

# Cross-national Study of Fighting and Weapon Carrying as Determinants of Adolescent Injury

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**ABSTRACT.** *Objectives.* We sought to (1) compare estimates of the prevalence of fighting and weapon carrying among adolescent boys and girls in North American and European countries and (2) assess in adolescents from a subgroup of these countries comparative rates of weapon carrying and characteristics of fighting and injury outcomes, with a determination of the association between these indicators of violence and the occurrence of medically treated injury.

*Design and Setting.* Cross-sectional self-report surveys using 120 questions were obtained from nationally representative samples of 161 082 students in 35 countries. In addition, optional factors were assessed within individual countries: characteristics of fighting (9 countries); characteristics of weapon carrying (7 countries); and medically treated injury (8 countries).

*Participants.* Participants included all consenting students in sampled classrooms (average age: 11–15 years).

*Measures.* The primary measures assessed included involvement in physical fights and the types of people involved; frequency and types of weapon carrying; and frequency and types of medically treated injury.

*Results.* Involvement in fighting varied across countries, ranging from 37% to 69% of the boys and 13% to 32% of the girls. Adolescents most often reported fighting with friends or relatives. Among adolescents reporting fights, fighting with total strangers varied from 16% to 53% of the boys and 5% to 16% of the girls. Involvement in weapon carrying ranged from 10% to 21% of the boys and 2% to 5% of the girls. Among youth reporting weapon carrying, those carrying handguns or other firearms ranged from 7% to 22% of the boys and 3% to 11% of the girls. In nearly all reporting countries, both physical fighting and weapon carrying were significantly associated with elevated risks for medically treated, multiple, and hospitalized injury events.

*Conclusions.* Fighting and weapon carrying are 2 common indicators of physical violence that are experienced by young people. Associations of fighting and weapon carrying with injury-related health outcomes are remarkably similar across countries. Violence is an important issue affecting the health of adolescents internationally. *Pediatrics* 2005;116:e855–e863. URL: [www.pediatrics.org/cgi/doi/10.1542/peds.2005-0607](http://www.pediatrics.org/cgi/doi/10.1542/peds.2005-0607); adolescent, etiology, fighting, injury, trauma, violence, weapon carrying.

ABBREVIATIONS. HBSC, Health Behaviour in School-Aged Children; OR, odds ratio.

Countries throughout the world have identified violence as a leading adolescent health concern.<sup>1–3</sup> Recent studies of adolescent populations in Canada,<sup>4,5</sup> Europe,<sup>4,6</sup> the Middle East,<sup>4,7</sup> and the United States<sup>1,4,8</sup> have described the prevalence of bullying, physical fighting, and weapon carrying within individual countries. Several studies have also examined correlates of violent behaviors, including their associations with psychosocial health,<sup>9</sup> substance use,<sup>10</sup> and fighting-related injury.<sup>11</sup> Results from these studies have broadened our knowledge of the global impact that adolescent violence has on public health. Existing international comparisons of youth violence have focused on the frequency of adolescent violence-related behaviors in a small number of countries,<sup>12</sup> comparisons of episodes of school violence and its determinants in Israeli and Arabic student populations,<sup>13</sup> studies of “child soldiers” in countries engaged in civil and international warfare,<sup>14,15</sup> international comparisons of firearm-related mortality,<sup>3</sup> and, as part of more general international comparisons, examinations of firearm regulations and rates of homicide,<sup>3,16,17</sup> robberies and sexual assaults,<sup>17,18</sup> and suicide.<sup>16</sup> Beyond studies of firearms, international comparisons of rates of youth violence are still lacking, and the magnitude and nature of the adolescent violence problem remains unknown for many countries. Cross-national comparisons of violent behaviors in youth have been problematic, because of the use of nonrepresentative samples in many countries and a lack of uniformity in study designs.

Physical fighting and engagement in weapon carrying are common manifestations of interpersonal violence observed in adolescent populations.<sup>1,19</sup>

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Measures for both behaviors have been well developed and standardized for studies involving children.<sup>19,20</sup> Using such indicators, analyses of the US National Longitudinal Study of Adolescent Health have shown that group fighting, fighting with strangers, and weapon use all lead directly to elevated risks for fighting-related injury.<sup>11</sup> Furthermore, these measures might also be considered as markers for a more complex behavioral syndrome of "multiple-problem"<sup>21</sup> or "multiple-risk"<sup>22</sup> behavior. This syndrome may lead to a variety of adverse health problems (eg, depression, somatic health complaints, trauma) that go beyond injuries experienced as a result of physical fights.

The Health Behaviour in School-Aged Children (HBSC) survey, a World Health Organization collaborative cross-national study, provides a unique opportunity to compare adolescent experiences with violence and their consequences across countries. The HBSC survey was initiated by researchers in 3 European countries in 1982. Since 1985, surveys have been conducted at 4-year intervals in a growing number of countries under the auspices of the World Health Organization Regional Office for Europe. Membership is by application to a multicountry committee, and new teams are accepted based on their perceived abilities to adhere to an accepted survey protocol. In 2002 the survey was expanded to 35 countries, mainly from continental Europe, the Middle East, and North America.<sup>23,24</sup>

The HBSC survey contains a set of measures that provide a valid representation of the health and lifestyle of adolescents in industrialized countries.<sup>24</sup> Measures, sampling, and data collection were designed to be common across countries.<sup>4</sup> The current analysis uses the HBSC survey to compare recent estimates of the prevalence of physical fighting and weapon carrying among adolescents across countries and uses standard measures and methods. Separate analyses are presented for boys and girls. The consistency of relationships cross-nationally between physical fighting and weapon carrying with the occurrence of 3 standard indicators of medically treated injury are also explored. The ability to generate meaningful international comparisons is a major strength of the HBSC survey, and this cross-national analysis provides a useful first look at the problem of adolescent violence in a select number of countries.

## METHODS

### Study Population and Procedures

School-based anonymous surveys were conducted during the 2001/2002 academic year according to the common HBSC research protocol.<sup>24</sup> National research teams were initially asked to survey schools to produce national or regional estimates for 11-, 13-, and 15-year-old children. Classes within schools were then selected by using a weighted probability technique to ensure that students were equally likely to be included. In some countries, regional geography and other salient demographic factors (eg, religion, language of instruction) were taken into consideration via stratification or restriction. Statistical criteria specify that samples submitted for international comparisons were sufficient to provide confidence intervals of  $\pm 3\%$  for representative estimates with sample design effects no more than 1.4 times greater than would be obtained from a simple random sample.

A limitation of the HBSC survey is that information necessary to calculate meaningful response rates at administrative-participant (eg, school board, school) then student-participant levels were not documented consistently in all countries. At the student-participant level, known response rates among countries varied from 64.5% to 91.2%.<sup>25</sup>

Each participating country obtained approval to conduct the survey from the ethics review board or equivalent regulatory body associated with the institution conducting each respective national survey.

### Primary Measures

The survey contained 120 mandatory questions about health behaviors, lifestyle factors, and demographic characteristics that were asked of all survey participants ( $n = 161\,082$ ). Additional optional injury and violence items were assessed in a more limited number of countries. Injury and violence items used in the present analysis are described below. (Note that results in Israel are based on approximately one half of the pool of respondents. Israel used a split-sample approach in which half of the participants were asked mandatory items plus optional questions about violence and injuries, and the other half of the participants were asked mandatory items plus optional questions about different health topics.)

#### *Injury*

Participants were asked to report the frequency of injury events during the past 12 months that required medical attention from a doctor or a nurse (mandatory item). An optional injury item assessed in 8 countries ( $n = 29\,183$ ) described the source of medical care for the 1 most serious injury reported. Wording of these questions and the response categories were based on surveillance efforts in the United States<sup>26,27</sup> and responses obtained during previous surveys.<sup>23,28</sup>

#### *Physical Fighting*

Participants were asked to report how frequently they had been involved in a physical fight during the past 12 months (mandatory item) and with whom they fought the last time they were involved (9 countries,  $n = 37\,571$ ). Frequency of fighting is a validated construct with extensive use in American and other youth risk-behavior surveys.<sup>20</sup>

#### *Weapon Carrying*

Weapon carrying is also a well-developed measure of violent behavior.<sup>3,19</sup> In 2 optional items assessed in 7 countries, participants ( $n = 24\,750$ ) were asked to report (1) on how many of the past 30 days they had carried a weapon such as a gun, knife, or club and (2) the type of weapon carried the last time they recalled carrying a weapon.

### Statistical Analysis

Data analyses were initially conducted with SPSS 12 (SPSS Inc, Chicago, IL). A conservative design effect of 1.2 was used in the inflation of SE estimates to account for the cluster-based sampling.<sup>4</sup> Descriptive analyses were conducted for each country to obtain the prevalence of physical fighting and weapon carrying by gender, and these factors were ranked and described cross-nationally. Among countries reporting fighting and weapon carrying, estimates were developed to describe with whom adolescents were fighting and the types of weapons carried within individual countries. An etiologic analysis then addressed risks for injury associated with a lifestyle that included engagement in physical violence. Multiple logistic-regression analyses were used to assess differences in risk for 3 general injury outcomes (medically treated, repeat [ $>1$ ], and hospitalized injury) among groups defined by levels of fighting and weapon carrying. To examine consistency of associations, these analyses were performed within countries but were restricted to the countries that assessed the requisite optional survey items. Variables that had been identified as potential confounders of violence-injury associations (age,<sup>25,29</sup> gender,<sup>29,30</sup> poverty,<sup>29,30</sup> time spent out with friends,<sup>31</sup> and average weekly physical activity<sup>30,32</sup>) were included as covariates in the statistical models. Because the focus of these etiologic analyses was on the consistency of associations between measures of vio-

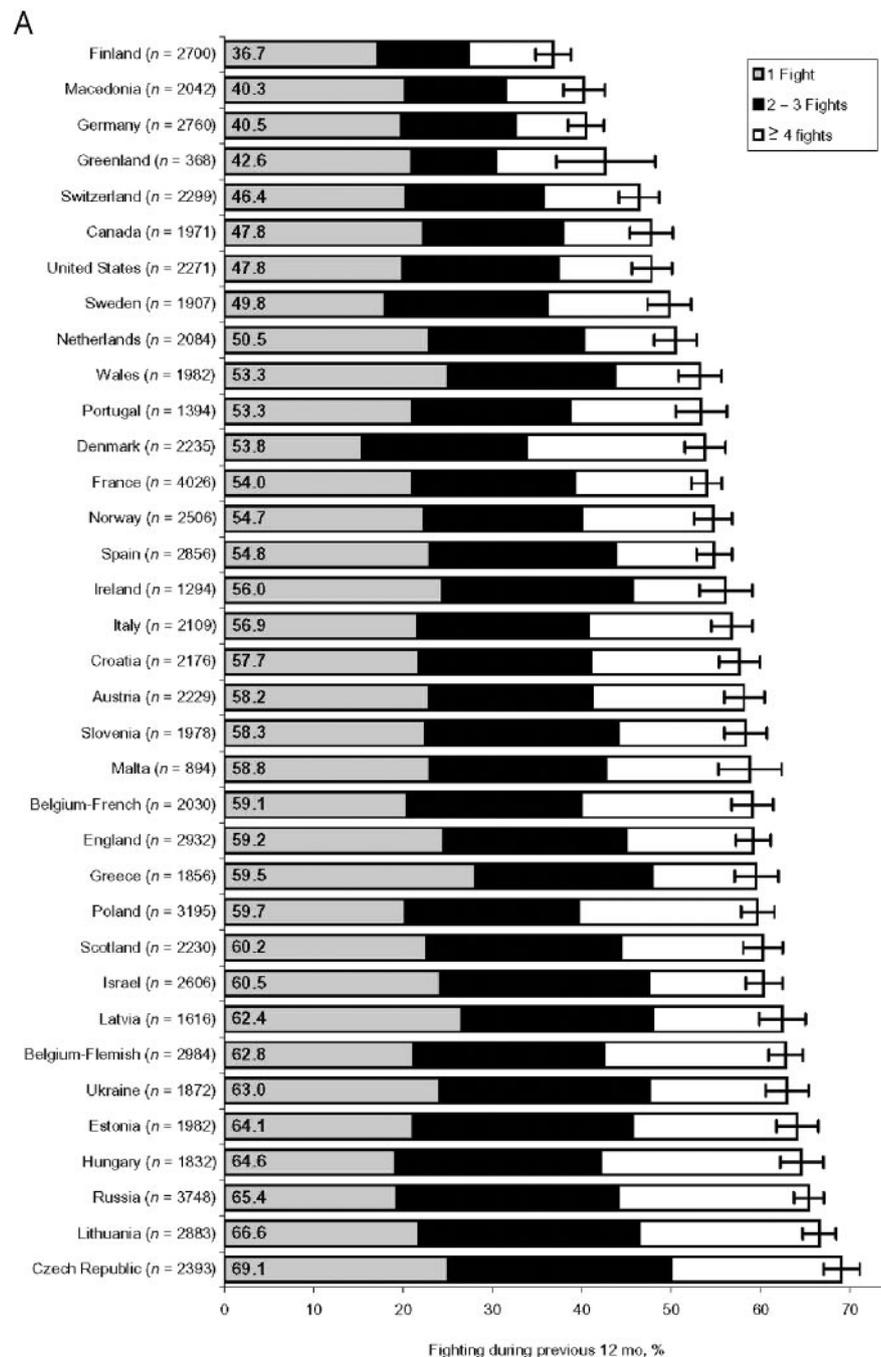
lence and injury, inferences were based on observed patterns of odds ratios (ORs) (eg, presence of an apparent gradient in risk) and not solely on the statistical significance of the etiologic findings.

## RESULTS

Children (161 082) in 35 countries participated in the 2001/2002 HBSC survey and answered the mandatory survey items; of these, 39 953 children in 9 countries responded to the optional questions about physical fighting, 24 750 children in 7 countries responded to the optional weapon-carrying items, and 29 183 children in 8 countries responded to optional questions about medically treated injury.

Involvement of the boys in physical fighting during the previous year ranged from 37% in Finland to 69% in the Czech Republic (Fig 1A), with an

overall average of 58%. Among girls, the prevalence of physical fighting ranged from 13% in Finland to 32% in Hungary (Fig 1B), with an overall average of 24%. The majority of countries reporting the highest rates of fighting by boys were from Eastern or Central Europe. In terms of their country ranking, reported rates of fighting by girls in some of these same countries (eg, Poland, Ukraine, Latvia) were quite low. Differences in the prevalence of physical fighting between countries were mainly attributable to the proportions of youth reporting fighting on multiple (>1) occasions. Across the 9 countries collecting optional data about physical fighting, youth most often reported fighting with friends or relatives, although there were strong cross-national differences in the participants involved in these physical fights



**Fig 1.** A, Boys' self-reported prevalence of physical fighting in 35 countries during the 12 months before the 2001/2002 HBSC survey. B, Girls' self-reported prevalence of physical fighting in 35 countries during the 12 months before the 2001/2002 HBSC survey. Error bars represent 95% confidence intervals.

(Table 1). Involvement in physical fights with total strangers varied from 16% (Canada) to 53% (Macedonia) of the boys and 5% (Estonia) to 16% (Macedonia) of the girls.

Involvement in weapon carrying in the last 30 days ranged from 10% (Belgium-French) to 22% (United States) of the boys and 2% (Portugal) to 5% (United States) of the girls (Table 2). The types of weapons being carried varied strikingly by country, although knives were the leading weapons reported everywhere (Table 3). Among youth reporting weapon carrying, those carrying handguns or other firearms ranged from 7% (Belgium-French, Estonia) to 22% (United States) of the boys.

In nearly all countries that provided optional data, both physical fighting (Table 4) and weapon carrying (Table 5) were consistently and strongly associated

with risks for the occurrence of medically treated, repeat (multiple), and hospitalized injuries during the previous 12 months. To illustrate, youth reporting  $\geq 4$  fights during the previous year experienced risks for hospitalized injury that ranged from 2 to 10 times those of youth reporting no physical fights. "Ever" versus "never" fighting was an important risk factor (as indicated by the increased risk for all types of injury associated with reporting at least 1 fight; Table 4). There also seemed to be gradients in risk for injury according to the frequency of fighting in some countries, as inferred from visual inspection of OR point estimates (Table 4) and tests for linear trends in ORs (data not shown). Similar types of associations were evident for ORs describing relationships between weapon carrying and hospitalized injury in Israel and the United States (Table 5).

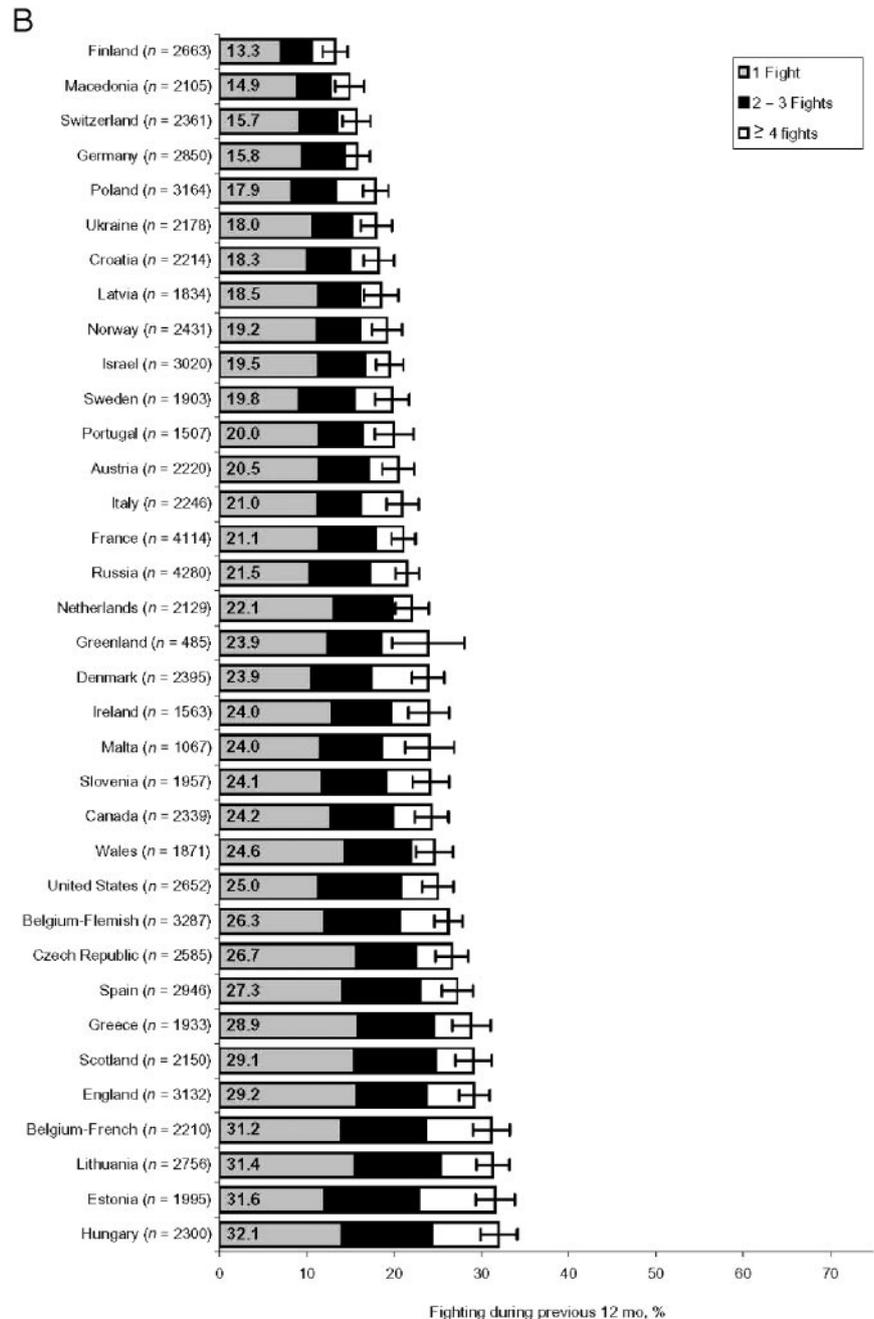


Fig 1. Continued

**TABLE 1.** Specified Person With Whom Respondents Fought During Their Most Recent Physical Fight (Among Adolescents Reporting  $\geq 1$  Fights During Past 12 Months) According to Gender and Country

Person Fighting With	Belgium-French		Canada		Estonia		Israel*		Latvia		Macedonia		Poland		Portugal		United States	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Boys, <i>n</i>	1050		608		972		501		582		484		1729		540		790	
Friend/someone known	55.0	1.7	68.1	2.1	40.2	1.3	36.7	2.4	37.1	2.2	28.1	2.2	55.8	1.3	63.1	2.3	58.7	1.9
Total stranger	22.6	1.4	15.5	1.6	19.5	1.2	23.0	2.1	33.7	2.1	52.5	2.5	27.6	1.2	23.9	2.0	16.2	1.4
Brother or sister	18.8	1.3	21.5	1.8	21.6	1.3	11.4	1.6	14.6	1.6	13.2	1.7	14.2	0.9	10.0	1.4	19.6	1.5
Boyfriend/girlfriend/date	2.5	0.5	2.0	0.6	16.7	1.2	23.8	2.1	13.1	1.5	3.3	0.9	1.4	0.3	1.9	0.6	2.2	0.6
Parent/adult family member	1.2	0.4	1.5	0.5	2.0	0.5	5.2	1.1	1.5	0.6	2.9	0.8	1.1	0.3	1.1	0.5	3.3	0.7
Girls, <i>n</i>	588		440		560		227		210		180		522		195		483	
Friend/someone known	47.3	2.3	42.5	2.6	19.3	1.8	35.2	3.5	30.5	3.5	37.2	3.9	36.0	2.3	59.5	3.9	48.2	2.5
Total stranger	9.9	1.3	7.3	1.4	4.8	1.0	10.1	2.2	10.0	2.3	16.1	3.0	8.6	1.3	10.3	2.4	7.0	1.3
Brother or sister	37.1	2.2	43.4	2.6	58.6	2.3	27.8	3.3	40.0	3.7	37.8	4.0	50.0	2.4	23.6	3.3	35.8	2.4
Boyfriend/girlfriend/date	4.8	1.0	3.9	1.0	14.6	1.6	23.3	3.1	17.1	2.8	3.9	1.6	3.3	0.9	3.6	1.5	4.1	1.0
Parent/adult family member	1.0	0.5	3.0	0.9	2.7	0.7	3.5	1.3	2.4	1.2	5.0	1.8	2.1	0.7	3.1	1.4	4.8	1.1

\* Israel used a split-sampling technique in their survey administration; hence, only a subsample of students were available for analysis here.

**TABLE 2.** Prevalence of Weapon Carrying in the Last 30 Days Among Adolescents According to Gender and Country

Weapon Carrying	Belgium-French		Estonia		Israel*		Latvia		Macedonia		Portugal		United States	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Boys, <i>n</i>	1282		1972		1256		1546		2038		1396		2267	
Did not carry	89.5	0.9	83.1	0.9	81.4	1.2	85.8	1.0	84.5	0.9	82.3	1.1	78.2	0.9
1 d	4.4	0.6	5.4	0.6	6.7	0.8	6.7	0.7	6.8	0.6	7.2	0.8	6.0	0.5
2-3 d	1.0	0.3	3.9	0.5	4.1	0.6	2.5	0.4	3.4	0.4	2.9	0.5	6.1	0.6
$\geq 4$ d	5.1	0.7	7.7	0.7	7.8	0.8	5.0	0.6	5.3	0.5	7.6	0.8	9.7	0.7
Girls, <i>n</i>	1459		1996		1516		1758		2101		1507		2656	
Did not carry	96.8	0.5	96.8	0.4	96.6	0.5	96.8	0.5	97.4	0.4	97.7	0.4	94.7	0.5
1 d	1.2	0.3	1.1	0.3	1.3	0.3	1.9	0.4	1.7	0.3	1.1	0.3	2.3	0.3
2-3 d	0.4	0.2	0.7	0.2	0.9	0.3	0.5	0.2	0.5	0.2	0.4	0.2	1.0	0.2
$\geq 4$ d	1.6	0.4	1.4	0.3	1.3	0.3	0.8	0.2	0.4	0.2	0.9	0.3	2.0	0.3

\* Israel used a split-sampling technique in their survey administration; hence, only a subsample of students were available for analysis here.

**TABLE 3.** Types of Weapons Carried Among Adolescents Reporting Weapon Carrying in the Last 30 Days According to Gender and Country

Weapon Type Carried	Belgium-French		Estonia		Israel*		Latvia		Macedonia		Portugal		United States	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Boys, <i>n</i>	124		331		200		191		263		230		403	
Knife or pocket knife	67.7	4.6	48.9	3.0	46.0	3.9	52.9	4.0	29.3	3.1	51.7	3.6	54.6	2.7
Handgun or other firearm	6.5	2.4	6.6	1.5	10.5	2.4	13.6	2.7	17.1	2.5	14.3	2.5	22.1	2.3
Stick or club	4.8	2.1	13.9	2.1	14.5	2.7	17.3	3.0	20.2	2.7	9.1	2.1	6.9	1.4
Brass knuckles	9.7	2.9	18.4	2.3	14.0	2.7	8.9	2.3	12.9	2.3	5.2	1.6	5.0	1.2
Tear gas/pepper spray/mace	2.4	1.5	9.7	1.8	6.0	1.8	2.6	1.3	3.0	1.2	3.5	1.3	2.5	0.8
Other/unspecified type	8.9	2.8	2.4	0.9	9.0	2.2	4.7	1.7	17.5	2.6	16.1	2.7	8.9	1.6
Girls, <i>n</i>	37		60		40		49		44		30		119	
Knife or pocket knife	54.1	9.0	55.0	7.0	50.0	8.7	57.1	7.7	34.1	7.8	66.7	9.4	59.7	4.9
Handgun or other firearm	10.8	5.6	3.3	2.5	7.5	4.6	6.1	3.8	9.1	4.7	3.3	3.6	10.9	3.1
Stick or club	0.0		8.3	3.9	7.5	4.6	10.2	4.7	29.5	7.5	3.3	3.6	5.0	2.2
Brass knuckles	10.8	5.6	1.7	1.8	5.0	3.8	0.0		9.1	4.7	6.7	5.0	5.9	2.4
Tear gas/Pepper spray/Mace	0.0		28.3	6.4	30.0	7.9	20.4	6.3	4.5	3.4	6.7	5.0	5.9	2.4
Other/unspecified type	24.3	7.7	3.3	2.5	0.0		6.1	3.8	13.6	5.7	13.3	6.8	12.6	3.3

\* Israel used a split-sampling technique in their survey administration; hence, only a subsample of students were available for analysis here.

## DISCUSSION

This study represents one of the first contemporary efforts to document the prevalence and nature of fighting and weapon carrying among adolescents cross-nationally by using standard measures and methods and to relate these violent behaviors to the occurrence of adolescent injury. We observed sub-

stantial differences by gender and country in the overall prevalence of physical fighting and with whom children fought. We also observed cross-national differences in the frequency of weapon carrying and the types of weapons carried by adolescents. Despite these differences, associations between physical fighting and the occurrence of injury were con-

**TABLE 4.** Associations Between Frequency of Physical Fighting in the Past 12 Months and the Occurrence of Adolescent Injury According to Country

	Belgium-French	Canada	Estonia	Israel	Latvia	Macedonia	Poland	Portugal	United States
<b>All injuries</b>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Did not fight	1.86 (1.49, 2.31)	1.77 (1.44, 2.19)	1.29 (1.03, 1.63)	1.64 (1.35, 2.00)	1.63 (1.29, 2.07)	2.10 (1.66, 2.67)	1.10 (0.89, 1.35)	1.58 (1.21, 2.06)	2.09 (1.69, 2.57)
1 time	2.06 (1.63, 2.62)	2.18 (1.67, 2.83)	1.37 (1.09, 1.72)	2.06 (1.63, 2.61)	2.64 (1.98, 3.52)	4.27 (3.13, 5.83)	1.17 (0.94, 1.45)	2.41 (1.73, 3.36)	2.44 (1.93, 3.08)
2-3 fights	2.01 (1.57, 2.59)	2.05 (1.48, 2.83)	1.86 (1.46, 2.38)	2.23 (1.63, 3.04)	2.51 (1.78, 3.54)	2.58 (1.79, 3.73)	1.43 (1.15, 1.77)	1.93 (1.35, 2.77)	2.11 (1.56, 2.85)
<b>Repeat injuries</b>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Did not fight	1.88 (1.4, 2.53)	1.83 (1.47, 2.28)	1.40 (1.02, 1.92)	2.02 (1.63, 2.51)	1.46 (1.08, 1.98)	1.91 (1.35, 2.72)	1.44 (1.03, 2.00)	1.69 (1.23, 2.32)	1.69 (1.35, 2.12)
1 time	2.43 (1.80, 3.29)	2.44 (1.89, 3.16)	1.74 (1.29, 2.35)	2.52 (1.99, 3.20)	2.86 (2.08, 3.93)	4.58 (3.15, 6.66)	1.91 (1.38, 2.65)	2.60 (1.82, 3.70)	2.68 (2.13, 3.38)
2-3 fights	2.76 (2.03, 3.75)	2.64 (1.93, 3.61)	2.33 (1.71, 3.17)	3.48 (2.59, 4.68)	3.78 (2.63, 5.45)	4.01 (2.55, 6.30)	2.30 (1.67, 3.16)	3.28 (2.24, 4.81)	2.60 (1.93, 3.50)
<b>Hospitalized injuries</b>	1.00	1.00	1.00	1.00*	1.00	+	1.00	+	1.00†
Did not fight	1.86 (1.24, 2.78)	1.88 (1.10, 3.21)	1.09 (0.72, 1.66)	1.86 (0.94, 3.71)	1.72 (0.98, 3.04)		0.92 (0.60, 1.42)		1.77 (0.48, 6.51)
1 time	2.17 (1.43, 3.30)	2.40 (1.35, 4.26)	1.34 (0.91, 1.99)	2.34 (1.09, 5.03)	3.48 (1.94, 6.24)		1.13 (0.73, 1.73)		5.23 (1.93, 14.15)
2-3 fights	1.57 (0.98, 2.52)	2.86 (1.54, 5.33)	1.83 (1.24, 2.72)	2.57 (1.06, 6.24)	3.61 (1.90, 6.88)		1.69 (1.14, 2.50)		10.43 (3.58, 30.44)

Values shown are ORs (95% confidence limits). ORs were adjusted for age, gender, poverty, time spent with friends, and average weekly physical activity (except in Belgium-French, which did not ask about the physical activity items).

\* Israel used a split-sampling technique in their survey administration; hence, only a subsample of students were available for analysis here.

† Data not available.

‡ Includes only ≥15-year-old children.

sistent across countries. This finding suggests that the acute health consequences of engaging in a violent lifestyle are somewhat universal and involve health consequences that include traumatic injury.

Physical fighting is the most common manifestation of interpersonal violence in adolescence.<sup>1</sup> Although researchers have documented fighting as an obvious and direct cause of adolescent injury,<sup>11</sup> our results support the idea that fighting is a marker for a lifestyle that has inherent injury risks for both boys and girls. In the past, a lifestyle that includes fighting has been described as a behavioral syndrome that can include substance use, truancy, and other problem behaviors during adolescence.<sup>21,22</sup> Because it is highly visible and often results in contact with health professionals, researchers have proposed fighting behavior as one of the earliest and most reliable markers of this multiple-risk-behavior syndrome.<sup>33</sup>

Differences in rates of fighting between countries likely reflect underlying cultural differences in the acceptance of violence within different societies.<sup>34</sup> To illustrate, in a war-torn country, fighting may be viewed as a normative behavior that is observed on a daily basis as an inherent part of basic survival.<sup>3</sup> Despite the variation observed cross-nationally, males in all countries were much more likely to fight than girls, which is consistent with the findings of others.<sup>1-3</sup> This finding may also indicate cultural acceptance of more overt forms of aggression as normative male behavior. Existing research suggests that boys are much more likely to become involved in physical fights, whereas girls are much more likely to engage in covert or relational forms of emotional aggression.<sup>35,36</sup>

Differences observed in the context of physical fights by gender suggest that girls are most likely to fight within intimate relationships. Although boys also fight in such contexts, they were much more likely to fight with total strangers. This finding may reflect boys' extrinsic tendencies to engage in group and community activities including organized sports, as well as (more speculatively) one of many possible intrinsic effects of hormonal (androgenic) differences associated with early male maturation.<sup>37</sup>

In all countries studied, the vast majority of children did not report any weapon carrying in the last 30 days. Observed differences in weapon carrying by gender may reflect the number and type of aggressive encounters that boys and girls experience. Knives seem to be the common weapon of choice. Although one cannot infer the intentions of individual children from the weapon-carrying reports, boys more often carry weapons associated with proactive aggression (eg, guns, sticks or clubs, brass knuckles), whereas girls more often carry weapons for defensive purposes (eg, mace, pepper spray, tear gas). International differences in the types of weapons carried may reflect accessibility to and/or cultural acceptance of different types of weapons. For example, the relatively high rate of handgun carrying by boys in some countries reflects the relative ease of access to firearms in these countries.<sup>38</sup>

Consistent with others,<sup>39</sup> our findings show that both physical fighting and weapon carrying are in-

**TABLE 5.** Associations Between Frequency of Weapon Carrying in the Last 30 Days and the Occurrence of Adolescent Injury, by Country

	Belgium-French	Estonia	Israel*	Latvia	Macedonia	Portugal	United States
All injuries							
Did not carry	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1 d	2.09 (1.14, 3.81)	1.79 (1.16, 2.76)	1.74 (0.91, 3.35)	1.32 (0.85, 2.07)	2.01 (1.34, 3.02)	1.43 (0.87, 2.35)	2.20 (1.48, 3.26)
≥2 d	1.81 (1.11, 2.97)	1.29 (0.95, 1.77)	1.92 (1.19, 3.09)	1.60 (1.03, 2.50)	2.10 (1.43, 3.07)	1.93 (1.24, 3.00)	1.88 (1.43, 2.49)
Repeat injuries							
Did not carry	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1 d	1.63 (0.80, 3.33)	1.84 (1.11, 3.04)	1.55 (0.84, 2.85)	1.63 (1.01, 2.63)	0.95 (0.50, 1.79)	1.35 (0.80, 2.27)	2.20 (1.52, 3.18)
≥2 d	2.20 (1.27, 3.80)	1.78 (1.24, 2.57)	2.20 (1.41, 3.44)	2.26 (1.45, 3.54)	2.59 (1.64, 4.08)	2.09 (1.36, 3.23)	2.14 (1.64, 2.80)
Hospitalized injuries							
Did not carry	1.00	1.00	1.00*	1.00	†	†	1.00‡
1 d	1.73 (0.69, 4.34)	1.60 (0.85, 2.99)	1.77 (0.51, 6.20)	2.47 (1.19, 5.10)			3.15 (0.50, 19.75)
≥2 d	1.26 (0.55, 2.89)	0.94 (0.55, 1.59)	4.75 (2.31, 9.76)	1.77 (0.77, 4.08)			8.48 (3.44, 20.91)

Values shown are adjusted ORs (95% confidence limits). ORs were adjusted for age, gender, poverty, time spent with friends, and average weekly physical activity (except in Belgium-French, which did not ask about the physical activity items).

\* Israel used a split-sampling technique in their survey administration; hence, only a subsample of students were available for analysis here.

† Data not available.

‡ Includes only ≥15-year-old children.

dicative of a violent lifestyle that has individual and family-related health consequences. We examined 3 common forms of injury, and similar etiologic findings emerged. Risks for the first 2 forms of injury examined (medically treated and repeat injuries) indicated that “ever” engaging in fighting was the most salient risk factor, whereas a stronger risk gradient was observed between the frequency of fighting and hospitalized injury occurrence. Similarly, we did not observe a gradient in risk for injury by frequency of weapon carrying, and “ever” versus “never” engaging in weapon carrying seems to have more etiologic significance.

Limitations of this analysis include our use of self-reported data and the cross-sectional nature of the survey. The HBSC questionnaire items have been subjected to extensive piloting and validation efforts,<sup>24</sup> yet the possibility of biased reporting of health risk behaviors motivated by a desire to provide socially desirable responses must also be recognized. Similarly, because these findings are based on classroom samples in selected countries, they will not be representative of adolescents in special or nonclassroom settings. Although the obvious link between physical fighting and fighting injury is established,<sup>11</sup> because of sample-size limitations we were unable to study this association, and the etiologic analyses were limited to more common injury outcomes. Finally, although the rates and trends in the occurrence of violence are thought to be representative of the countries under study, they are less likely to depict the experiences of adolescents in other (eg, war-torn<sup>14,15</sup>) countries. Our study findings are not purported to be representative of the experiences of children globally.

Strengths of this analysis also warrant recognition. These strengths include the size and cross-national nature of our analysis, our use of standard measures and survey procedures, and the anonymous nature of reporting. The latter should promote accuracy in responses. Indeed, our study was one of the largest epidemiologic analyses of its kind, and we believe that the breadth of our cross-national comparisons is unique to the biomedical literature.

Study results inform the research agenda for these important topics in adolescent health. One leading topic to be addressed is the determinants of physical fighting and weapon carrying and how they vary across countries and adolescent cultures. Our findings also provide objective data to inform preventive research initiatives. Fighting may be an early risk factor or a marker for engaging in other forms of violent behavior.<sup>37</sup> In addition, the results suggest that prevention programs should begin early to prevent the potential escalation from fighting to weapon carrying and injury. There are several examples of effective early interventions to reduce aggression involving the family (eg, parent training).<sup>40</sup> Similarly, minimization of violent imagery in the media combined with parent and child review of this imagery promote understanding of the consequences of violence.<sup>41</sup> Integration of media-awareness strategies into school curriculums has proven to be efficacious, and the school environment is an optimal setting for the early detection of aggressive behavior.<sup>42,43</sup> Existing trials demonstrate that programs that emphasize the development of social skills,<sup>44–46</sup> anger management,<sup>44–46</sup> and conflict resolution<sup>47</sup> have also led to decreases in aggression, increases in prosocial behavior,<sup>44</sup> reductions in injuries,<sup>45</sup> and improved adjustment, which are reflected by increases in assertiveness among girls and decreases in physical fighting among boys.<sup>46,47</sup> The latter provide a basis for future interventional work.

## CONCLUSIONS

Physical fighting and weapon carrying are 2 indicators of adolescent violence that are commonly reported by youth across countries. Patterns of fighting and weapon carrying observed by gender and cross-nationally are indicative of cultural trends and norms in the occurrence and perhaps acceptance of violence. Associations of fighting and weapon carrying with injury-related health outcomes are remarkably similar across these same countries. Violence is clearly an important issue affecting the immediate health of adolescents internationally, and this topic

continues to deserve focused interventional research and intentional programming.

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