Relationships between community social capital and injury in Canadian adolescents: a multilevel analysis

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ABSTRACT

Background Characteristics of social environments are potential risk factors for adolescent injury. Impacts of social capital on the occurrence of such injuries have rarely been explored.

Methods General health questionnaires were completed by 8910 youth aged 14 years and older as part of the 2010 Canadian Health Behaviour in School-Aged Children study. These were supplemented with community-level data from the 2006 Canada Census of Population. Multilevel logistic regression models with random intercepts were fit to examine associations of interest. The reliability and validity of variables used in this analysis had been established in past studies, or in new analyses that employed factor analysis.

Results Between school differences explained 2% of the variance in the occurrence of injuries. After adjustment for all confounders, community social capital did not have any impact on the occurrence of injuries in boys: OR: 1.01, 95% CI 0.80 to 1.29. However, living in areas with low social capital was associated with lower occurrence of injuries in girls (OR 0.78, 95% CI 0.63 to 0.96). Other factors that were significantly related to injuries in both genders were younger age, engagement in more risky behaviours, and negative behavioural influences from peers.

Conclusions After simultaneously taking into account the influence of community-level and individual-level factors, community levels of social capital remained a relatively strong predictor of injury among girls but not boys. Such gender effects provide important clues into the social aetiology of youth injury.

INTRODUCTION

Injuries are common and potentially preventable health events that lead to substantial public health burdens in child populations. Over a half of Canadian school-aged children report the occurrence of one or more medically treated injuries annually[1] and at the global level more than 8 755 000 children are killed per year as a result of injury.[2]

Injury is a complex health outcome and simultaneous consideration of multiple individual, social and physical contextual factors has been suggested for exploring its aetiology.[3] At an individual level, male sex and diagnosed psychological problems are well documented risk factors.[4] Additionally, there is substantial evidence on the cumulative and persistent effects of overt risk behaviours on injury.[5–8] Jessor[6] demonstrated that in youth, smoking, drinking, cannabis use and sexual intercourse are all manifestations of an underlying *propensity* for problem behaviour, and individual and collective engagement in these behaviours makes adolescents more vulnerable to injuries. Concurrent involvement in such multiple risk behaviours during early adolescence is also a predictor of injury at the age of 15 years[5] and increases the odds of youth injury.[8] In addition, the influential roles of peers on engagement in risk behaviours during adolescence[9] merits consideration.

Social[10] and physical[11] contextual factors are also important in the aetiology of youth injuries. One such potential determinant is social capital, typically measured by levels of social cohesion and the strength of interpersonal relationships. A main pathway that links social capital and injuries, conceptually, is health risk behaviours.[12] Community (school or neighbourhood) resources affiliated with higher levels of social capital include improved levels of health literacy, safer norms and attitudes, and increased political support for social and public health reforms, all of which may play a preventive role in injury-related health behaviours.[12] However, existing studies[13–15] provide weak evidence on this potential preventive impact.

There are methodological considerations surrounding the aetiological modelling of adolescent injury and its determinants. Multilevel analyses are efficient regression techniques that account for nested and correlated data structures and permit simultaneous analyses of the effects of individual-level and community-level variables.[16] An important step when performing such analyses is the quantification of between-cluster variation.[17] If these variations are small, the outcome occurs mainly due to differences *within* clusters, that is, as a result of individual differences,[16] a situation in which performing multilevel analyses is seldom justified. One traditional indicator of between-cluster variation is the interclass correlation coefficient (ICC); defined as the ratio of the between-cluster variance to the total variance. A large ICC means that effects at the level of the cluster are important in the occurrence of the outcome and they should be taken into account in aetiological analyses. Two other measures are available with more interpretable information for discrete outcomes.[17] The median OR (MOR) quantifies between-cluster variation by comparing persons from two different clusters with larger levels indicative of high levels of variation between clusters. The interval OR (IOR) incorporates the random effect and the effect of the cluster-level variable. A narrow IOR means between-cluster variations are small and containing a value of *one* indicates the between cluster variability is large *relative* to the effect of the cluster-level variable.[17] However, such methods have rarely been used in social epidemiological studies in our field.

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We had an opportunity to conduct a study of social capital and adolescent injury with consideration of the above methodological issues, using a large Canadian survey of school-aged children. The core objective of this study was to examine relations between the perception of social capital at the residential neighbourhood and the occurrence of injuries. We limited our analysis to non-sport injury outcomes, as sport injuries are thought to have a unique aetiology that is partially independent from such contextual social effects.[18] Secondary objectives were (1) to explore distributions of all available potential risk factors for youth injury; (2) to develop and test the psychometric properties of composite scales for the measurement of 'risk behaviours' and 'peer influence'; and, (3) to quantify the variations in the occurrence of injuries due to between-school differences by calculating ICC, MOR and IOR.

METHODS

Data sources/study population

We obtained data from Cycle 6 (2009–2010) of the Canadian Health Behaviour in School-Aged Children (HBSC) Study.[1] This is a cross-sectional study of health behaviours and outcomes in a nationally representative sample of 26 078 Canadian students mainly aged 11–15 years, from 436 schools.[1] Data were collected between October 2009 and May 2010 via administration of a written, inclass questionnaire. The HBSC survey has been designed based on the *population health framework*[19] which focuses on individual and contextual determinants of health, and their interactive effects on the health of children. We restricted our analysis to students in the older age range (those aged 14+years; grades 9 and older) because we were interested in examining the impact of social environments, and specific questionnaire modules about such relationships were only asked of these older students. From the original sample of 26 078, 12 189 met our age-related inclusion criterion, and then 3279 were excluded because they either did not answer the injury question or were injured due to sport-related activities. This left a final unweighted sample size of 8910.

Measures

The main exposure

Social capital is a complex social construct and there is controversy over its definition. Following existing precedents[14 20 21] levels of trust, social cohesion and cooperation were used as indicators of individual perception of social capital in neighbourhoods. Children were asked to provide a rating for five statements using Likert-like responses, with five options ranging from '*1-strongly agree*' to '*5-strongly disagree*'. Statements focused on if they can 'trust' people around them, the possibility of asking for help from neighbours as a measure of 'cooperation', and three statements about 'social cohesion'. Cohesion was defined as the quality of interpersonal relationships, and availability of safe places for social interactions and spending free time (see online appendix table A1). Analysing psychometric properties of these five items via exploratory and confirmatory factor analyses showed that all loaded highly onto a single factor with relatively high internal consistency (Cronbach's $\alpha=0.76$) and good model fit.[21 22] We constructed a summary measure for social capital defined as the sum scores of each item. This composite scale was the measure of 'individual' social capital. We followed the standard methodology of aggregating survey responses to the group level for constructing neighbourhood levels of social capital.[12 23] Averages of individual scores were aggregated using 'schools'. We chose schools versus neighbourhoods for our aggregate analysis because HBSC data were collected from a representative sample of all non-private Canadian schools, and any variation in Socio-economic status (SES) between these schools is a true reflection of the differences in the whole Canadian youth population. Furthermore, the large number of schools (n=436) permitted quantification of between-school variations in multilevel regression models. There is direct evidence that areas around schools are a place for social interaction between students with potential impacts on their health.[11 14]

Schools then were divided into low, medium and high tertiles based upon the distribution of these scores.

The outcome

The occurrence of injuries was indicated by the self-reported question in the HBSC: "During the past 12 months, how many times were you injured and had to be treated by a doctor or nurse?" We excluded non-sport injuries and the measure included injuries due to any reason except 'playing' or 'training' for sports. This self-report measure for child injuries has been validated by showing excellent agreement with hospital records at 3 months and adequate agreement at 12 months[23] and has been used extensively in past publications.[7]

Covariates

Individual/family variables

Age in years, gender (boy or girl) and self-rated health (four categories, 'excellent' through 'poor' as an indicator for general physical health status)[24] were selected as covariates. We also included other established determinants of youth injuries such as risk-taking behaviours, family and social network factors in our analysis (see below).

Risk-taking behaviours

We performed exploratory factor analyses to examine if there is a latent factor of *risk behaviours*[6] in adolescence which manifests itself through one or more of the following: cannabis use, smoking, alcohol misuse and sexual activity. Since the response options for these risk questions were compiled in Likert scales, in the pattern matrix, polychoric/tetrachoric correlation coefficients were used as suggested by Wuensch.[25] Factor analysis resulted in a one factor solution with high and similar loadings, indicating that each of these four behaviours contribute equally to the latent factor that we called 'risk behaviour' (see online appendix table A2). We subsequently created an additive score consisting of summed counts of these risk behaviours.

Family related variables

We included three documented risk factors related to family: 'family affluence', 'number of siblings'[26] and 'family structure'[27] in the analysis. Family affluence as a proxy for the individual-level socioeconomic status was measured by a self-rated question: "How well off do you think your family is?" Students were divided into three groups of 'well off', 'average' and 'worse off', consistent with prior research.[28] 'Number of siblings' was categorised into *none*, *1–2*, and *more than 2* and 'family structure' was initially categorised as *intact* (living with both parents) and *non-intact* (any other family structure). Due to the relatively high number of youth living with adults other than their parents or in foster care, a '*living with others/foster care*' category was also created.

Social network variables

Numbers of 'close friends' reported by youth were categorised into three groups (*0–1, 2, >2*). A series of questions also asked about *peer influence*; that is, the behaviours of the group of friends with whom students spend most of their leisure time. The students ranked statements such as "most of my friends in my group smoke cigarettes, get drunk, care for environment, …." into 'never or rarely', 'sometimes' and 'often' categories. Factor analyses performed with polychoric/tetrachoric correlation coefficients[25] produced a two-factor solution in which negative and risky behaviours loaded onto one factor, whereas positive behaviours loaded onto a second factor. Two composite scores were constructed by combining scores from each item with equal weights (see online appendix table A3).

Community-level covariates

At the community level, we assessed two risk factors for injury, neighbourhood socioeconomic status[14] and street connectivity[11] based upon geographical information estimates for a 1 km buffer surrounding each school. Prior research has demonstrated that this buffer around schools is reliable for social and environmental constructs such as street types and connectivity,[29] food environments,[30] green space[31] and socioeconomic environments.[32] The psychometric properties, full definitions and detailed measurement of community-level variables have been described in a companion paper.[22] Briefly, using 2006 Canada Census of population,[10] the neighbourhood socioeconomic status consisted of an additive composite scale that included average family income, the proportion of people (15+years) with at least a high school diploma, and the proportion of people older than 25 years who were employed. The additive composite scale of *Street Connectivity* included intersection density, average blocks length and connected node ratio; directly measured via Geographic Information System technology (ArcGIS V.9.3 software; ESRI, Redlands, California, USA).

Statistical analysis

Descriptive

Weighted distributions of all variables across different social capital groups were estimated and compared using analysis of variance and χ^2 tests. Crude relationships between the outcome and all other variables were examined by estimation of prevalence rate ratios for injury occurrence by constructing bivariate regression models with binomial distributions.

Aetiological analyses

Multilevel multivariate statistical analyses were performed in three steps using models estimated via the GLIMMIX procedure in SAS (V.9.2, Carry, North Carolina, USA) with a *logit* link. Due to convergence challenges we were not able to directly estimate RRs and therefore adjusted our models to estimate ORs.

First, we fit an 'empty' (random intercept only) model in which the occurrence of injuries was modelled purely as a function of students' school identifiers. The second model included only community-level variables estimated as fixed effects. We then followed parsimonious modelling strategies using methodologies outlined by Rothman (2008)[33] and Kleinbaum and Klein (2010).[34] We started by adding all individual-level variables with potential confounding effects (according to bivariate analyses) to the community-level model to construct a fully adjusted model.[33 34] We used a change in estimate strategy to identify true confounders,[33] excluding variables whose removal from the fully adjusted model resulted in less than 10% change in the OR describing relations between social capital and injury. Then, to account for each variable's potential impacts on the random effects of schools, we also included variables which produced more than a 10% change in the measure of variance at the school level. This process resulted in several different models to choose from. To determine the best fit model, two standard measures of goodness-of-fit—the Akaike Information Criterion and Bayesian Information Criterion statistics—were calculated.[35] The final model was chosen after consideration of all criteria. We concluded our analyses by examining possible cross-level interactions between socioeconomic status,[14] gender and social capital. Variations in the occurrence of injuries due to between-school differences were quantified by calculating ICC, MOR and an 80% IOR[17] which contains the middle 80% of the all possible ORs comparing any set of two persons from two different clusters with different cluster-level variables.

RESULTS

The mean age of participants was 14.8 (SD: 0.81) years, and almost two-thirds (70%) reported residing in neighbourhoods with at least medium levels of social capital. Seventy-two per cent of respondents lived in intact families and 55% rated their level of family affluence as high (table 1). Thirty-nine per cent of boys and 32% of girls reported the occurrence of one or more injuries. Poor street connectivity, male sex, engaging in more risky behaviours, low family socioeconomic status, not living with two parents, and reporting poor self-rated health were identified statistically as risk factors for injuries in bivariate analyses (table 2).

The three standard measures used to estimate between-school variation in injuries suggested that the random effect of the aggregate level should be taken into account in these analyses. In the community-level variables only model (table 3), the estimated ICC of 2% and MOR of 1.25 each showed an acceptable size to justify the use of multilevel analysis.[36] The relatively narrow 80% IOR of 0.65–1.48 suggests that variations in the occurrence of injuries are being weakly affected by differences between schools. Also, because the IOR contains 1.0, these differences are large and important *relative* to the effect of the community social capital.

'Individual social capital', 'number of risk behaviours' and 'negative peer influence' were each identified as true confounders in the relationship between community social capital and injuries. We also added 'street connectivity', 'family influence' and 'number of siblings' into the final model because they influenced random effects of schools by more than 10%.[16] The final adjusted multilevel model (table 3) suggested that students exposed to low community levels of social capital had a16% reduction in relative odds of reporting an injury (OR 0.84, CI 0.72 to 0.98) compared with those living in high social capital areas. Other significant predictors of injury were: younger age, male sex, engagement in risk behaviours and negative peer influences. Holding all other variables constant, the relative odds of reporting an injury in boys was 37% higher, and engaging in one more risk behaviour was associated with a 35% increase in relative odds of injury. Each year of age decreased the odds of injuries by 14% (OR 0.86, CI 0.80 to 0.92) and when analysed as a continuous variable with a possible range of 4–12, each unit increase in the score of negative peer influence increased the odds of injuries by 4% (OR 1.04, CI 1.02 to 1.08).

The statistical significance of tests for interaction between community social capital and gender (p=0.043) suggested that construction of gender-stratified models was warranted. We included the same variables from the final adjusted model for the overall sample in the gender-stratified models which showed differential impact of social capital across gender groups. The odds of injuries reported for boys were not significantly affected by community social capital (OR 1.01, CI 0.80 to 1.29), but for girls the

Table 1 Characteristics of the population by levels of community social capital

	Total	High SC	Medium SC	Low SC	p Value*
Community-level variables					
SES					
High	1875 (22)	419 (20)	901 (27)	555 (16)	<0.0001
Medium	4275 (48)	976 (47)	1534 (46)	1765 (51)	
Low	2691 (30)	681 (33)	880 (27)	1129 (33)	
Street connectivity					
High	4268 (48)	895 (43)	1282 (39)	2091 (60)	<0.0001
Medium	2587 (29)	667 (32)	1001 (30)	919 (26)	
Low	2023 (23)	518 (25)	1031 (31)	474 (14)	
Individual-level variables					
Gender					
Male	4089 (46)	889 (43)	1657 (49)	1543 (45)	<0.0001
Female	4845 (54)	1192 (57)	1711 (51)	1941 (55)	
Age					
Mean (SD)	14.8 (0.81)	14.7 (0.77)	14.8 (0.79)	14.9 (0.84)	<0.0001
Individual level of social capital					
High	2995 (34)	944 (45)	1202 (36)	849 (24.5)	<0.0001
Medium	2770 (31)	628 (30)	1082 (32)	1060 (30.5)	
Low	3169 (35)	508 (25)	1085 (32)	1575 (44)	
Number of risky behaviours					
0	3238 (37)	908 (44)	1096 (33)	1234 (36)	<0.0001
1	2580 (29)	583 (28)	1004 (30)	994 (29)	
2	1105 (12.5)	217 (10.5)	460 (13)	428 (12)	
3	1168 (13)	235 (11.5)	470 (14)	463 (13)	
4	769 (8.5)	130 (6)	318 (10)	327 (10)	
Family affluence					
Well-off	4736 (55)	1129 (55)	1832 (56)	1775 (52)	<0.0001
Average	3193 (36)	775 (38)	1158 (35)	1260 (37)	
Worse off	823 (9)	132 (7)	310 (9)	380 (11)	
Number of siblings					
0	1430 (16)	316 (15)	512 (15)	602 (17.5)	<0.0001
1–2	5830 (66)	1365 (67)	2264 (68)	2201 (64)	
≥3	1562 (18)	369 (18)	557 (17)	634 (18.5)	
Family structure					
Living with two parents	6427 (72)	1596 (77)	2444 (73)	2387 (69)	<0.0001
Living with one parent	1682 (19)	308 (15)	627 (19)	747 (22)	
Somebody else/foster care	756 (9)	156 (8)	276 (8)	324 (9)	
Number of friends					
0–2	199 (2)	28 (1)	88 (3)	83 (2.5)	0.002
3–4	586 (6.5)	119 (6)	247 (7)	220 (6.5)	
≥5	8148 (91)	1933 (93)	3044 (90)	3181 (91)	
Negative peer-influence					
Mean (SD)	7.5 (3.0)	7.1 (2.8)	7.4 (2.9)	7.7 (3.1)	<0.0001
Positive peer-influence					
Mean (SD)	14.6 (3.2)	14.8 (2.9)	14.5 (3.1)	14.6 (7.8)	0.03
Self-rated health					
Good-excellent	6782 (77)	1652 (80)	2589 (78)	2541 (74)	<0.0001
Fair-poor	2055 (23)	401 (20)	751 (22)	902 (26)	

Frequencies are weighted and rounded to the nearest integer.
Numbers inside parentheses represent column percentages.
*From χ^2 and analysis of variance (ANOVA) statistics where appropriate.

effect was present and statistically significant. Female students who perceived their neighbourhood with low levels of social capital reported 23% lower odds of injury in the year preceding the survey (OR 0.72, CI 0.62 to 0.94). Age and negative peer influence had similar effects on the occurrence of injuries in both genders. However, compared with girls, risk behaviours appeared to be more detrimental for boys. Reported engagement in each of a number of additional risk behaviours of cannabis use, smoking, drinking and sexual activity increased the odd of injuries in boys by 43% (OR 1.43,CI 1.35 to 1.52), whereas the increase in relative odds for girls was only 27% (OR 1.27, CI 1.19 to 1.34). Family wealth was identified as a risk factor for injuries in girls but not in boys; however, the interaction product term was not statistically significant (p=0.24).

Table 2 Bivariate relationships between all variables and the outcome

	Injured N=3101 (34.80)	Not-injured N=5809(65.20)	Prevalence rate ratio (95% CI)
Community-level variables			
Social capital			
High	565 (35)	1214 (65)	Ref.
Medium	1105 (35)	2050 (65)	0.99 (0.92 to 1.08)
Low	1340 (35)	2455 (65)	0.98 (0.91 to 1.06)
SES			
High	843 (35.2)	1552 (64.8)	Ref.
Medium	1343 (34.5)	2550 (65.5)	0.98 (0.91 to 1.05)
Low	849 (34.6)	1620 (64.8)	0.98 (0.91 to 1.08)
Street connectivity			
High	1335 (33.2)	2679 (66.8)	Ref.
Medium	951 (35.4)	1738 (64.6)	1.06 (0.99 to 1.14)
Low	794 (36.8)	1366 (63.2)	1.11 (1.03 to 1.19)
Individual-level variables			
Gender			
Female	1485 (32)	3237 (68)	Ref.
Male	1615 (39)	2570 (61)	1.23 (1.16 to 1.30)
Age			
Mean (SD)	14.76 (0.83)	14.78 (0.81)	t test P=0.33
Individual level of social capital			
High	986 (33.9)	1926 (66.1)	Ref.
Medium	892 (32)	1893 (68)	0.95 (0.88 to 1.02)
Low	1223 (38.1)	1990 (61.9)	1.12 (1.05 to 1.20)
Number of risky behaviours			
0	819 (26.1)	2319 (73.9)	Ref.
1	825 (33.2)	1659 (66.8)	1.27 (1.17 to 1.38)
2	440 (39.4)	678 (60.6)	1.51 (1.37 to 1.66)
3	534 (43.7)	687 (56.3)	1.68 (1.54 to 1.83)
4	436 (50.8)	422 (49.2)	1.94 (1.78 to 2.12)
Family affluence			
Well-off	1465 (32.1)	3103 (67.9)	Ref.
Average	1197 (36.3)	2102 (63.7)	1.13 (1.06 to 1.20)
Worse off	355 (42.1)	489 (57.9)	1.31 (1.20 to 1.43)
Number of siblings			
0	553 (36.2)	975 (63.8)	Ref.
1–2	1880 (43.2)	3619 (65.8)	0.95 (0.87 to 1.04)
≥3	604 (34.4)	1152 (65.6)	0.95 (0.88 to 1.02)
Family structure			
Living with two parents	2107 (33.5)	4186 (66.5)	Ref.
Living with one parent	656 (37.4)	1100 (62.6)	1.12 (1.04 to 1.20)
Somebody else/foster care	302 (38.5)	482 (61.5)	1.15 (1.05 to 1.27)
Number of friends			
≥5	2849 (34.9)	5312 (65.1)	Ref.
3–4	152 (28.6)	380 (71.4)	0.82 (0.71 to 0.94)
0–2	100 (46.1)	117 (53.9)	1.32 (1.14 to 1.53)
Negative peer influence			
Mean (SD)	8.06 (2.97)	7.25 (3.00)	t test p<0.0001
Positive peer influence			
Mean (SD)	14.36 (3.29)	14.75 (3.15)	t test p<0.0001
Self-rated health			
Good-excellent	2.279 (33.9)	4434 (66.1)	Ref.
Fair-poor	786 (37.3)	1319 (62.7)	1.10 (1.03 to 1.17)

Numbers inside parentheses represent row percentages.
Prevalence rate ratios were directly estimated from binomial distributions for injury occurrence.

DISCUSSION

Our study of social determinants of adolescent injury in young Canadians had a number of important findings. First, we confirmed the potential importance of contextual environments as risk factors in this study population. An ICC of 2% in the empty model suggests that 2% of total variance in the

Table 3 Multilevel models

			Gender-stratified models*	
Empty model	**Community-level model**	**Final adjusted model**	**Boys**	**Girls**
Community-level variables				
Social capital (main exposure)				
Low	0.98 (0.86 to 1.23)	0.84 (0.72 to 0.98)	0.93 (0.74 to 1.18)	0.77 (0.62 to 0.94)
Medium	0.99 (0.86 to 1.14)	0.88 (0.75 to 1.03)	1.01 (0.80 to 1.29)	0.78 (0.63 to 0.96)
High	Reference	Reference	Reference	Reference
Street connectivity				
Low	1.19 (1.04 to 1.35)	1.10 (0.96 to 1.27)	1.13 (0.91 to 1.40)	1.03 (0.85 to 1.25)
Medium	1.21 (0.99 to 1.26)	1.04 (0.91 to 1.18)	0.99 (0.81 to 1.21)	1.06(0.89 to 1.27)
High	Reference	Reference	Reference	Reference
SES				
Low	1.01 (0.88 to 1.16)	–	–	–
Medium	0.99 (0.88 to 1.14)	–	–	–
High	Reference	–	–	–
Individual-level variables				
Age (years)		0.86 (0.80 to 0.92)	0.85 (0.78 to 0.94)	0.86 (0.78 to 0.94)
Gender				
Male		1.37 (1.23 to 1.54)	–	–
Female		Reference	–	–
Individual social capital				
Low		1.04 (0.92 to 1.19)	0.94 (0.78 to 1.13)	1.16 (0.97 to 1.39)
Medium		0.88 (0.78 to 1.01)	0.82 (0.68 to 0.98)	0.96 (0.80 to 1.47)
High		Reference	Reference	Reference
Number of risk behaviours		1.35 (1.29 to 1.41)†	1.43 (1.35 to 1.52)	1.27 (1.19 to 1.34)
Family affluence				
Low		1.23 (1.003 to 1.47)‡	1.18 (0.91 to 1.53)	1.28 (1.01 to 1.63)
Medium		1.13 (1.01 to 1.26)	1.00 (0.85 to 1.18)	1.26 (1.09 to 1.47)
High		Reference	Reference	Reference
Number of siblings				
More than one		0.88 (0.74 to 1.04)	0.86 (0.68 to 1.10)	0.89 (0.71 to 1.40)
One		1.02 (0.89 to 1.17)	1.05 (0.86 to 1.28)	0.99 (0.82 to 1.20)
None		Reference	Reference	Reference
Negative peer influence		1.04 (1.02 to 1.06)	1.03 (1.01 to 1.05)	1.05 (1.02 to 1.08)
Random effects				
ICC				
2%	2%	1.2%	0.5%	1.7%
MOR				
1.21	1.25	1.20	1.14	1.26
80% IOR (lower-upper)				
–	0.65 to 1.48	0.59–1.33	0.66–1.17	0.60–1.45

*p value for the interaction term between gender and community social capital=0.043.
†p value for the interaction term between risk behaviours and community social capital=0.58.
‡p value for the interaction term between family affluence and community social capital=0.24.
ICC, interclass correlation coefficient; IOR, interval OR; MOR, median OR;

occurrence of injury is due to differences between schools. Second, in the final gender-stratified models, this measure was 1.7% for girls and 0.5% for boys, suggesting that context is a more important contributing factor for injury among girls versus boys. These results were supported by a larger MOR in girls (1.26 vs 1.14). Third, and contrary to existing studies,[13–15] we did not observe a direct preventive effect for social capital on the occurrence of youth injury. This may be attributed to the fact that existing studies all lacked a well-developed conceptual framework and did not account for simultaneous impacts of individual-level and community-level variables. Also, in contrast to other studies,[26 27] none of the family-level factors were identified as direct risk factors for injuries in our study. Fourth, we found that relationships between community social capital and the occurrence of injuries were significantly modified by gender, with lower levels of social capital showing a protective effect in girls only. The seemingly counterintuitive finding has several potential explanations. In general, community factors affect men and women differently[37] as has been documented for body mass index,[38] cardiovascular risk factors[39] and life expectancy.[40] More specifically, it has been well documented that the health effects of collective social capital might be gendered in favour of women.[41–43] It is also plausible that for the outcome of adolescent injury, community factors affect boys and girl differently due to higher perception of community-based risks among girls versus boys. In areas with low social capital, due to lower levels of safety (real or perceived), girls may prefer to stay at home and therefore limit the risk for injuries, whereas for boys, injury remains a function of individual factors including increased exposures to risk.

With respect to our methodological intentions, results of exploratory factor analyses showed that the items in the HBSC questionnaire contribute to valid tools used to measure the latent factors of 'risk behaviour' and 'peer influence'. Consistent with the Problem Behavior Theory[6] and similar studies[4 26] these factors were significant predictors of injuries in boys and girls.

We feel that our study was strong because of our thorough use of advanced social epidemiological methodologies in order to increase internal validity. We performed multilevel analyses after ensuring structural confounding[44] (confounding resulting from social sorting mechanisms) does not exist in the data,[22] we followed the most recent analytical methodologies to quantify between-schools variations[17] to justify use of multilevel analyses, we identified true confounders using standard epidemiological approaches,[33] and we validated our 'risk behaviour' and 'peer influence' scales by performing factor analyses. Our study findings are also generalisable to a national population of young people aged 14–15 years.

We also recognise that our study has some methodological limitations. Based on existing literature, there is no established cut-off point for what is a meaningful 'between-cluster' indication of variation explained. Recent studies have performed multilevel analyses even with an ICC as low as 1.6%; we performed our analysis after obtaining a relatively small ICC of 2%. In addition, despite its non-significance, we kept social capital in the final model because our main objective was to describe its impact on injuries via building an association model[33] as opposed to identifying risk factors by a predictive model. Other limitations relate to data constraints. We recognise that cross-sectional data preclude establishment of the temporal aspects of causality. Because items describing peer influence were only available for students older than 14 years, our analysis necessarily had to exclude younger adolescents (ages 11–13 years).

In summary, this study sheds some light on the complex aetiology of youth injury by demonstrating simultaneous significant effects of contextual and individual factors. The observed differential influence of social context on injuries between boys and girls shows the importance of a gender-based approach in research and programme implementation and warrants targeted prevention policies. Girls' experiences with social capital are quite different from those of boys and this distinction should be considered in devising injury prevention health policies. Considering the specific impact of community factors on injury occurrence in girls, such policies should focus on the particular needs of girls.

To determine the universality of our findings, future research should repeat the same analysis in other settings, cultures and age groups. These studies may include longitudinal data to confirm our cross-sectional findings.

What is already known on the subject

- Injuries in children are substantial public health burdens.
- Social and environmental factors are potential determinants of youth injuries.
- Levels of social capital may play a preventive role in the occurrence of injuries via a health behaviour pathway.

What this study adds

- Contextual environments are risk factors for youth injuries.
- Levels of social capital have no independent impact on the occurrence of injuries in boys.
- After adjustment for confounding effects of a variety of community and individual-level factors, higher levels of social capital were a predictor of injuries in girls.

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Ethics approval The study protocol for the 2010 HBSC study has been approved by the General Research Ethics Board at Queen's University. Ethical approval for this particular analysis was obtained from the Queen's University Health Sciences and Affiliated Teaching Hospital Research Ethics Board.

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Father kills self, wife and three children

A family of five was shot dead in a murder–suicide.

The father died of a self-inflicted gunshot wound. The motive is uncertain, but there is no question about the weapon used, although several newspaper accounts avoid any mention of a rifle. *Editor*: I remind readers that guns are one of the main methods used in suicides, and one reason why gun control advocates insist on far more stringent criteria for heir purchase.

Biking and sex

Although not really an 'injury' in the usual sense, bicycling may harm sexual functions. If the bike seat is too narrow, it can reduce blood flow to the penis by as much as 66%. The same processes account for bicycling-related sexual problems in women. To avoid these problems, riders are advised to use wide, well-padded seats that are not tilted upward and to adjust the height of seat and handlebars so they sit upright.