# Mortality, severe morbidity, and injury in children living with single parents in Sweden: a population-based study

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## Summary

**Background** Growing up with one parent has become increasingly common, and seems to entail disadvantages in terms of socioeconomic circumstances and health. We aimed to investigate differences in mortality, severe morbidity, and injury between children living in households with one adult and those living in households with two adults.

**Methods** In this population-based study, we assessed overall and cause-specific mortality between 1991 and 1998 and risk of admission between 1991 and 1999 for 65 085 children with single parents and 921 257 children with two parents. We estimated relative risks by Poisson regression, adjusted for factors that might be presumed to select people into single parenthood, and for other factors, mainly resulting from single parenthood, that might have affected the relation between type of parenting and risk.

**Findings** Children with single parents showed increased risks of psychiatric disease, suicide or suicide attempt, injury, and addiction. After adjustment for confounding factors, such as socioeconomic status and parents' addiction or mental disease, children in single-parent households had increased risks compared with those in two-parent households for psychiatric disease in childhood (relative risk for girls 2·1 [95% CI 1·9–2·3] and boys 2·5 [2·3–2·8]), suicide attempt (girls 2·0 [1·9–2·2], boys 2·3 [2·1–2·6]), alcohol-related disease (girls 2·4 [2·2–2·7], boys 2·2 [2·0–2·4]), and narcotics-related disease (girls 3·2 [2·7–3·7], boys 4·0 [3·5–4·5]). Boys in single-parent families were more likely to develop psychiatric disease and narcotics-related disease than were girls, and they also had a raised risk of all-cause mortality.

**Conclusions** Growing up in a single-parent family has disadvantages to the health of the child. Lack of household resources plays a major part in increased risks. However, even when a wide range of demographic and socioeconomic circumstances are included in multivariate models, children of single parents still have increased risks of mortality, severe morbidity, and injury.

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## Introduction

Children do not themselves choose the circumstances of their childhood and adolescence, and childhood family background still seems to be an important predictor of a person's life-chances as an adult.[1–5] In the second half of the 20th century, growing up with one parent is increasingly common for children in developed countries. In 1999, a quarter of all Swedish 17-year-olds had experienced their parents' separation.[6] Several investigators[7] have assessed the implications of parental divorce and single parenthood on children's educational achievement, conduct, psychological adjustment, social competence, and health.[7] Despite these contributions, conclusions about the health and wellbeing of the child have been controversial. Findings generally suggest that divorce, which is the main cause of family breakdown, has adverse consequences in the short term.[8–10] However, Edwards[11] suggested that most children recover from divorce with few long-term consequences, whereas Krantz[12] and Wallerstein[13] concluded that children whose parents have divorced are at increased risk of inadequate psychological adjustment.

In a large meta-analysis,[7] parental divorce had little effect on the wellbeing of the children. But the authors concluded that researchers in general are looking for effects in the wrong place—ie, short-term emotional and social problems could be less serious than long-term consequences in terms of adult attainment and quality of life. In Sweden and Finland, the breaking-up of a family and a single-parent background had negative effects on mental and general health of the children, and was associated with deaths in young adults.[1,14–16]

Previous research has usually been based on small samples, and has mainly considered conditions reported by parents or teachers, or by children or adolescents themselves. We postulated that the generally poorer household resources of single parents affect their children's health.

## Materials and methods

*Participants*

We used Swedish national registers, which contain information about many aspects of individuals in a population, to assess the effects of single parenthood on health problems and psychosocial disturbances in Swedish children, adolescents, and young adults. Every Swedish resident is allocated a unique personal identification number, so we could link individuals' data between different data sources.

We identified children in Sweden living in households with the same single adult (parent or guardian) in both 1985 and 1990, and children who were living with the same two adults of different sex at these times from Swedish Population and Housing censuses. Children were categorised irrespective of whether their parent or guardian were biological parents. A household was defined as a

| Outcome | Age at outcome (years) | Data sources | ICD9 1991–96 | ICD10 1997–98 (99)* |
|---|---|---|---|---|
| Total mortality | 6–25 | Mortality data | All diagnoses | .. |
| Child and adolescent psychiatric care (except for diagnoses indicating addiction) | 6–19 | Inpatient data | .. | .. |
| Adult psychiatric care (except for diagnoses indicating addiction) | 20–26 | Inpatient data | 290–319 (except for diagnoses 291, 292, 303–305.0) | F00–F99 (except for diagnoses F10–16, F18–19) |
| Suicide/suicide attempt | 13–26 | Inpatient data | | .. |
| | 13–25 | Mortality data | E950–59, E980–89 | X60–84, Y10–34 |
| Traffic injury | 6–26 | Inpatient data | | |
| | 6–25 | Mortality data | E800–49 | V01–V99 |
| Intentional violence | 6–26 | Inpatient data | | |
| | 6–25 | Mortality data | E960–68 | X85–Y09 |
| Fall and poisoning | 6–26 | Inpatient data | | |
| | 6–25 | Mortality data | E850–59, E880–88 | X40–49, W00–19 |
| Alcohol-related diagnosis | 13–26 | Inpatient data | 291, 303, 305.0, 357.5, 425.5, 535.3, 571.0–571.3, E860, E980+980 | E24.4, F10.1–F10.9, G31.2, G62.1, G72.1, I42.6, K29.2, K70, K86.0, O35.4, P04.3, Q86.0, T51, Y90.1–Y90.9, Y91.1–Y91.9, Z50.2, Z71.4 |
| | 13–25 | Mortality data† | | |
| Narcotics-related diagnosis | 13–26 | Inpatient data | 292‡, 304, 965.0, 968.5, 969.6, 969.7 | F11.1–F11.9, F12.1–F12.9, F13.1–F13.9, F14.1–F14.9, F15.1–F15.9, F16.1–F16.9, F18.1–F18.9,F19.1–F19.9, O35.5, P04.4, T40.0–T40.3, T40.5–T40.9, T43.6, Z50.3, Z71.5 |
| | 13–25 | Mortality data† | | |

*Mortality is analysed for 1991–98 and inpatient data for 1991–99. †Alcohol-related and narcotics-related mortality are presented together (addiction). ‡Not included in mortality diagnoses.

Table 1: **Classification of outcomes**

person or group of people registered in the same dwelling, which made it possible to link different members of any household. The woman had to be aged 18–49 years and the men 18–59 years at the time of the child's birth. Children were aged 6–18 years at the start of follow-up (in 1991); by the end of 1999, the youngest child was 14 years old and the oldest 26 years old (birth cohort 1973–1985). We excluded 169 613 (15%) of the 986 342 children identified because they did not meet our criteria for the family situation.

*Procedures*
Since our main aim was to assess the net effects of single parenthood and to increase understanding of the possible mechanisms through which parenting status and health are related, we obtained relevant information from several data sources. From the census of 1990, we obtained information about the age of child and parents (at delivery of the child), and various parental characteristics (such as country of birth, socioeconomic group affiliation, housing situation, residency, number of children aged 17 years or younger living in the household). Socioeconomic groups were classified in accordance with a classification mainly based on occupation, but also takes into account position at work and industrial sector. For households with two adults, we chose the higher of the socioeconomic group statuses of the adults to characterise the household; for country of birth and parental age, we gave preference to information about the mother.

We obtained information about social welfare and unemployment benefits from Sweden's Total Enumeration Income Survey of 1990. Data from these surveys are entered into a register, maintained by Statistics Sweden, which contains information about the incomes and personal taxes of all Swedish residents. We had access to yearly totals, and households that obtained any allowance were classified as either receiving benefits or not.

We also gathered information about alcohol or drug-abuse and psychiatric disease by the adults in the household from the Swedish Hospital Discharge Register (for the years 1987–99), which contains data for all discharges from Swedish hospitals through the Swedish National Board of Health and Welfare.

We assessed mortality in children from 1991–98 and severe morbidity (indicating psychosocial disturbance or injury) over the period 1991–99 using data from the National Cause of Death Register and the National Hospital Discharge Register, respectively. Diagnoses in the records from the Swedish Hospital Discharge Register are mainly based on the judgment of the doctor, standard diagnostic assessments are rarely used. We classified the outcomes in accordance with International Classification of Diseases (ICD) 9 (1991–1996) and ICD 10 (1997–99) (table 1).

*Statistical analysis*
Mortality risks and severe morbidity, indicated by records of hospital discharges, were analysed and reported separately, with person-months at risk used as a basis for assessment. For our assessment of mortality, we calculated the number of months that individuals were alive during follow-up; and, for other outcomes based on hospital data, the months until the first relevant discharge or death. In general, we used only the primary diagnosis at first discharge (1991–99) or underlying cause of death (1991–98) as an outcome. However, in the cases of alcohol and drug addiction, we also considered contributory diagnoses. Relative risks with 95% CIs were used as estimates of effects, with children in households with two adults as the reference group. Multivariate analyses were done with Poisson regression (SAS, version 8.0).

We entered the ages of the children and parents (preferably the mother) at the time of delivery of the child as continuous independent second-degree polynomial variables. All other variables were classified when entered into the models. Boys and girls were assessed together, with interaction between sex and type of parenting, but results are presented separately for the sexes. First, we investigated the effects on morbidity of adjustment for each variable separately. After these preliminary analyses, we excluded unemployment benefit from all models because this factor did not affect any of the relations studied.

In the multivariate analyses, we distinguished between variables referring to conditions before the operation of

the independent variable (confounders) and those that operated contemporaneously between family position and the health outcome in question (mediators) (figure). For example, adjustment for different measures of income might control for circumstances resulting from living in a single-parent household. Such a procedure can be used to understand a relation, although it is not suitable for dismissing a spurious association[17] and these adjustments can also have relevance to the timing of interventions relevant to prevention of ill-health. Although making such distinctions in real life is difficult, we assessed variables such as age of child and parents, and parental characteristics such as socioeconomic group affiliation, living in a big city, country of birth, alcohol or drug abuse, or psychiatric disease, as confounders. Women with low educational status, which is highly correlated with socioeconomic status (as measured by occupation), have a higher risk of being a single mother through separation than do mothers with high education.[18] We also believe that the style of living in a big city leads to an increase in the number of single parents, rather than that becoming a single parent leads to urban migration. Ill-health in parents can be accounted for by the stress of divorce and the fact of being alone. However, when we use severe morbidity with in-patient care as a measure of ill-health, such difficulties are even more related to the prerequisites for either entering into or staying in a relationship.[19–23] Thus, ill-health in parents was treated as a confounder in our analyses.

By contrast, receiving social benefit and renting or owning a home were seen as measures of household resources and treated as mediators. Many findings[18,24] have suggested that the poor financial situation in which single parents often find themselves is a consequence of being sole providers for their family. Income selection processes—ie, that economic difficulties often arise before eventual separation—do not seem to have the same effect.[24] Number of children was also classified as a mediator.
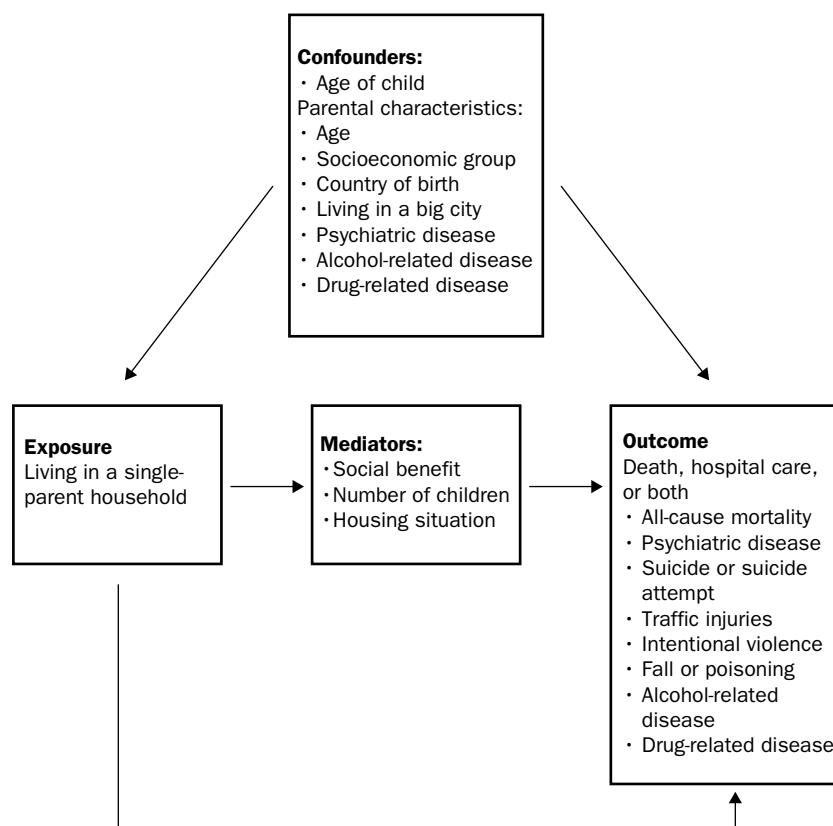
In the multivariate analyses, we adjusted for the different groups of variables described above. For the first model, adjustment was made only for age of child. The second model included the confounders, whereas the third encompassed the variables treated as mediators. Finally, both confounders and mediators were added to make up a fourth model.

*Role of the funding source*
The sponsor of the study had no role in study design, data collection, data analysis, data interpretation, or in the writing of the report.

## Results
We investigated 65 085 children living with the same single parent in both 1985 and 1990 (5433 registered with their father and 59 652 with their mother) and 921 257 children living with the same two parents in both years.

**Confounders:**
· Age of child
Parental characteristics:
· Age
· Socioeconomic group
· Country of birth
· Living in a big city
· Psychiatric disease
· Alcohol-related disease
· Drug-related disease

**Exposure**
Living in a single-parent household

**Mediators:**
· Social benefit
· Number of children
· Housing situation

**Outcome**
Death, hospital care, or both
· All-cause mortality
· Psychiatric disease
· Suicide or suicide attempt
· Traffic injuries
· Intentional violence
· Fall or poisoning
· Alcohol-related disease
· Drug-related disease

**A conceptual framework for investigation of the effect of single parenthood on morbidity and injury of the child**

The socioeconomic situation of children in families with only one adult was different from that of children in families with two adults. More single parents than couples were unskilled manual workers, low-grade non-manual workers, and people without occupation, whereas couples were more likely than single parents to be high-grade or medium-grade non-manual workers (table 2). Children in single-parent families were more likely to live in large towns than were children in two-parent families, and it was slightly more common for their mother (or father if the mother was absent) to be born outside Sweden. The number of parents on social welfare in 1990 was seven times greater in the single-parent group than in the two-parent-group, and five times as many single parents as couples rented rather than owned their homes (table 2). Twice as many single parents as couples received unemployment benefit (table 2). Admissions for psychiatric disease or addiction to alcohol were recorded in 60% more single parents than parents with partners. Note that values for couples are expressed for the household—ie, two people contribute to the probability of disease, compared with households with a single parent.

1912 children in Sweden died during the 8-year study period. The crude mortality rate (number of deaths per 100 000 person-years at risk) suggested that children with single parents had a higher risk of death than those with two parents, with only a few exceptions (table 2). Among children with parental alcohol-related or drug-related disease, the risk of death was lower in those with single parents (death rate 24·6 per 100 000 person-years) than in those with two parents (41·7). This was also the case among children from outside Europe (death rates 23·9 and 30·7, respectively). The excess death rate in children with single parents was more pronounced in those aged 13–17 years (55·0 for single parents and 35·5 for two parents) than in those aged

| | Children with single parent (n=65 085) | | | Children with two parents (n=921 257) | | |
|---|---|---|---|---|---|---|
| | n (%) | Deaths | Death rate* | n (%) | Deaths | Death rate* |
| **Sex of child** | | | | | | |
| Girl | 31 669 (49%) | 56 | 22·1 | 448 291 (49%) | 608 | 17·0 |
| Boy | 33 416 (51%) | 131 | 49·1 | 472 966 (51%) | 1117 | 29·6 |
| **Age of child in 1990 (years)** | | | | | | |
| 5–12 | 34 352 (53%) | 52 | 18·9 | 552 536 (60%) | 679 | 15·4 |
| 13–17 | 30 733 (47%) | 135 | 55·0 | 368 721 (40%) | 1046 | 35·5 |
| **Household characteristics** | | | | | | |
| Number of children | | | | | | |
| 1 | 31 307 (48%) | 92 | 36·8 | 185 263 (20%) | 454 | 30·7 |
| 2–3 | 31 797 (49%) | 90 | 35·4 | 661 396 (72%) | 1097 | 20·7 |
| ≥4 | 1981 (3%) | 5 | 31·6 | 74 598 (8%) | 174 | 29·2 |
| **Socioeconomic group in 1990** | | | | | | |
| Unskilled manual workers | 17 994 (28%) | 42 | 29·2 | 110 326 (12%) | 278 | 31·5 |
| Skilled manual workers | 7394 (11%) | 24 | 40·6 | 143 151 (16%) | 287 | 25·1 |
| Low-grade non-manual workers | 11 705 (18%) | 32 | 34·2 | 122 086 (13%) | 197 | 20·2 |
| High and medium-grade non-manual workers | 15 937 (24%) | 45 | 35·3 | 420 426 (46%) | 712 | 21·2 |
| Self-employed | 1361 (2%) | 3 | 27·6 | 108 097 (12%) | 207 | 24·0 |
| Others† | 10 694 (16%) | 41 | 48·0 | 17 171 (2%) | 44 | 32·1 |
| **Country of birth** | | | | | | |
| Sweden | 55 432 (85%) | 155 | 35·0 | 830 513 (90%) | 1515 | 22·8 |
| Other Nordic countries | 5236 (8%) | 22 | 52·6 | 44 403 (5%) | 112 | 31·6 |
| Other European countries | 2845 (4%) | 7 | 30·8 | 25 553 (3%) | 47 | 23·0 |
| Rest of world | 1572 (2%) | 3 | 23·9 | 20 788 (2%) | 51 | 30·7 |
| **Place of residence** | | | | | | |
| Big town | 28 671 (44%) | 86 | 37·5 | 270 966 (29%) | 492 | 22·7 |
| Intermediate town | 20 822 (32%) | 47 | 28·2 | 320 796 (35%) | 550 | 21·4 |
| Small town | 15 592 (24%) | 54 | 43·4 | 329 495 (36%) | 683 | 25·9 |
| **Housing** | | | | | | |
| Owns | 21 187 (33%) | 63 | 37·2 | 790 079 (86%) | 1438 | 22·8 |
| Rents | 42 276 (65%) | 119 | 35·2 | 119 580 (13%) | 262 | 27·4 |
| Other | 1622 (2%) | 5 | 38·6 | 11 598 (1%) | 25 | 27·0 |
| **Received social welfare in 1990** | | | | | | |
| Yes | 13 672 (21%) | 46 | 42·1 | 26 563 (3%) | 77 | 36·3 |
| No | 51 413 (79%) | 141 | 34·3 | 894 694 (97%) | 1648 | 23·0 |
| **Received unemployment benefit in 1990** | | | | | | |
| Yes | 6015 (9%) | 16 | 33·3 | 40 214 (4%) | 84 | 26·1 |
| No | 59 070 (91%) | 171 | 36·2 | 881 043 (96%) | 1641 | 23·3 |
| **Parental psychiatric diagnosis 1987–99** | | | | | | |
| Yes | 3621 (6%) | 20 | 69·2 | 32 217 (3%) | 114 | 44·3 |
| No | 61 464 (94%) | 167 | 34·0 | 889 040 (97%) | 1611 | 22·7 |
| **Parental alcohol-related diagnosis 1987–99** | | | | | | |
| Yes | 1524 (2%) | 3 | 24·6 | 13 206 (1%) | 44 | 41·7 |
| No | 63 561 (98%) | 184 | 36·2 | 908 051 (99%) | 1681 | 23·2 |
| **Parental drug-related diagnosis 1987–99** | | | | | | |
| Yes | 547 (1%) | 2 | 45·8 | 2352 (<1%) | 10 | 53·3 |
| No | 64 538 (99%) | 185 | 35·9 | 918 905 (100%) | 1715 | 23·3 |

*Deaths per 100 000 person-years. †Including people without an occupation.

Table 2: **Sociodemographic indicators and crude mortality data by type of parenting**

5–12 years (18·9 compared with 15·4) (table 2). After adjustment for age, the risk of dying was more than 50% greater in boys in single-parent families than in those boys living with both parents (table 3). The risk of death did not differ between girls with single parents and those with two parents (table 3). However, girls with single parents were more than twice as likely to commit suicide and more than three times as likely to die from an addiction to drugs or alcohol than were girls with two parents (table 3). Boys of single parents were more than five times more likely to die from an addiction to drugs or alcohol, more than three times as likely to die from a fall or poisoning, and four times more likely to die from external violence (but this measure was based on very few deaths; table 3). The number of deaths from traffic injuries did not differ between children with single parents and those with two parents (table 3).

| | Girls | | | Boys | | |
|---|---|---|---|---|---|---|
| | Single parent | Two parents | Relative risk (95% CI)* | Single parent | Two parents | Relative risk (95% CI)* |
| **Cause of death** | | | | | | |
| Total mortality | 56 | 608 | 1·21 (0·92–1·59) | 131 | 1117 | 1·54 (1·29–1·85) |
| Suicide | 19 | 96 | 2·43 (1·48–3·97) | 32 | 217 | 1·83 (1·26–2·65) |
| Traffic injury | 8 | 155 | 0·67 (0·33–1·36) | 29 | 336 | 1·12 (0·77–1·64) |
| Violence | 2 | 10 | 2·54 (0·56–11·6) | 6 | 19 | 4·04 (1·61–10·13) |
| Fall and poisoning | 1 | 4 | 1·40 (0·18–11·03) | 9 | 16 | 3·68 (1·75–7·73) |
| Addiction | 4 | 13 | 3·73 (1·22–11·44) | 16 | 37 | 5·31 (2·95–9·55) |

*Adjusted for age of child.

Table 3: **Relative risks for various mortality outcomes 1991–98 for children living with single parents compared with children with two parents**

| | Number of cases (incidence*) | | Model 1 (relative risk, 95% CI) | Model 2 (relative risk, 95% CI) | Model 3 (relative risk, 95% CI) | Model 4 (relative risk, 95% CI) |
|---|---|---|---|---|---|---|
| | Single parents | Two parents | | | | |
| **Psychiatric disease in children and adolescents** | | | | | | |
| Girls | 718 (361) | 4166 (138) | 2·46 (2·27–2·66) | 2·08 (1·91–2·26) | 1·85 (1·69–2·02) | 1·77 (1·62–1·94) |
| Boys | 516 (244) | 2466 (77) | 2·97 (2·70–3·27) | 2·52 (2·28–2·78) | 2·24 (2·02–2·48) | 2·15 (1·94–2·39) |
| **Psychiatric disease in young adults** | | | | | | |
| Girls | 309 (373) | 2048 (205) | 1·82 (1·61–2·05) | 1·58 (1·40–1·79) | 1·46 (1·28–1·66) | 1·42 (1·25–1·62) |
| Boys | 241 (279) | 1317 (125) | 2·24 (1·95–2·56) | 1·96 (1·70–2·25) | 1·65 (1·54–1·76) | 1·65 (1·54–1·77) |
| **Suicide** | | | | | | |
| Girls | 709 (304) | 3773 (122) | 2·44 (2·25–2·64) | 2·04 (1·87–2·22) | 1·84 (1·68–2·02) | 1·78 (1·62–1·96) |
| Boys | 326 (132) | 1524 (47) | 2·79 (2·47–3·14) | 2·33 (2·06–2·64) | 2·12 (1·86–2·40) | 2·05 (1·80–2·33) |
| **Traffic injuries** | | | | | | |
| Girls | 608 (216) | 7272 (182) | 1·16 (1·07–1·27) | 1·13 (1·04–1·23) | 1·23 (1·13–1·34) | 1·18 (1·08–1·29) |
| Boys | 996 (337) | 12 124 (289) | 1·14 (1·07–1·22) | 1·11 (1·04–1·18) | 1·21 (1·12–1·29) | 1·15 (1·07–1·23) |
| **Intentional violence** | | | | | | |
| Girls | 83 (29) | 400 (10) | 2·63 (2·08–3·33) | 2·02 (1·59–2·57) | 1·86 (1·46–2·38) | 1·69 (1·32–2·16) |
| Boys | 401 (134) | 2442 (58) | 2·10 (1·89–2·33) | 1·62 (1·45–1·81) | 1·50 (1·33–1·69) | 1·35 (1·20–1·53) |
| **Fall and poisoning** | | | | | | |
| Girls | 1000 (357) | 12 085 (304) | 1·20 (1·13–1·28) | 1·18 (1·10–1·26) | 1·21 (1·13–1·30) | 1·18 (1·10–1·26) |
| Boys | 1552 (530) | 20 212 (486) | 1·12 (1·06–1·17) | 1·09 (1·04–1·15) | 1·12 (1·06–1·19) | 1·09 (1·03–1·16) |
| **Alcohol-related disorder** | | | | | | |
| Girls | 365 (156) | 1623 (52) | 2·96 (2·64–3·31) | 2·42 (2·15–2·72) | 2·23 (1·97–2·53) | 2·09 (1·84–2·37) |
| Boys | 430 (66) | 2138 (174) | 2·66 (2·40–2·95) | 2·18 (1·95–2·43) | 2·02 (1·80–2·26) | 1·88 (1·67–2·12) |
| **Drugs-related disorder** | | | | | | |
| Girls | 213 (90) | 586 (19) | 4·53 (3·87–5·30) | 3·17 (2·70–3·74) | 2·54 (2·14–3·01) | 2·38 (2·00–2·84) |
| Boys | 362 (25) | 809 (146) | 5·63 (4·97–6·37) | 3·97 (3·48–4·53) | 3·21 (2·79–3·70) | 3·01 (2·60–3·48) |

Model 1=adjusted for age of child. Model 2=adjusted for age of child and parental confounders (age, socioeconomic group, living in a big city and country of birth, psychiatric disease, alcohol and drug addiction). Model 3=adjusted for age of child and parental mediators (social benefit, number of children, and housing situation). Model 4=adjusted for age of child, parental confounders, and mediators. *Incidence per 100 000 person-years (crude).

**Table 4: Multivariate models for severe psychiatric diseases and injuries 1991–99 for children in single-parent families compared with those in two-parent families**

Both boys and girls in single-parent households had raised risks of all outcomes over the 9-year period compared with those in two-parent households (table 4) when morbidity was measured with hospital data. The largest risks for boys and girls were for diagnoses indicating misuse of drugs, with risks of suicide and violence also very high (table 4). We recorded only small increases in risks for traffic injuries, and falls and cases of poisoning. Young people in single-parent households had a greater risk of psychiatric disease during both childhood and early adulthood than did those with two parents, with the increase in risk greater during childhood than in young adulthood for both boys and girls (table 4).

The raised risks for most outcomes in children with single parents lessened when the variables treated as confounders or mediators, especially mediators, were added to the initial model (table 4, models II-III). The adjustments substantially decreased the risks for all outcomes except traffic injuries and falls and cases of poisoning. The mediators (receipt of social benefit, renting or owning a house, number of children) accounted for 42% of the difference in risk of attempting suicide between girls in single-parent families compared with those in two-parent families and for 37% of this risk in boys—calculated by ([relative risk in model 1–1]–[relative risk in model 2–1])÷(relative risk in model 1–1). The confounders (age of child and parents, socioeconomic group, living in a big city, country of birth, psychiatric disease, alcohol or drug diagnosis in adults) accounted for 28% of the difference in risk of attempting suicide for girls and for 26% of this risk in boys. Confounders and mediators taken together accounted for 46% of the difference in suicide attempts in girls and for 41% of the difference in boys. Of the variables treated as confounders, socioeconomic group affiliation was the most important factor in accounting for differences between children with single and those with two parents. Country of birth and residency had only a small effect on

the relation, mainly for drug-related disease. Psychiatric disease and addiction in the parents accounted for an even smaller part of the differences (data not shown).

The largest explained fractions, encompassing all factors included in the models, were for violence and addiction to narcotics (at around 60% for both boys and girls). However, for all outcomes, significant increases in risk remained unaccounted for even in the fully adjusted model.

The effects of living in a single-parent household on risk of death did not differ significantly between boys and girls. CIs for the interaction were wide, and all included 1·0 for all causes of death studied (after adjustments were made for the variables adjusted for in model 2). Furthermore, when discharges for suicide attempt, traffic injury, intentional violence, fall and poisoning, and alcohol-related disease were analysed, we recorded no significant differences between the sexes. However, compared with girls, boys in single-parent households had higher risks of drug-related disease (interaction term 1·25, 95% CI 1·02–1·53) and of psychiatric disease during childhood (1·21, 1·07–1·37) and adulthood (1·24, 1·03–1·48).

The sex of the custodial parent, however, did not significantly modify the relation between single parenthood and severe morbidity or injury in either boys or girls (data not shown).

To supplement risk comparisons as a measure of potential improvement we calculated the number of admissions and deaths that would have been avoided if children living with single parents had faced the same risk as those living with two parents. In such hypothetical circumstances, 608 (10%) suicide attempts, 497 (11%) cases of alcohol-related disease, and 454 (23%) cases of drug-related disease would not have occurred. Only 52 deaths (3%) would have been avoided. If, instead, we base our calculations on household socioeconomic affiliation, thereby assuming that all children have the risk

of ill-health faced by children of middle and upper white-collar workers, we showed that 168 (9%) deaths would have been avoided, as would 900 (14%) suicide attempts, 547 (12%) cases of alcohol-related disease, and 473 (24%) cases of drug-related disease. Based on these figures, family situation has the same importance as socioeconomic affiliation as a predictor of cases of addiction and suicide attempts in adolescents.

## Discussion

Our findings in almost a million children and adolescents showed increased risks of psychiatric disease, suicide or suicide attempt, injury and addiction in children in single-parent households compared with those in two-parent households. Boys in single-parent families had higher risks than girls for psychiatric disease and drug-related disease, and they also had a raised risk of all-cause mortality.

Investigators from early child-psychiatric studies focused mainly on the process of divorce, suggested that the effect of divorce on children could be understood in terms of a crisis model, in which short-term effects related to transition were common, but long-lasting effects were rare. Long-term effects were usually dependent on other stress factors.[13] Our findings, however, are consistent with those of more recent studies,[5,14–16] in which divorce and living in a single-parent household were shown to have long-term effects.

Much of the raised risks recorded in children living with only one parent in our analyses can be accounted for by differences in socioeconomic circumstances, a finding much the same as those in previous studies.[1,5,14,25–26] Parental economic distress, in general followed by inconsistent parental discipline, was associated with behavioural problems such as delinquency and drug misuse among children.[27] Lipman[28] used the same method in her analysis of Canadian data—ie, regression analysis with adjustments for other factors that could contribute to child outcome—and found that inclusion of sociodemographic variables such as household income, lessened the increase in risk. In our study, the main explanation for the increase in risk was lack of household resources, as indicated by receipt of social-welfare benefit and housing situation. These factors seemed to serve as intermediate paths through which single parenthood affects children's health and wellbeing. Somewhat smaller contributions were made by the factors we assumed to occur before the existing family situation (parental age, socioeconomic group, residence, country of birth, addiction and mental illness in parents). Of these factors, socioeconomic group played the biggest part, while a very small part of the raised risk can be accounted for by addiction and mental illness, both of which were more frequent in single parents than in those with a partner. Such factors have an important effect on interaction patterns between parents and children, and there could also be a genetic component involved.

Significant risk increases remained unaccounted for even in our fully adjusted model. Factors such as parental absence, lack of social support, and family conflict could have been important in accounting for these increases. In one-parent households the adult takes on many different roles, including that of being the only breadwinner, which constrains attention, help, and supervision of the child. The loss of one parent as a role model in the home could also be important, especially for boys who grow up with a single mother.[29,30] Our results do not, however, lend support to the view that the sex of the custodial parent or child affects the difference in risk. The sons of single parents had worse outcomes than girls only in psychiatric and drug-related disease.

When divorce is the cause of the family breakdown, this process is usually preceded by family conflict, which in many cases continues well beyond actual separation. Hostility between the parents creates an aversive home environment in which children become stressed, unhappy, and insecure. The results of several studies[1,7,24] have suggested that children are better off in a single-parent family with a low level of conflict than in an intact family with a high level of conflict.

The main strengths of this register-based study lie in its coverage of the whole population of a country and the potential such analysis offers to adopt a longitudinal approach with a low dropout rate. Use of deaths and hospital-discharge records means that our health measure is not biased by self-reporting, and can be expected to cover most serious morbidity outcomes. However, a diagnosis on a hospital record does not include any information about severity of disease or injury. If children of single parents are more likely to be admitted for less serious conditions, their relative risks will be overestimated. Such an effect is possible, since the decision to admit a child could be affected by the doctor's judgment of the parent or parents' capability of taking care of their child at home. Single parents could be more inclined to seek hospital care. Analyses from the UK[31] showed higher rates of consultations of general practitioners for children in households with one adult, which could reflect the insecurity of a single adult with no opportunity to share responsibility for a sick child. Whether such effects are applicable to the outcomes of our study is questionable, with the exception of falls and cases of poisoning. However, the risk of death from fall or poisoning was, at least for boys, higher than that of being admitted for the same reason.

In the registers we used, any child in a single-parent household was recorded as living with just one parent, usually the mother. We could not distinguish shared custody from other forms of arrangements, despite the fact that shared custody has become more frequent. To have knowledge about the non-custodial parent's living-conditions would have been valuable, especially for psychiatric illness and substance misuse. However, the census gives information only about adults in the household in which the child is registered. Psychiatric disease and addiction in the parents of children in single-parent familes is probably underestimated, and consequently, adjustments for such factors cannot attenuate the risk increases in an optimum way.

Another weakness is a lack of information about when in childhood an eventual parental divorce took place, which made it impossible to assess risks in relation to length of time since parental separation. We defined long-term exposure as having been living with the same single parent or the same two parents for at least 5 years; however, we do not know if the situation applies continuously over the whole period.

The personal financial disadvantages of being a single parent vary greatly between different societies in developed countries, with social policy an important determinant.[32,33] From an international perspective, the socioeconomic situation of a single parent in Sweden is quite favourable, mainly because of the opportunities available for state-subsidised day-care and financial support. In a comparison of self-perceived health between single mothers and mothers with partners in Britain and Sweden, the increased relative risk for single mothers was the same in both countries, despite a more favourable social policy in Sweden.[32] However, different mechanisms seem to be at work in the two countries. One hypothesis is

that single mothers in Sweden are affected more by less time than by less money.[32] Swedish family and employment policies do not distinguish between single parents and working parents, and do not recognise the special needs of the single parents as the only family breadwinners and carer. If everyday life is characterised by psychosocial stress and loss of control, this surely will have an injurious effect on children's wellbeing. Improving prerequisites for combining being a single parent with working life is a challenging task.

Accordingly, preventive efforts aimed at the risk behaviours of children and young people would be especially desirable. Family circumstances can be improved in various ways, so that children gain access to environments outside the family—through social-policy measures, maternal and child health care, and preschool, school, and leisure programmes.

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