Pupil injury risks as a function of physical and psychosocial environmental problems experienced at school

L Laflamme, E Menckel

Abstract

Objectives—To investigate relations between physical and psychosocial environmental problems in schools, as perceived by school principals, and injuries among pupils.

Method—Proportionate injury ratios (PIRs) were computed for 77 public sector Swedish schools (33 248 pupils), and divided into four classes based on types of environmental problems reported. Sports related injuries, injuries during recesses, and violence related injuries were considered.

Results—The schools reporting psychosocial problems (9.1% of schools and 7.3% of pupils) had more injuries than expected by chance than all types of injuries aggregated (PIR = 1.92; 95% confidence interval (CI) 1.64 to 2.27), and in the case of sports related injuries (PIR = 1.79; 95% CI 1.37 to 2.34) and injuries due to physical violence (PIR = 2.20; 95% CI 1.33 to 3.65). There were no significant excess risks of injuries for schools facing physical problems or a combination of physical and psychosocial problems.

Conclusions—Psychosocial problems may exacerbate the risk of intentional and unintentional injuries among pupils. The results offer a reminder that school environment must be planned as part of any assessment of youth safety.

(*Injury Prevention* 2001;7:146–149)

Keywords: school safety; pupil injury; school environment; physical violence

In Sweden, pupils' lives in school are the concern of both the public health and occupational health authorities. Public health authorities are concerned, because the school is the environment outside the home where children and young people spend the greatest part of their time. In fact, the educational school environment accounts for a substantial proportion of injuries sustained by school age children. Injuries are also on the occupational health agenda, because Swedish labor legislation stipulates that all school pupils aged 6 and above are covered by the provisions of Sweden's Work Environment Act.

Little is known regarding the extent to which the school environment influences injuries among pupils.^{1,2} The evidence so far indicates that injury rate and injury severity vary considerably from school to school, but the reasons for this have been only sparsely investigated.^{3–5}

However, Boyce *et al* have shown that organizational aspects, such as long school hours, alternative curricula and low pupil-to-staff ratios, are significantly associated with high injury rates.³ Likewise, Woringer observed that injury rates and severity are higher in "special" classes (that is, classes that had been reduced in size, or classes for children with developmental problems) than in others.⁵ Bergström and Björnstig found no relation, however, between injury rate and size of school, age of school building, high migration areas, social problems, special education support, or per cent of students bussed to school.⁴

The focus of the current study is on school related environmental problems, rather than on their organizational or neighborhood characteristics. More specifically, it focuses on the relation between physical and psychosocial environmental problems experienced at school and injury risks. The study is based on material gathered during a two phase project, comprising a two year national survey of school environments and pupil injury risks (school year 1995–96)^{6,7} and a one year period of more specific data collection designed to build up a pupil injury register (school year 1996–97).^{8–11}

The study only concerns public sector schools (attended by approximately 95% of Sweden's children). In Sweden, compulsory school lasts for nine years and is divided into three levels, each comprising three years or grades: junior level (pupils aged 7–9 years), intermediate level (pupils aged 10–13), and senior level (pupils aged 14–17). The Swedish high school program lasts for three years, and is either vocationally oriented or provides preparation for university studies.

Methods

STUDY POPULATION

The study population comprises all pupils from 77 Swedish schools that participated in the build-up of a pupil injury register during the school year 1996–97 (33 248 pupils). These schools were recruited from a sample of public sector schools offering compulsory or high school programs and that had responded to a questionnaire on pupils' work environments and injury determinants during the previous school year (1995–96). The initial sample comprised 1036 schools, representative of Sweden's types of municipalities and types of school (school levels catered for).^{6,7} The response rate was 68.7%.^{6,7}

Karolinska Institutet,
Department of Public
Health Sciences,
Division of Social
Medicine and National
Institute of Public
Health, Injury
Prevention Program,
Stockholm, Sweden
L Laflamme

National Institute of
Public Health, Injury
Prevention Program
and National Institute
for Working Life,
Division of Work and
Health, Stockholm,
Sweden
E Menckel

Correspondence to:
Dr Lucie Laflamme,
Karolinska Institutet,
Department of Public Health
Sciences, Division of Social
Medicine, Norrbacka,
SE-171 76 Stockholm,
Sweden
lucie.laflamme@phs.ki.se

Table 1 Classification of Swedish schools based on perceived environmental load at phase 1 and phase 2

Environmental load	Phase 1: % schools (n=672)	Phase 2: % schools (n=77)	% Pupils
Both physical and psychosocial problems	5.8	11.7	8.7
Physical problems only	13.4	19.5	14.0
Psychosocial problems only	10.9	9.1	7.3
No or few problems of either kind	69.9	59.7	70.0
Total	100.0	100.0	100.0

FOUR GROUPS OF SCHOOLS

For the current study, four classes of schools were created according to the nature and amount of environmental problems they reported in response to the questionnaire (school year 1995–96): (1) schools with both physical and psychosocial problems; (2) schools with physical problems only; (3) schools with psychosocial problems only; and (4) schools with no problems of either kind. The classification was identical to an earlier one created after the 1995–96 national survey, which had been designed to consider the relation between environmental problems and perceived pupil-injury determinants.⁹

In 1995–96, principals were requested to review a list of psychosocial and physical characteristics/descriptors, and then to rate their school as satisfactory or not in each respect. The data compilation gave a generally positive picture of the environment in most schools.⁷ For the purpose of the classification in the four categories of schools, seven out of 10 physical problems (ventilation/indoor climate; premises; noise; outdoor environment; maintenance of premises; ergonomic conditions; lighting) and four out of eight problems related to the psychosocial environment (pupil-teacher ratio; pupils' opportunity to obtain social support; staff's opportunity to give social support; classroom size) were judged as unsatisfactory by 10% of principals or more. As can be seen in table 1 (second column), some schools faced considerable environmental problems of both kinds (for further methodological details, see Laflamme *et al*).⁹

Table 2 Observed and expected frequencies, and proportionate injury ratios (PIRs) with 95% CI for types of environmental problems experienced at school in relation to various sets of injuries

Type of problem	Observed	Expected	PIR (95% CI)
All types of injuries			
Both physical and psychosocial	83	94.7	0.87 (0.70 to 1.08)
Physical	134	152.3	0.88 (0.74 to 1.04)
Psychosocial	152	79.4	1.92 (1.64 to 2.27)
None	719	761.6	0.94 (0.94 to 0.87)
Total	1094	1094	
Sports related injuries			
Both physical and psychosocial	40	36.2	1.10 (0.80 to 1.50)
Physical	58	58.2	1.00 (0.77 to 1.29)
Psychosocial	54	30.4	1.79 (1.37 to 2.34)
None	264	291.2	0.91 (0.80 to 1.02)
Total	416	416	
Recess injuries			
Both physical and psychosocial	41	32.5	1.26 (0.92 to 1.71)
Physical	33	52.2	0.63 (0.45 to 0.88)
Psychosocial	20	27.2	0.74 (0.48 to 1.14)
None	279	261.1	1.07 (0.95 to 1.20)
Total	373	373	
Injuries due to physical violence			
Both physical and psychosocial	6	8.2	0.73 (0.33 to 1.62)
Physical	15	13.2	1.14 (0.69 to 1.89)
Psychosocial	15	6.9	2.17 (1.33 to 3.65)
None	58	65.7	0.88 (0.68 to 3.65)
Total	94	94	

In contrast to the original sample, the schools that took part in the injury register cannot be regarded as representative of all public sector Swedish schools. Nevertheless, item comparisons revealed that the two groups of schools do not differ significantly with regard to the type (or amount) of physical and psychosocial environmental problems they experience.^{8,9} The results of classification of the schools in four groups after phase 1 and phase 2 surveys are given in table 1. They demonstrate a slight over-representation of schools facing both physical and psychosocial problems at phase 2.

FOUR SETS OF INJURIES

The injury register assembled during 1996–97 was based on information compiled using a standardized data collection instrument.² The injuries to be recorded in each school were defined as encompassing “any serious bodily injury requiring a hospital visit/medical care”, “any injury involving more than one pupil”, “any injury that might be due to violence between pupils”, and “any kind of injury that is frequently incurred and may be a sign of/ due to a deficiency in the environment”. Further, an incident was defined, for the purpose of registration, as “any event that might have led to a serious injury or could have led to injuries to more than one pupil”. The register comprises 1094 injury events, 6% of which were incidents.

For the current study, four sets of injuries were considered:

- (1) All injuries aggregated.
- (2) Injuries incurred during recess periods at any location inside or outside school.
- (3) Injuries incurred during school gymnastics or sports, organized or not.
- (4) Injuries due to acts of physical violence between pupils.

PROPORTIONATE INJURY RATIOS

The proportionate injury ratio (PIR) was used to estimate injury risk by category of school. The PIR for a given group of schools is the ratio of the observed number of injuries incurred during a specified period to the expected number of injuries, taking into account the number of pupils in any particular school category.¹² A ratio of 1.0 indicates that observed and expected numbers of injuries are equal. PIRs with 95% confidence intervals (CI) were computed by type of school (according to experienced environmental problems) for each subgroup of injuries considered.

Results

Table 2 presents PIRs with 95% CI when schools are grouped into categories of environmental problems, considering in turn all injuries aggregated, sports related injuries, recess injuries, and injuries due to violence.

All injuries aggregated, the only category of schools registering a PIR significantly greater than 1.0 is that with solely psychosocial problems (7.3% of the total number of pupils at phase 2); the PIR is very high (1.92; 95% CI

1.63 to 2.27). Sports related injuries and injuries due to violence are also significantly much more frequent than expected in these schools (PIR = 1.79; 95% CI 1.37 to 2.34 and PIR = 2.20; 95% CI 1.33 to 3.65 respectively).

Injuries during recesses are not more frequent than expected in any category of schools.

Discussion

The first conclusion that can be drawn from the results is that, as was the case for the national survey,⁹ schools confronted with considerable problems in either the physical or psychosocial environment are in a relative minority (30%–40%).

The second conclusion is that, where they exist (or are reported by school principals), psychosocial problems may exacerbate the risk of intentional or unintentional injuries among pupils. Those schools (9.1% of schools, and 7.3% of pupils) have more than twice as many injuries due to violence than expected by chance, 78% more injuries during sports activities, and 90% more injuries of all kinds. Interestingly, one year earlier, at the first phase of the project, these schools—and also those with both physical and psychosocial problems—judged “individual pupils’ attitudes/aggressive behaviors” as a major injury risk contributor in greater proportions than expected by chance. They also found they had a “moderate” or “large” problem with physical violence between pupils.

Finally, in our material, problems related to the physical environment, alone or in combination with psychosocial problems, do not seem to be a source of increased risk of any kind of injury.

LIMITATIONS

One limitation has to do with the classification of schools. First, as it was based on ratings made by school principals, there is the possibility of a bias towards favorable ratings and an underestimation of the number of schools where notable environmental problems exist.

Second, the ratings were made on preselected physical and psychosocial aspects of the environment. The list may not have been exhaustive in 1995–96, and may well have changed, possibly in every school, between the two school years considered. With regard to the coverage of the list, however, it should be noted that principals were asked to specify the types of environmental problems they had been working with before being requested to review the items we had selected. Their selection of items was in line with our own, suggesting that omission of relevant environmental factors was not a weakness of the study.

Third, the classification is based on the assumption that all problems have the same weight. This assumption is plausible, but was not testable.

Another limitation is that, from the point of view of “deciding what to do”, at the school or community level, the results lack specificity. This is due in part to a lack of qualitative and

Key points

- About one school out of 10 reported psychosocial problems (7.3% of pupils).
- Those schools had more injuries than expected by chance when considering all types of injuries aggregated, sports related injuries, and injuries due to physical violence.
- There were no significant excess risks of injuries for schools facing physical problems or a combination of physical and psychosocial problems.
- The results offer a reminder that school environment must be planned as part of any assessment of youth safety.

quantitative information on the role played by the school environment in the genesis of the injuries considered. It is also due to the fact that pupils’ opinions are not considered.

Implications for prevention

Although the proportion of Swedish schools experiencing environmental problems—physical, psychosocial, or both—does not exceed 40% (30% of the total number of pupils), the results offer a reminder of the need for the school environment to be planned and evaluated in relation to the safety of pupils.^{13 14} Maintenance of, and, where required, improvement to the psychosocial and physical environments of schools may reduce pupils’ risks of sustaining injuries (whether intentional or not). Educational and developmental prospects may also be promoted by adopting such an approach.

In the case of violence between and against pupils, several types of preventive approaches can be envisaged.^{15–19} It is worth stressing that the problem has been shown to be best dealt with by adopting simultaneous approaches and “multiple long term strategies” that target a broad spectrum of schools (not only those where the problem is most evidently acute). In this context, the leisure time sites where school age children spend a lot of their time and relate to each other require particular attention.

Finally, over 50% of the principals reached in phase 1 expressed their view concerning the manner in which physical violence between pupils might be prevented (open question). These responses point above all to a need for greater involvement on the part of adults (parents, teachers, and sometimes the police) in the school environment and curriculum. Surveillance by adults during recess periods could be increased, school specific antiviolenace plans introduced, and the school curriculum adjusted.⁹ Close inspection of response profiles by type of school suggests that the value attributed to preventive strategies of different kinds varies by type of school and according to the extent to which violence is regarded as problematic.

1 Laflamme L, Menckel E. School injuries in an occupational health perspective: what do we learn from community based epidemiological studies? *Inj Prev* 1997;3:50–6.

- 2 Laflamme L, Menckel E, Aldenberg E. School-injury determinants and characteristics. Developing an investigation instrument from a literature review. *Accid Anal Prev* 1998; 30:481–95.
- 3 Boyce T, Sprunger LW, Sobolewski S, et al. Epidemiology of injuries in a large, urban school district. *Pediatrics* 1984;3:342–9.
- 4 Bergström E, Björnstig U. School injuries. Epidemiology and clinical features of 307 cases registered at hospital during one school year. *Scand J Prim Care* 1991;3:209–16.
- 5 Woringer V. Les accidents scolaires. *Rev Med Suisse Romande* 1995;2:153–6.
- 6 Menckel E, Laflamme L, Schelp L, et al. *Pupils' work environment and injury risks. The perspective of school principals*. Stockholm: Sweden's National Institute of Public Health, 1997. (In Swedish.)
- 7 Laflamme L, Menckel E, Aldenberg E. The physical and psychosocial environments in Swedish schools: quality aspects and relations to pupil-injury determinants as perceived by school principals. *WORK* 1998;11:57–65.
- 8 Laflamme L, Menckel E. *Pupils' injuries and school environment. Injury patterns and risk situations*. Stockholm: Sweden's National Institute of Public Health, 1998.
- 9 Laflamme L, Menckel E, Schelp L. Injuries to Swedish school pupils: distribution and patterns by type of school and type of municipality. *WORK* 1999;13:153–61.
- 10 Laflamme L, Menckel E. Injuries during recess in Swedish schools. Patterns and distribution by type of municipality and type of school. *Safety Science* 1999;33:89–101.
- 11 Menckel E, Laflamme L. Injuries to boys and girls in Swedish Schools: different activities, different results? *Scand J Public Health* 2000;28:132–6.
- 12 Checkoway H, Pearce NE, Crawford-Brown DJ. *Research methods in occupational epidemiology*. New York, NY: Oxford University Press, 1989.
- 13 Coppens NM, Krehel Gentry L. Video analysis of playground injury-risk situations. *Research in Nursing & Health* 1991;14:129–36.
- 14 Sleet DA, Dane JK. Wellness factors among adolescents. *Adolescence* 1985;XX:909–20.
- 15 CDC. Violence-related attitudes and behaviours of high-school students—New York City, 1992. *MMWR Morb Mortal Wkly Rep* 1993;42:773–7.
- 16 CDC Injury prevention. *Wkly Epidemiol Rec* 1994;69:56–9.
- 17 Stephens R. Planning for safer and better schools: school violence prevention and intervention strategies. *School Psychology Review* 1994;23:204–15.
- 18 Valois RF, McKeon RE, Garrison CZ, et al. Correlates of aggressive behaviours among public high school adolescents. *J Adolesc Health* 1995;16:26–34.
- 19 Wolfe D. Three approaches to coping with school violence. *English Journal* 1995;Sept:51–4.

Wedded to the car?

Americans lead the world in use of automobiles over walking or biking. One study cited by the US Centers for Disease Control and Prevention found Americans use cars for 84% of their trips in urban areas compared with cars used to make 36% of trips in Sweden.

In addition, a nationwide online survey found that 45% of married Americans ranked their cars as the thing they considered most important to them with 17% of males saying that they planned to buy their vehicle a gift on Valentine's Day.

The UK Transport Minister launched a new guide aimed at encouraging more children to make their journey to school by bus based on a survey. The findings include the intriguing statistic that 14% of adults who travelled to school by bus in their youth claim to have met a future boyfriend or girlfriend on the bus, or when waiting at the bus stop. On a more serious note, the guide aims to reverse the trend towards children being transported to school by parents, by encouraging local authorities, bus operators, schools and parents' groups to increase the use of school buses.

New safety device?

The *LA Times* reported that Progressive Insurance Co, one of the nation's largest auto insurers, has placed devices in customers' vehicles to measure how much they drive, when and where, with the incentive being a reduction in premiums for those who drive well. The device's patent describes a system of on-board sensors that could track whether a driver signals before turning, tailgates, or stops so sharply that antilock brakes engage.

Morse on the case of the persecuted pedestrian

Colin Dexter, the English writer who created Morse, our editor's favourite TV detective, received the freedom of the city of Oxford. But according to one report, he will not find it easy to exercise that freedom because Oxford streets are distinctly unfriendly to pedestrians and less safe than they should be.