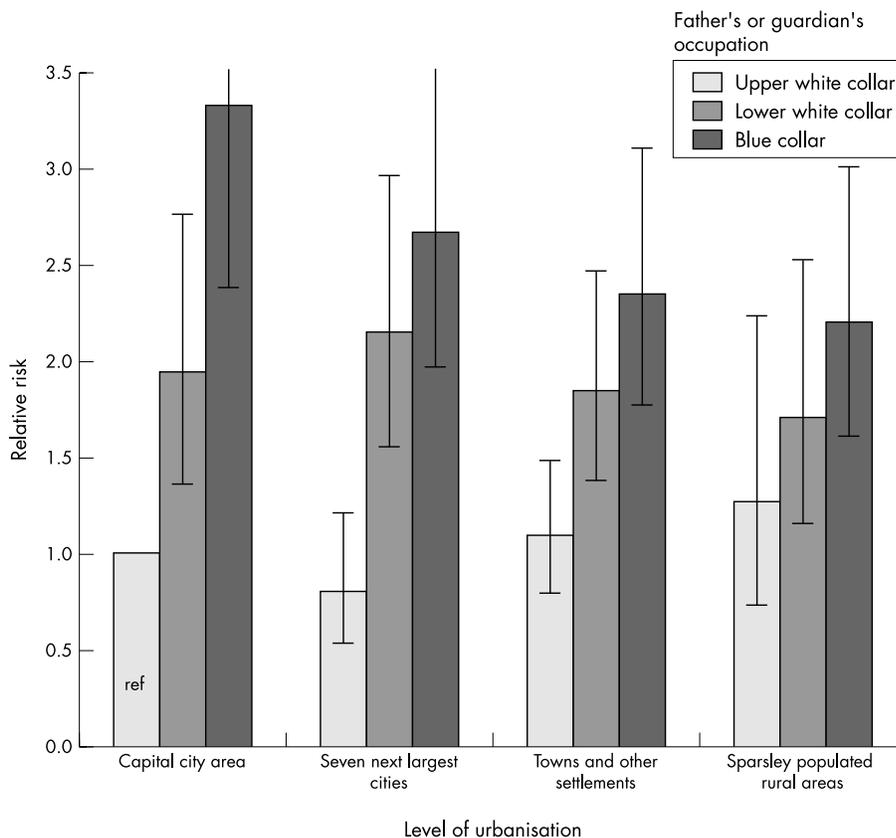
- There were large differences in teenage pregnancy risk by socioeconomic status (measured by father's occupation and the level of education), particularly in the capital city area (Helsinki).
- Swedish speaking girls had a lower pregnancy risk than their Finnish speaking counterparts, and this also remained so when their different distributions by socioeconomic status were taken into account.
- Differences in teenage pregnancy risk by family structure were large. Girls from intact two parent families had the lowest pregnancy risk and early home leavers the highest. The higher pregnancy risk of girls who live with an own parent and a step-parent compared with girls who lived in a one parent family was a new finding.
- There was no systematic change in most sociodemographic differentials in the teenage pregnancy risk from 1987 to 1998, and the changes in the sociodemographic structure did not explain the levelling off of the downward trend in pregnancy risk. However, there was some increase over time in the differences by family structure.

- The differences in the socioeconomic characteristics of the regions did not explain regional differentials in teenage pregnancy risk. The differences by level of urbanisation were to a large extent explained by the variation of family structure by urbanisation.

## Assessment of data

Our results are based on a large nationally representative dataset that was set up to analyse the occurrence of pregnancies by various background characteristics over a period of time. The response rates of the baseline surveys ranged from 84% to 88%, which allows us to be confident in generalising the results for the entire teenage population of Finland over the study period. We were able to measure the pregnancy rate of the non-respondents, because their data were also linked to registered pregnancies. The teenage pregnancy rate of the non-respondents was 71% higher than that of the respondents, which is consistent with some earlier findings where the non-respondents have been found more likely to be engaged in health compromising behaviours than the respondents.<sup>36</sup> Given the difference in the pregnancy rate between the respondents and the non-respondents, it is also likely that there are more girls from lower socioeconomic background among the non-respondents. Even if the pattern of socio-demographic differences among the non-respondents was different, it would have only a negligible effect on the results, given their low proportion.

It is important from the point of view of the reliability of our results that the information on the outcome variable was not self reported and came from high quality registers. This allows us to rule out the under-reporting of undesirable life events (abortions and miscarriages) as a known source of bias. The



**Figure 1** Relative teenage pregnancy risks by level of urbanisation and father's or guardian's occupation.

dataset also included most pregnancies that ended in miscarriage. Altogether this enabled us to provide better estimates for the sociodemographic differentials than has been possible in most previous studies on teenage pregnancies.

### Sociodemographic differences

#### Socioeconomic status

Macintyre and West<sup>37</sup> have studied how the different indicators of socioeconomic status are related to its association with health in adolescence. They concluded that the patterns observed in the different dimensions of health were remarkably consistent between the different occupational measures, and many non-occupational measures (housing, income, and car availability) did not consistently produce differences not already detected by the occupational measures. Hence, it is likely that there would not be any essential change to our results if more refined measures of socioeconomic status could be applied.

Based on research from other countries we expected the finding that adolescents from lower socioeconomic background had a higher pregnancy risk. Although there were large differences by both indicators of socioeconomic background in our study, they appear modest in comparison with the social class differences in teenage birth rates in England and Wales, where the difference between the opposite ends of the social class distribution was almost 10-fold.<sup>14</sup> Our results show somewhat smaller differences than those reported for the United States, where daughters of fathers from a manual occupation had 3.6 times the odds of having a pre-marital birth by the age of 23,<sup>11</sup> and where the odds of giving birth at teenage were reduced in the range of 6% to 11% by each year of the mother's education, depending on the study and reference population.<sup>10,17</sup> In these comparisons it has to be borne in mind that the Finnish teenage pregnancy rate is on a level less than a quarter of that in the United States, and about one third of that in England and Wales. In Switzerland, where the

level is close to that of Finland, Narring *et al*<sup>12</sup> found no differences by socioeconomic status of the father. Their result may, though, partially result from the study design, because they included only 15–20 year olds enrolled at post-mandatory schools.

The crucial importance of adolescence is that during this phase of life health differences are created that are likely to remain in adulthood.<sup>38,39</sup> Several studies have shown that the experience of a teenage pregnancy, and particularly a teenage birth, is a predictor of social and health disadvantages in later adult life.<sup>40,41</sup> Teenage pregnancy can thus be viewed both as a cause and consequence of social exclusion<sup>42</sup> and as one of the channels that transmits socioeconomic differences across generations.

#### Family structure

As expected, girls who live in a nuclear family with both parents were clearly distinguished as the category with the lowest pregnancy risk. This is consistent with previous findings from other countries.<sup>10,16,21,43,44</sup>

Our results show that those who move into a partnership in adolescence have the same very high pregnancy risk as the girls who do not live together with parents or with a partner. This suggests that those who start a partnership early do not use contraception adequately and that they, to a certain extent, share the risk behaviours of all the adolescents who do not live with parents. However, among those who reported living with a partner there may also be a proportion of intended pregnancies that contributes to their high pregnancy risk. It has been found in other research that adolescents who do not live with parents not only have a high pregnancy risk,<sup>12,15</sup> but also display by far the most health problems and health compromising behaviours<sup>45</sup> and they have the highest mortality.<sup>46</sup> They have also been found to have problems later in their educational and family careers.<sup>47–49</sup> Our findings suggest that early home leavers are a risk group in terms of early pregnancies.

### Key points

- Considerable sociodemographic differences in the occurrence of teenage pregnancies exist also in a welfare society like Finland.
- No systematic change in socioeconomic differentials was found in teenage pregnancy risk from 1987 to 1998
- Girls living with an own parent and a step-parent had a higher pregnancy risk than girls living in a one parent family.
- Given the impressive decline in teenage pregnancies in Finland until the mid-1990s, the absolute socio-demographic differences have diminished.

Girls in stepfamilies and one parent families showed levels of pregnancy risk placed at an intermediate level between those living with both parents and those in a partnership or not living together with the parents. However, it was somewhat surprising to find that girls from stepfamilies had a higher pregnancy risk than those from one parent families. To our knowledge, this has not been previously reported, and earlier research provides different results on the effect of stepfamilies on the adolescent in comparison with one parent families. There is evidence that the wellbeing of adolescents in stepfamilies is at an intermediate level between those from one parent families and those in intact families, and is closer to the level of intact families.<sup>50</sup> Teenage girls from one parent families have also been found to report more emotional problems than girls from stepfamilies.<sup>51</sup> On the other hand, it has been shown that young men and women in stepfamilies are more likely than those in one parent families to leave home because of friction<sup>52</sup> and they also leave home earlier than the adolescents from intact and one parent families.<sup>53</sup> Our results support the idea that the entry of a step-parent into the family may cause problems for children, and could result in involvement with risk behaviours (E Bernhardt *et al*, PAA annual meeting, Washington, DC, March 2001).

In our analyses it was shown that the sex of the parent with whom the adolescent stayed after the break up of the parental family did not have any effect on pregnancy risk. In fact, the girls living with only the father had levels of pregnancy risk remarkably close to those living with only the mother, and girls living with father and stepmother had an equal risk to those who lived with mother and stepfather. As a shortcoming in this respect, we do not have information on when the last transition in the parental family occurred, nor on the changes in the parental family during the follow up. To gain a deeper insight into the reasons for the different pregnancy risks between girls from these two types of families, family relations would have to be considered in addition to family composition, as it has been argued that the adolescent's good relationship with at least one adult in the family may be a better predictor of the adolescent's behaviour than the family structure itself.<sup>50</sup>

### Mother tongue

Our finding of the lower teenage pregnancy rate in the Swedish speaking population is in accordance with earlier research on the more favourable health situation in this minority group. Hyyppä and Mäki<sup>27</sup> have hypothesised that the level of social cohesion or social capital can explain the health differences between the two language groups, especially as they could not be attributed to socioeconomic characteristics. It may well be the case that factors related to social behaviour can also explain the differences in teenage pregnancy risk between the two population groups. There are reasons to believe that the social behaviour of the Swedish speaking minority differs from that of the Finnish speaking majority<sup>54</sup> and the Swedish speaking community has a higher level of

social cohesion because of its small size, strong institutional network, cultural activity, and geographical stability. Minority language can also be regarded as an indicator of social cohesion, and the considerably lower divorce rate among the Swedish speaking population may be understood as another indicator of social integrity.<sup>55</sup>

### Change over time

During the study period there was some change in the distribution of adolescents by occupation and level of education of their parents, and by family structure. The rise in completed levels of education over time is reflected in the increasing proportion of adolescents whose father had 12 or more years of education (from 12% in 1987 to 23% in 1997) or was an upper white collar employee (from 16% in 1987 to 24% in 1997). There has also been some effect of the increasing divorce rate on the family structure of adolescents: the proportion of adolescents who did not live with both parents increased from 21% in 1987 to 25% in 1997. Neither the change in socioeconomic background nor that in the family structure influenced the temporal change in the teenage pregnancy rate. Relative differences in teenage pregnancies by family structure somewhat increased over time, but there was no systematic change over time in socioeconomic differences and in the differences by mother tongue and region. The large and persistent differences by socioeconomic status tell us that the Finnish policies that aim at reducing socioeconomic health differences have not been particularly successful with respect to teenage pregnancies.

### Regional differences

The known regional differences in the Finnish teenage pregnancy rate<sup>3, 28, 56</sup> were confirmed in our data, but the known regional differences in socioeconomic structure and urbanisation did not explain the regional differences in the teenage pregnancy rate. One possible reason for the fact that the regional variation in teenage pregnancies was not reduced in our study, when we took socioeconomic variables into account, may be that we did not have specific measurements of regional context. For a deeper understanding of the influence of socioregional context on the teenage pregnancy rate, regional level information on the various aspects of social context has to be obtained and analysed by multilevel models.

Teenage pregnancy and abortion rates in the capitals of all the Nordic countries are higher than those in other parts of the country.<sup>57</sup> In our data, the difference between the capital city and other larger towns in Finland appeared rather small, while there were differences between them and the less urbanised areas. Moreover, we were able to explain the differences in pregnancy risks between areas of different urbanisation level by the family structure. The proportion of adolescents who lived with both parents decreased by urbanisation (87% in sparsely populated rural areas and 69% in the capital city area, other categories in between), and that was sufficient to explain the differences. At the same time, socioeconomic status played an opposite part. The more urban areas, and especially the capital city area, had a larger proportion of adolescents from upper white collar backgrounds (41% in the capital city area, 7% in sparsely populated rural areas, others in between) whose pregnancy risk in general was lower, and it appeared that the socioeconomic differences were more pronounced in the capital city than in the rest of the country.

In this study, the place of residence was measured at the time of the survey and the possible subsequent moves could not be covered. It is known that there has been an ongoing migration from the more rural areas and from the northern and eastern part of Finland to the urban centres in the south, to the capital in particular.<sup>58, 59</sup> This holds also for older teenagers, many of whom move to study. If the urban context of the

capital enhances behaviours that increase the teenage pregnancy rate, that would also influence the pregnancy rate of those who come to the capital at teenage. In that case, the actual difference between the capital and other regions may be even larger than we measured, because those who moved to Helsinki at teenage are recorded as living at their place of departure in our data.

### Sexual behaviour

It has been estimated in several studies that adolescents from lower socioeconomic groups engage in sexual activities earlier.<sup>60–61</sup> This has been confirmed in Finland.<sup>62</sup> In accordance with this, Kosunen *et al.*<sup>63</sup> have found that girls from lower socioeconomic groups in Finland are more likely to be oral contraceptive users already at the age of 16. It has also been shown that adolescents who live in intact nuclear families with their parents start sexual relations considerably later than those who have experienced the break up of their parents' union (MR Moore, 2000 Meeting of the American Sociological Association, Washington, DC, 2000).<sup>64–65</sup> Even if adolescents from the less favourable background were to know about contraception and apply contraception with the same success as adolescents from more affluent and stable family backgrounds, the differences in exposure would result in differences in pregnancy rates. It is thus likely that at least in part, the sociodemographic differences in adolescent pregnancy rates are explained by sexual behaviour, namely by the earlier start of sexual relations by adolescents from lower socioeconomic groups or incomplete families.

Sexual behaviour among Finnish adolescents has been monitored by repeated surveys since the mid-1980s. Between 1986 and 1997 the results of these studies did not suggest any remarkable change in adolescent sexual activity.<sup>66</sup> However, the latest results from the School Health Promotion Study suggest that proportions of adolescents who had experienced their first sexual intercourse by the end of comprehensive school (mean age 15.8 years) increased from 29% to 32% among girls and from 24% to 27% among boys in the late 1990s.<sup>67</sup> This is likely to be related to the levelling off of the teenage pregnancy trend in the second half of the 1990s.

### Concluding remarks

Our study showed that also in a welfare society like Finland there are considerable sociodemographic differences in the occurrence of teenage pregnancies. These differences have persisted over time, although the level of the teenage pregnancy rate has decreased. Legislation and population and family policies in Finland have aimed at reducing socioeconomic and regional differences,<sup>68</sup> and these targets have not yet been achieved with respect to relative differences in teenage pregnancies. However, given the impressive decline in teenage pregnancies that continued until the mid-1990s in all sociodemographic groups, the absolute sociodemographic differences in teenage pregnancies have diminished and are at an essentially lower level than in Britain or the United States.

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