

Parental Social Determinants of Risk for Intentional Injury: A Cross-Sectional Study of Swedish Adolescents

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The contribution of intentional injury to the overall burden of trauma, mortality, and morbidity increases substantially during adolescence. In Sweden, for example, the incidence of self-inflicted injury among girls aged 15–19 years is close to that of traffic-related injury.¹ Additionally, strong inverse relationships have been found between household (parental) socioeconomic status (SES) and injury risk among adolescents^{2–10}—in particular, interpersonal violence–related injury^{2,3,10} and self-inflicted injury.^{4,6}

Apart from household SES, few household social and economic characteristics have been documented in relation to intentional injuries during adolescence. However, it seems that living in a single-parent home^{11–13} and being in a family that receives welfare benefits¹⁴ both have an impact on risk level. By contrast, the effect of parental country of birth is unclear.³ Furthermore, population density has been found to be associated with injury caused by interpersonal violence among young people.¹⁵

The fact that studies have not commonly considered several family-related social characteristics simultaneously limits our understanding of the true effect of any particular family social circumstance on injury risk during adolescence.² A recent Swedish national study revealed that among adolescents, the combination of living in a single-parent home, receiving welfare benefits, and not having a parent born in Sweden reduces the association of household SES with risk of intentional injury but not with risk of traffic-related injury.¹ Yet, the manner in which these characteristics operate separately and in association with one another remains unclear.

Our study investigated this question more closely. We considered family-related social attributes in conjunction with population density, and we measured the individual and the combined effects of these factors on risk of self-inflicted and interpersonal violence–related injury among Swedish adolescents.

Objectives. We investigated the effect of family social and economic circumstances on intentional injury among adolescents.

Methods. We conducted a cross-sectional register study of youths aged 10 to 19 years who lived in Sweden between 1990 and 1994. We used socioeconomic status, number of parents in the household (1- or 2-parent home), receipt of welfare benefits, parental country of birth, and population density as exposures and compiled relative risks and population-attributable risks (PARs) for self-inflicted and interpersonal violence–related injury.

Results. For both genders and for both injury types, receipt of welfare benefits showed the largest crude and net relative risks and the highest PARs. The socioeconomic status–related PAR for self-inflicted injury and the PAR related to number of parents in the household for interpersonal violence–related injury also were high.

Conclusions. Intentional-injury prevention and victim treatment need to be tailored to household social circumstances. (*Am J Public Health.* 2004;94:640–645)

METHODS

Creation of the Data Set

A cross-sectional design was employed and the study was based on a data set we created by linking records from 14 Swedish national registers (the population register, 2 censuses, 5 annual income registers, 5 annual hospital discharge registers, and the causes-of-death register). The study population consisted of all adolescents aged 10 to 19 years who lived in Sweden at some point between 1990 and 1994. Subjects were identified through the Swedish National Population Register, and gender and age were established through the national census of 1990.

Adolescents were linked to parents using the national censuses of 1985 and 1990 to document parental social and economic attributes and population density. Subjects were matched with the adult or adults they lived with (including biological and nonbiological parents); those subjects who could not be linked to a parent and whose parents did not reside in Sweden at the time of the 1990 census were excluded (about 5.2%). All household information was taken from the 1990 census, with the exception of information on receipt of welfare benefits, which was extracted from the annual income registers.

Adolescent SES was determined on the basis of the highest parental SES in the household in accordance with the dominance principle.¹⁶ The Swedish socioeconomic classification provides a measure of class on the basis of occupation.^{17,18} It divides individuals in the labor force into self-employed and employed. The former group is further divided into farmers and other self-employed persons; the latter group is divided into manual workers and nonmanual workers, who in turn are subgrouped according to the average educational level required for any particular occupation. In our study, all adolescents were allocated to 1 of 6 categories of household SES: high/intermediate-level nonmanual workers, assistant nonmanual workers, skilled manual workers, unskilled manual workers, self-employed persons (farmers and other self-employed), and other (students, housewives, persons living on early-retirement pensions, and the long-term unemployed).

With regard to number of parents in the household (1- or 2-parent home), we assigned the single-parent home characteristic to adolescents who were living with a parent who was not cohabiting with another adult. During the study period, approximately 15% to 20% of all children in Sweden lived with a single parent, and approximately 30% to 50% of these children were born to single-parent families.¹⁹

A household was regarded as having received welfare benefits if anyone in the household received benefits at least once during the study period.

We also included parental country of birth to assess whether subjects had at least 1 Swedish-born parent. An adolescent was considered to have a parent born in Sweden if 1 or both parents were born in the country.

Population density was calculated as the number of inhabitants (in 1990) within a 30-kilometer radius of the most heavily populated district within a particular municipality. For our study, 2 categories were created: high–population density areas (i.e., the 3 main Swedish urban areas of Stockholm/Södertälje, Gothenburg, and Malmö/Lund/Trelleborg), and low–population density areas (i.e., the rest of Sweden).

This material was then linked to the annual National Hospital Discharge registers for the years 1990 to 1994 and to the national causes-of-death registry for the years 1991 to 1994. Non-fatal (but requiring 1 or more nights of hospitalization) and fatal (2.6%) intentional injuries were examined together. We avoided double counting of subjects in both types of registers by excluding from the hospital discharge registers any subject who had the same diagnosis in both register data sets within 2 months. Coverage of the hospital discharge registers was estimated to be nearly complete; however, about 4.5% of subjects either lacked information on the external cause of injury or had no personal identification number.²⁰

In accordance with the *International Classification of Diseases, 9th Revision (ICD-9)*,^{21,22} injuries were divided into 2 categories: interpersonal violence–related injury (E960–E969) and self-inflicted injury (E950–E959). Person-years were compiled as follows: subjects who lived in Sweden a whole year contributed 1 person-year; those who moved from Sweden, or who were born or died, contributed 1 half year for that year. Person-years (denominator in the relative-risk calculations) and injuries (numerator) were summed for the 5-year study period (1990–1994). Table 1 shows the distribution of person-years across categories of social characteristics. It also shows injury incidences per 100 000 person-years across

TABLE 1—Injury Incidence per 100 000 Person-Years, by Selected Household Characteristics: Sweden, 1990–1994^a

Characteristic	Injury Incidence per 100 000 Person-Years					
	Person-Years		Self-Inflicted		Interpersonal Violence-Related	
	Girls	Boys	Girls	Boys	Girls	Boys
Household socioeconomic status						
High/intermediate-level nonmanual workers	843 705	885 876	111	26	9	57
Assistant nonmanual workers	275 404	285 019	129	30	13	74
Skilled manual workers	282 805	298 899	145	30	17	92
Unskilled manual workers	292 772	305 868	210	44	27	99
Self-employed persons	154 774	164 411	133	34	14	69
Other	13 853	146 576	288	74	41	150
No. parents in household						
2-parent home	1 553 839	1 739 833	121	28	13	68
1-parent home	33 415	346 816	277	62	31	128
Receipt of welfare benefits						
No	1 745 102	1 830 954	110	26	11	64
Once or more	242 887	255 694	414	91	53	176
Parental country of birth						
1 or both parents born in Sweden	1 809 384	1 894 430	137	32	15	73
No parent born in Sweden	178 606	192 218	251	48	27	128
Population density						
Low	1 544 749	162 097	140	33	15	67
High	443 241	465 678	170	38	19	116
Total	1 987 990	2 086 648	147	34	16	78

^aFatal injuries were measured for 1991 to 1994 only; the proportion of fatal injuries (2.6%) and the injury incidence are therefore somewhat underestimated.

social characteristics by diagnostic group and by gender. As expected, boys experienced more interpersonal-violence injuries and girls experienced more self-inflicted injuries.^{1,23} For boys and girls together, self-inflicted injuries outnumbered injuries caused by interpersonal violence. Additionally, a large proportion of the interpersonal violence–related injuries were likely to have been perpetrated by strangers or acquaintances (i.e., nonfamily members).¹⁰

Data Analysis

We performed all analyses separately for boys and for girls, and we controlled for age category (10–14 years and 15–19 years) in all instances. Relative risks (RRs) with 95% confidence intervals (CIs) were computed for each social characteristic independently. High/intermediate-level nonmanual workers,

2-parent home, not having received welfare benefits, having at least 1 parent born in Sweden, and living in a low–population density area were used as reference categories.

We then performed multivariate regression analyses, with all social characteristics in a single model, to establish the importance of each measure when we controlled for the others. Population density was included only when RRs had been found to be significant in the former set of analyses. Logistic regression was used to compute the RRs.

Finally, population-attributable risks were calculated to assess the reduction (percentage) in injury risk that would be achieved assuming all groups on 1 variable had the same risk level as the group with the lowest risk level.^{24,25} For our study, population-attributable risks were calculated with the RRs from the multivariate regressions.

TABLE 2—Relative Risk (RR) for Intentional Injury, by Selected Household Characteristics, Adjusted for Age: Sweden, 1990–1994

Characteristic	Self-Inflicted Injury, RR (95% CI)		Interpersonal Violence-Related Injury, RR (95% CI)	
	Girls	Boys	Girls	Boys
Household socioeconomic status				
High/intermediate-level nonmanual workers	1.00	1.00	1.00	1.00
Assistant nonmanual workers	1.16 (1.02, 1.31)	1.13 (0.88, 1.45)	1.39 (0.94, 2.06)	1.30 (1.11, 1.53)
Skilled manual workers	1.32 (1.18, 1.48)	1.17 (0.92, 1.49)	1.79 (1.24, 2.56)	1.63 (1.41, 1.89)
Unskilled manual workers	1.90 (1.72, 2.10)	1.69 (1.37, 2.09)	2.88 (2.11, 3.94)	1.75 (1.52, 2.02)
Self-employed persons	1.19 (1.02, 1.38)	1.30 (0.97, 1.73)	1.51 (0.94, 2.42)	1.21 (0.99, 1.48)
Other	2.69 (2.39, 3.02)	2.91 (2.32, 3.66)	4.48 (3.18, 6.29)	2.73 (2.33, 3.20)
No. of injuries	2917	702	320	1622
No. parents in household				
2-parent home	1.00	1.00	1.00	1.00
1-parent home	2.31 (2.13, 2.50)	2.29 (1.95, 2.69)	2.42 (1.91, 3.06)	1.94 (1.74, 2.16)
No. of injuries	2805	664	310	1538
Receipt of welfare benefits				
No	1.00	1.00	1.00	1.00
Once or more	3.98 (3.68, 4.30)	3.80 (3.25, 4.45)	5.03 (4.02, 6.29)	2.95 (2.65, 3.29)
No. of injuries	2917	702	320	1622
Parental country of birth				
1 or both parents born in Sweden	1.00	1.00	1.00	1.00
No parent born in Sweden	1.92 (1.74, 2.12)	1.56 (1.25, 1.94)	1.83 (1.35, 2.49)	1.85 (1.62, 2.12)
No. of injuries	2917	702	320	1622
Population density				
Low	1.00	1.00	1.00	1.00
High	1.22 (1.12, 1.32)	1.16 (0.97, 1.37)	1.21 (0.94, 1.55)	1.76 (1.58, 1.95)
No. of injuries	2917	702	320	1622

Note. CI = confidence interval.

RESULTS

Main Effects

Table 2 shows important differences in RRs with regard to all characteristics. Results for self-inflicted injury and for injury caused by interpersonal violence were fairly comparable. For both diagnosis groups, and for both boys and girls, the differences were greatest for receipt of welfare benefits, with the highest RR for interpersonal violence among girls whose families received welfare benefits (RR=5.03; 95% CI=4.02, 6.29).

Particularly high RRs were found for both male and female adolescents whose families were classified as “other” for household SES (students, housewives, persons living on early-

retirement pensions, and the long-term unemployed) compared with adolescents whose parents were high/intermediate-level nonmanual workers, but RRs also were high among adolescents from unskilled-manual-worker families and, to a lesser degree, from skilled-manual-worker families.

Compared with living in a low–population density area, living in a high–population density area entailed an excess risk (although a lower risk than for other attributes) of interpersonal violence–related injury for teenaged boys and self-inflicted injury for teenaged girls.

Combined Effects

The RRs derived from the multivariate analyses are shown in Table 3. The expected

reductions in RR were comparable in size for the 2 diagnostic groups, with the important exception of household SES. In spite of these reductions, RR for both types of injury remained higher for adolescents whose families received welfare benefits than for adolescents whose families did not. Interestingly, the RR for girls was higher than that for boys in the case of interpersonal violence–related injury (3.71 vs 2.24), although the CIs did overlap. Furthermore, the net effect of living in a single-parent home, as opposed to living with 2 adults, remained significantly higher for both boys and girls, with an excess risk of about 60% for self-inflicted injury and about 40% for interpersonal violence.

Decreases in RRs were most considerable for household SES and parental country of birth. With regard to household SES, only girls from unskilled-manual-worker families remained at noticeably higher risk for self-inflicted injury than did the comparison group, whereas girls and boys both from families classified as “other” and from unskilled-manual-worker families and skilled-manual-worker families remained at higher risk of injury caused by interpersonal violence. Having no parent born in Sweden was no longer a risk factor for intentional injury for boys, although it remained a risk factor for girls in the case of self-inflicted injury (albeit substantially lower than before controlling for the other social and economic characteristics).

Living in a high–population density area, as opposed to a low–population density area, still entailed excess risk of interpersonal violence–related injury for boys and excess risk of self-inflicted injury for girls.

Population-Attributable Risks

Population-attributable risks (expressed as percentages) are shown in Table 4. The risks varied from 0 to 29.8 for self-inflicted injury and from 0 to 32.1 for interpersonal violence–related injury. Population-attributable risks were quite similar across diagnoses for all characteristics except household SES.

Receipt of welfare benefits was the characteristic with the highest population-attributable risk for the 2 types of injury. It was closely followed by household SES for interpersonal violence and by number of parents in the household for self-inflicted injury. Interestingly,

TABLE 3—Relative Risk (RR) for Intentional Injury, by Selected Household Characteristics, Adjusted for All Other Household Characteristics and Age: Sweden, 1990–1994

Characteristic	Self-Inflicted Injury, RR (95% CI)		Interpersonal Violence-Related Injury, RR (95% CI)	
	Girls	Boys	Girls	Boys
Household socioeconomic status				
High/intermediate-level nonmanual workers	1.00	1.00	1.00	1.00
Assistant nonmanual workers	0.99 (0.87, 1.12)	0.99 (0.77, 1.27)	1.21 (0.81, 1.80)	1.19 (1.01, 1.40)
Skilled manual workers	1.08 (0.96, 1.22)	0.98 (0.76, 1.25)	1.46 (1.01, 2.10)	1.53 (1.31, 1.78)
Unskilled manual workers	1.19 (1.06, 1.33)	1.11 (0.88, 1.40)	1.81 (1.29, 2.54)	1.36 (1.16, 1.58)
Self-employed persons	1.14 (0.98, 1.32)	1.24 (0.92, 1.66)	1.41 (0.88, 2.26)	1.22 (0.99, 1.50)
Other	1.16 (1.00, 1.35)	1.26 (0.93, 1.70)	2.29 (1.51, 3.47)	1.38 (1.12, 1.71)
No. of parents in household				
2-parent home	1.00	1.00	1.00	1.00
1-parent home	1.56 (1.43, 1.71)	1.64 (1.37, 1.96)	1.36 (1.04, 1.76)	1.38 (1.22, 1.56)
Receipt of welfare benefits				
No	1.00	1.00	1.00	1.00
Once or more	3.20 (2.92, 3.50)	2.99 (2.47, 3.62)	3.71 (2.84, 4.84)	2.24 (1.96, 2.55)
Parental country of birth				
1 or both parents born in Sweden	1.00	1.00	1.00	1.00
No parent born in Sweden	1.17 (1.04, 1.31)	0.92 (0.72, 1.18)	0.91 (0.66, 1.28)	1.11 (0.95, 1.29)
Population density				
Low	1.00	1.00
High	1.14 (1.04, 1.24)	1.72 (1.54, 1.92)
No. of injuries	2805	664	310	1538

Note. CI = confidence interval.

TABLE 4—Population-Attributable Risk for Intentional Injury, by Selected Household Characteristics: Sweden, 1990–1994^a

Characteristic	Self-Inflicted, Injury, %		Interpersonal Violence-Related Injury, %	
	Girls	Boys	Girls	Boys
Receipt of welfare benefits	29.8	26.6	32.1	22.6
Household socioeconomic status	8.5	8.1	31.1	21.1
No. of parents in household	13.1	14.4	9.5	9.7
Parental country of birth	3.5	2.4
No. of injuries	2805	664	310	1538

^aThe population-attributable risk for each household characteristic was based on relative risks obtained after we controlled for all other household characteristics and age.

for both diagnostic groups, the population-attributable risk related to parental country of birth was extremely low.

DISCUSSION

Main Findings

We found considerable differences in risk for intentional injury among Swedish adoles-

cents for each household characteristic we investigated, which is in line with the findings of earlier studies.^{2–4,6,10–15} For both boys and girls, receipt of welfare benefits showed the largest RR differences and was followed by household SES, number of parents in the household, and parental country of birth. In general, girls had somewhat higher RRs than did boys, but CIs overlapped.

As expected, simultaneous consideration of all characteristics led to RR reductions for all characteristics and for both diagnostic groups. The most remarkable reductions occurred for parental country of birth (RRs became negligible for both types of intentional injuries) and for household SES (mainly for self-inflicted injury). After we controlled for other characteristics, only adolescent girls from unskilled-manual-worker families showed a higher risk of self-inflicted injuries as compared with the reference group. Nevertheless, adolescent boys and girls from both unskilled-manual-worker and skilled-manual-worker families, and also those from families classified as “other,” still showed an excess risk of injury caused by interpersonal violence.

As might be expected, population-attributable risks were highest for receipt of welfare benefits—for both boys and girls and for both types of intentional injuries. The risks of self-inflicted injury and interpersonal violence-related injury could be reduced by 23% to 30% (depending on gender and diagnosis) if adolescents from families who received welfare benefits lived with circumstances similar to those of families who did not. Alternatively, the risk of self-inflicted injury could be reduced by 13% to 14% if the living circumstances of adolescents from single-parent homes mirrored those of 2-parent homes. Likewise, injuries related to interpersonal violence could be reduced by at least 21% if adolescents from all household SES categories lived with circumstances similar to those of children whose parents were high/intermediate-level nonmanual workers.

The finding of a large net effect of receipt of welfare benefits after we controlled for all other attributes may be surprising, because the Swedish welfare system is designed in such a way that welfare allocations are sufficiently high to prevent individuals and families from living in poverty. As a consequence, receipt of welfare benefits is generally not strongly related to individual financial poverty in Sweden.²⁶ Furthermore, compared with children in many other European countries, few Swedish children are considered to be poor in absolute or relative terms.^{27,28} Nevertheless, the fact that wage earners can count on a reallocation of wealth to compensate for economic shortfall does not eliminate the dis-

comfort and the uncertainty they experience when faced with any such shortfall. Additionally, there are good reasons to believe that receipt of welfare benefits, as well as indicating financial strain on a family, also may signal the presence of a variety of related dysfunctional conditions in the household, such as alcohol abuse, depression, and aggression.

It is important to note that during the study period, Sweden was facing an economic recession. This recession meant that more people were dependent on welfare benefits and, among these people, more beneficiaries were newly exposed to such a situation because of unemployment.²⁹ Accordingly, it was difficult to assess whether the effects we observed were circumstantial or were intrinsic to being in a family in need of state subsidy.

Furthermore, in light of our results, it may be hypothesized that receipt of welfare benefits mediates household SES and intentional injury and does so to a greater extent for self-inflicted injuries than for interpersonal violence-related injuries. Additionally, the fact that RRs and the population-attributable risk for household SES remained high in the case of injuries caused by interpersonal violence indicates that household SES had a true impact on injury risk that cannot fully be explained by the confounding effects of welfare benefits or other family characteristics. A large proportion of the injuries caused by interpersonal violence during adolescence were not sustained in the household.¹⁰

Welfare benefits also may have mediated some of the effect of number of parents in the household on the risk of self-inflicted injury. However, single parents in Sweden need less financial support than in many other countries because of Sweden's labor market policies and subsidized public child care.³⁰ The presence of this "safety net" may explain, in part, why the net RRs of living with 1 parent remained significant for both boys and girls and for both diagnoses. This observation, in turn, suggests that single parenthood increased the risk for intentional injury among adolescents for reasons that cannot be reduced to the economic burden borne by parents. Still, it should be emphasized that population-attributable risks were quite low for that family characteristic.

One aspect highlighted by our results was that not having a Swedish-born parent had a low

population-attributable risk when we controlled for other family social and economic characteristics. It is reasonable to suppose that factors such as receipt of welfare benefits, household SES, and population density were mediators of the originally observed excess risk of intentional injury. There is, in fact, evidence that Swedish immigrants are educationally overqualified for their work to a greater extent than are Swedish-born workers³¹; a high proportion of immigrants settle in the country's 3 largest city areas. However, the low population-attributable risk associated with not having a Swedish-born parent may be a reflection of a weak association between parental country of birth and the risk for intentional injury.

Our study is silent regarding the mechanisms that underlie the social patterning of intentional injury during adolescence. In particular, other intrafamilial risk factors that were not considered, or even the experience of earlier episodes of maltreatment within the family,³²⁻³⁴ may have had an aggravating effect on the risk of self-inflicted and interpersonal violence-related injuries in social groups already at high risk.^{10,32} Likewise, contextual factors related to adolescents' living circumstances outside the home (e.g. the school, peer groups, youth culture) also may have modified—either protected against or aggravated—the effect of family social characteristics.³⁵⁻³⁸

Study Strengths and Limitations

Our data have very good population coverage, and gaps in data caused by lack of information about social characteristics (5.2%) or injuries (4.5%) were few.

The first limitation of our study lies in the manner in which the household status of some adolescents was determined, which may have resulted in misclassification of SES and other social characteristics. Only 1 household was identifiable for adolescents who spent equal time living in the separate homes of each parent, because children in Sweden are registered at a single address. In the worst case, some adolescents were allocated to a different SES category than they should have been. Nevertheless, the number of cases is so small that it cannot significantly alter our results.¹⁹

Another concern lies in the underreporting inherent in register-based studies of inten-

tional injury.¹⁰ More importantly, because it is not possible to establish whether the degree of underreporting is comparable across categories of the social characteristics we considered, some uncertainty remains about the RRs we compiled.^{1,23} For instance, if a lower propensity exists among adolescents from families with lower SES to seek hospital care when intentionally injured, RRs will be underestimated. And, in contrast, if the propensity is greater, RRs will be overestimated. The same reasoning applies to the other family characteristics. Unfortunately, we had no opportunity to assess the direction of underreporting bias in the various family characteristics, nor do we know whether the propensity on the part of hospital staff to keep injured adolescents in the hospital varies according to the adolescent's social group or whether there are diagnostic inaccuracies at the hospital (either the victim "does not tell" or the hospital "does not see") that are unevenly distributed across social groups.^{39,40} However, it can be stated that there is no evidence of such discrimination by hospital staff in Sweden.⁴¹

Also, it should be stressed that intentional injuries, particularly self-inflicted ones, make up diagnosis-related groups in which individual victims can appear several times in hospital discharge registers. In our study, the number of injury occasions was used regardless of the number of so-called "repeaters." It was beyond the scope of our study to investigate whether repeaters were more prevalent in some social groups than in others. Nor did we investigate whether the likelihood of dying following an injury varied with social status. These questions are worth investigating in future studies.

CONCLUSIONS

Our study highlights the importance of a variety of social and economic characteristics of an adolescent's family when studying the association between parental SES and risk for self-harm or for violence perpetrated by others. Undeniably, the mechanisms that underlie the relationship between household SES and risk for intentional injury are complex. The relationship is likely to be mediated by the receipt of welfare benefits in the case of self-inflicted injuries.

For long-lasting effects to be achieved in the prevention of intentional injury—and for the treatment of victims to be successful—there may be a need to supplement population-based interventions with other interventions tailored to social circumstances particular to some households. ■

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Contributors

K. Engström conceived the study, built the data set, performed the analyses, and participated in the writing of the article. F. Diderichsen assisted in refining core ideas and helped with the analyses. L. Laflamme helped refine core ideas and interpret the results and participated in the writing of the article.

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Human Participant Protection

Ethical approval for this study was obtained from the Karolinska Institute's research ethics committee.

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