Non-fatal injuries in three Central and Eastern European urban population samples: the HAPIEE study

Olga Vikhireva[1], Hynek Pikhart[1], Andrzej Pajak[2], Ruzena Kubinova[3], Sofia Malyutina[4], Anne Peasey[1], Roman Topor-Madry[2], Yuri Nikitin[4], Michael Marmot[1], Martin Bobak[1]

Background: Despite high mortality from injuries and accidents, data on rates and distribution of non-fatal injuries in Central and Eastern European populations are scarce. **Methods:** Cross-sectional study of random population samples of 45–69-year-old men and women ($n = 28\,600$) from Novosibirsk (Russia), Krakow (Poland) and six Czech towns, participating in the Health, Alcohol and Psychosocial factors In Eastern Europe (HAPIEE) study. Participants provided information on non-fatal injuries in the past 12 months, socio-economic characteristics, alcohol consumption and other covariates. **Results:** The period prevalence of non-fatal injuries in the last year among Czech, Russian and Polish men was 12.5, 9.4 and 5.3%, respectively; among women, the respective proportions were 9.9, 9.8 and 6.4%. Injury prevalence declined with age in men and increased with age in women. Higher injury prevalence was associated with being unmarried, material deprivation, higher drinking frequency and problem drinking. In the pooled data, the adjusted odds ratio (OR) for the highest versus lowest material deprivation category was 1.57 [95% confidence interval (CI) 1.38–1.79]; for problem drinking, the OR was 1.44 (95% CI 1.23–1.69). Alcohol did not mediate the link between socio-economic status and injury. **Conclusion**: Non-fatal injuries were associated with material deprivation, other socio-economic characteristics and with alcohol. These results not only underscore the universality of the inequality phenomenon, but also suggest that the mediating role of alcohol in social differentials in non-fatal injury remains an unresolved issue.

Keywords: alcohol, Central and Eastern Europe, injury, morbidity, socio-economic position.

Introduction

Injuries are one of the leading preventable causes of death worldwide. In Europe, they are the third most common cause of mortality after cardiovascular disease and cancer, killing nearly 800 000 people per year.[1] In Central and Eastern Europe (CEE) and the former Soviet Union (FSU), injuries account for an even larger proportion of deaths than in Western Europe, as the profound and sometimes turbulent societal transformation has been associated with increases in most types of unintentional injuries and violence.[2] For example, in 2006, Russian mortality from external causes was 5 times higher than in the European Union (EU), and external causes were responsible for 13% of all deaths.[3] However, mortality rates are only the tip of the iceberg of the injury-associated health burden; it has been estimated that for every fatal injury, there are ∼30 hospitalizations and 300 admissions to emergency departments.[1] Despite the burden of injury mortality and morbidity, there is very little information on the rates and distribution of non-fatal injuries in CEE/FSU populations.

In countries with available data, the burden of injury falls disproportionately on people with low socio-economic position (SEP).[1] Although socio-economic inequalities tend to be larger for injury mortality than morbidity, SEP is also an important predictor of a range of non-fatal injury outcomes, and inequalities are more pronounced for more severe non-fatal injuries.[4–7] The link between deprivation and injury occurrence is particularly important for CEE/FSU, where the societal transformation led to large increases in income inequalities,[8,9] in the proportion of people on low incomes,[8,10] and to massive increases in social differentials in mortality, including injury mortality.[11–17] Again, despite these general trends, the evidence on socio-economic inequalities in non-fatal injuries in CEE/FSU remains scarce; in fact, we are not aware of any reports on socio-economic patterns of injury morbidity in the region.

For several reasons, alcohol could be a potentially important determinant of injury in CEE/FSU populations, as well as a possible link between socio-economic conditions and injury. First, most CEE/FSU countries have high per capita consumption of alcohol, a large share of unrecorded alcohol production and the most hazardous drinking patterns.[18–21] Second, injuries account for almost 50% of all alcohol-attributable deaths and ∼44% of the alcohol-attributable disease burden in Europe,[20] and the new EU member states and Russia have substantially higher alcohol-attributable premature mortality than the old EU countries.[21] Third, since problem drinking is usually associated with both low socio-economic status and injuries, it could mediate the relationship between SEP and injuries in CEE/FSU populations.

1 Department of Epidemiology and Public Health, University College London, UK
2 Department of Epidemiology and Population Studies, Jagiellonian University Medical College, Krakow, Poland
3 National Institute of Public Health, Prague, Czech Republic
4 Institute of Internal Medicine, Siberian Branch of the Russian Academy of Medical Sciences, Novosibirsk, Russia
Correspondence: Olga Vikhireva, Department of Epidemiology and Public Health, University College London, 1-19 Torrington Place, London WC1E 6BT, UK. tel: +44 20 7679 1725, fax: +44 20 7813 0280, E-mail: o.vikhireva@public-health.ucl.ac.uk

The aim of this article is to analyse the period prevalence and distribution of non-fatal injuries in three CEE/FSU population samples from Russia, Poland and the Czech Republic. Specifically, we examined (i) the association between non-fatal injuries and several indicators of SEP, (ii) the relationship between non-fatal injuries and alcohol consumption and (iii) the potential mediating role of alcohol in the suspected link between SEP and non-fatal injury.

Methods

Study population and subjects

We used the data from the baseline survey of the Health, Alcohol and Psychosocial factors In Eastern Europe (HAPIEE) study, which were collected in Novosibirsk (Russia), Krakow (Poland) and six Czech towns (Havířov/Karviná, Jihlava, Ústí nad Labem, Liberec, Hradec Králové and Kromìøíz) in 2002–05. The population samples included 45–69-year-old men and women, randomly selected from urban population registers (electoral lists in Russia). A total of 28 947 individuals were recruited (overall response rate 59%), and injury data were available for 28 600 subjects. The methodology is described in detail elsewhere.[22] The study was approved by the University College London/University College London Hospital ethics committee and by the local ethics committee in each participating centre. All participants gave written informed consent.

Measurements

The main outcome variable was self-reported, medically attained non-fatal injury in the previous 12 months. In all three countries, the presence/absence of injuries was ascertained by the following question: 'In the past 12 months, have you been injured or have you had an accident serious enough to contact a doctor?'

A number of SEP indicators were considered: (i) education (primary or less, vocational, secondary and university degree); (ii) marital status (married/cohabiting, single, separated/divorced and widowed); (iii) self-reported economic activity, which we classified into the following categories: working non-pensioners, working pensioners, non-working pensioners, currently unemployed and housewives (women only; the very few men who reported being 'house-persons' were excluded); (iv) the number of household items (microwave, dishwasher, washing machine, colour TV, car, freezer, summer house, satellite TV, video recorder, camcorder, mobile phone, telephone), varying from 0 to 12, was divided into country-specific tertiles, to represent relative deprivation and (v) material deprivation, assessed by three questions about how often the participant's household had difficulties in buying enough food or clothes and paying bills for housing, heating and electricity, with the possible answers 'never', 'rarely', 'sometimes', 'often' or 'all the time', coded as 0–4, summed into a score and categorized into four groups: 0 points (no deprivation), 1–2, 3–5 and 6–12 points (maximal deprivation).

Annual alcohol consumption and drinking patterns, including binge drinking, were estimated on the basis of graduated frequency (GF) questionnaire,[23,24] assessing how often during the past 12 months the subjects drank more than a specific amount of alcohol ($\geq$10; 7–9; 5–6; 3–4; 1–2 and $\sim$0.5 drink; one drink equals $\sim$20 g of ethanol). The frequency was measured on a nine-point scale, from 'never' to 'every day'. Based on the GF responses, we estimated the frequency of drinking ('never'; 'less than once per month'; '1–3 times per month'; 'at least once per week'). In addition, we used the CAGE questionnaire[25] and the questionnaire on the negative consequences of drinking in everyday life,[26] with two or more positive answers taken as presence of drinking-related problems or consequences. The internal consistency and reliability of these drinking measures in the HAPIEE study population were satisfactory.[27]

Statistical analysis

First, we assessed the period prevalence of injuries in the previous 12 months by socio-economic and alcohol consumption indicators, separately by country and gender. Secondly, as the relationship between SEP and injuries was similar across country- and gender-specific strata (no interactions between country and SEP were statistically significant), we pooled the data, and the associations between injuries and SEP characteristics were then analysed by logistic regression. We started with odds ratios (ORs) adjusted for age as a continuous variable, gender and country. These ORs were then additionally controlled for drinking measures, to assess the presence and magnitude of the potential confounding or effect modification affecting the associations of interest. All statistical analyses were done using Stata 10.0 (StataCorp LP, Texas, USA).

Results

Table 1 shows the numbers of subjects and age-adjusted prevalence of non-fatal injury in the last year by socio-economic indicators, drinking frequency and problem drinking. Among men, the injury prevalence ranged from 5.3% in Poland to 12.5% in Czech Republic; among women, it varied from 6.4% in Poland to 9.9% in the Czech Republic. Injury prevalence decreased with age in men and increased in women. It was not consistently linked to education or number of household items, but showed a strong inverse association with deprivation score. Injuries were more common in frequent and problem drinkers in Russia.

Overall, 10 and 14% of men consuming $\geq$100 g of ethanol at least once per month or per week reported injury in the past 12 months, which is $\sim$40 and 60% higher, respectively, than in non-bingers (data not shown). In women, however, the prevalence of binge drinking was too low (<1%) for meaningful analysis. Since binge drinking and negative consequences of drinking in everyday life had similar associations with injury as drinking frequency and CAGE score (data not shown), subsequent analyses focused on the latter two parameters.

The details on the place, mechanism, intention and treatment of injury were available only in Russia and Poland. The period prevalence of injury by the most common categories of these characteristics is presented in table 2. Compared with Polish men, Russian men had higher prevalence of injuries at work and of intentional injuries (a 3- and 11-fold difference, respectively). In women, the differences were generally smaller and proportional to the differences in all-cause injuries between the two samples.

As the associations between injuries, SEP and alcohol characteristics were similar across country- and gender-specific groups, the samples were pooled. The only statistically significant interaction for gender was with economic activity ($P < 0.001$), and this interaction was included in the multivariate models described below. The contribution of alcohol to the socio-economic differences in injuries is shown in table 3. In the pooled data, statistically significant effects were demonstrated for marital status, household items ownership, deprivation and economic activity in

Table 1 Age-standardized injury prevalence, socio-economic parameters and alcohol consumption

| | Czech Republic | | | | Russia | | | | Poland | | | |
| | Men | | Women | | Men | | Women | | Men | | Women | |
	N	Percentage injured (SE)	N	Percentage injured (SE)	N	Percentage injured (SE)	N	Percentage injured (SE)	N	Percentage injured (SE)	N	Percentage injured (SE)
Whole sample	4047	12.5 (0.5)	4670	9.9 (0.4)	4264	9.4 (0.5)	5088	9.8 (0.4)	5124	5.3 (0.3)	5407	6.4 (0.3)
Age group (years)[a]												
<50	639	16.0 (1.5)	837	8.4 (1.0)	679	10.6 (1.2)	915	8.7 (0.9)	897	6.8 (0.8)	1061	5.8 (0.7)
50–54.9	770	15.5 (1.3)	950	9.3 (1.0)	835	9.8 (1.0)	972	7.9 (0.9)	1010	5.8 (0.7)	1163	7.7 (0.8)
55–59.9	796	11.7 (1.1)	856	10.6 (1.0)	916	8.1 (0.9)	1086	9.6 (0.9)	1101	5.1 (0.7)	1111	6.0 (0.9)
60–64.9	893	10.6 (1.0)	1105	9.0 (0.9)	820	10.1 (1.0)	956	10.6 (1.0)	1039	4.5 (0.6)	1051	6.8 (0.8)
≥65	949	9.5 (1.0)	922	12.0 (1.1)	1014	8.6 (0.9)	1159	11.8 (0.9)	1077	4.6 (0.6)	1021	6.0 (0.8)
P for trend		<0.01		0.03		0.26		<0.01		0.01		0.82
Education												
Primary	244	12.7 (2.2)	844	11.3 (1.2)	487	8.5 (1.7)	490	6.8 (1.4)	486	6.2 (1.1)	731	6.1 (1.0)
Vocational	1773	12.1 (0.8)	1451	10.7 (0.8)	927	10.9 (1.0)	1553	10.4 (0.8)	1413	4.3 (0.6)	814	5.2 (0.8)
Secondary	1273	12.9 (1.0)	1893	8.7 (0.7)	1492	9.6 (0.8)	1706	9.1 (0.7)	1679	5.2 (0.5)	2393	6.4 (0.5)
University	732	13.0 (1.2)	463	10.7 (1.5)	1358	9.1 (0.8)	1339	10.9 (0.9)	1543	5.9 (0.6)	1463	7.6 (0.7)
P for trend		0.38		0.32		0.86		0.14		0.43		0.05
Marital status												
Single	118	13.0 (3.1)	110	16.8 (3.6)	112	14.2 (3.3)	239	14.4 (2.4)	209	8.0 (1.8)	384	6.8 (1.4)
Married	3392	12.2 (0.6)	3179	8.6 (0.5)	3743	9.0 (0.5)	3021	9.2 (0.6)	4420	5.0 (0.4)	3583	6.3 (0.4)
Divorced	389	14.5 (1.8)	702	12.2 (1.3)	238	12.3 (2.2)	739	11.4 (1.2)	288	8.5 (1.6)	500	8.0 (1.2)
Widowed	131	8.1 (2.5)	663	11.7 (1.4)	171	12.8 (4.4)	1089	9.5 (1.1)	193	5.4 (1.9)	929	6.0 (0.9)
P for heterogeneity		0.37		<0.01		0.10		0.33		0.01		0.64
Economic activity												
Working	1997	13.3 (1.2)	1,840	6.1 (0.9)	1713	16.4 (3.3)	1547	21.5 (4.7)	2088	5.6 (0.8)	1795	4.9 (0.6)
Working pensioners	327	6.3 (1.3)	355	15.0 (4.5)	902	7.5 (1.1)	826	8.6 (0.9)	394	3.9 (0.9)	302	8.9 (2.4)
Non-working pensioners	1543	9.2 (1.4)	2260	11.0 (1.3)	1412	8.6 (1.1)	2478	9.5 (1.0)	2323	5.4 (0.8)	2910	6.0 (0.5)
Housewives	N/A	N/A	50	11.5 (4.8)	N/A	N/A	96	1.8 (0.8)	N/A	N/A	154	3.8 (1.7)
Currently unemployed	128	12.6 (2.2)	123	8.9 (2.1)	236	27.8 (1.3)	141	4.6 (1.1)	306	5.8 (1.6)	234	4.2 (1.6)
P for heterogeneity		0.88		0.05		0.57		0.50		0.86		0.65
Household items number												
Top tertile	1693	11.7 (0.8)	1561	7.7 (0.7)	1690	8.9 (0.8)	1464	8.7 (0.8)	1963	4.6 (0.5)	1485	6.6 (0.8)
Middle tertile	1142	12.8 (1.0)	1383	9.6 (0.8)	1443	10.0 (0.8)	1701	9.5 (0.7)	1609	5.9 (0.6)	1668	6.1 (0.6)
Bottom tertile	925	13.7 (1.2)	1400	11.1 (0.9)	1099	10.1 (1.0)	1909	10.9 (0.8)	1476	6.0 (0.7)	2156	6.7 (0.6)
P for trend		0.17		0.01		0.32		0.04		0.08		0.57
Deprivation score												
0 (min)	2174	11.3 (0.7)	2089	8.5 (0.6)	1596	8.5 (0.7)	1016	8.8 (0.9)	2654	4.1 (0.4)	2282	5.6 (0.5)
1–2	884	12.0 (1.1)	1205	8.3 (0.8)	656	10.0 (1.2)	737	9.4 (1.1)	803	6.1 (0.8)	905	5.9 (0.8)
3–5	628	14.0 (1.4)	823	11.8 (1.1)	885	9.0 (1.0)	1350	9.3 (0.8)	816	6.2 (0.8)	1020	6.3 (0.8)
6–12 (max)	292	16.5 (2.1)	477	15.6 (1.7)	1125	10.9 (1.0)	1985	11.0 (0.7)	796	7.3 (0.9)	1143	8.3 (0.8)
P for trend		<0.01		<0.01		0.07		0.04		<0.01		<0.01
Drinking frequency												
Never	262	9.8 (1.8)	826	10.8 (1.2)	573	5.5 (1.0)	910	9.4 (1.0)	1103	4.8 (0.7)	2478	6.0 (0.5)
<1/month	667	10.7 (1.2)	1474	9.0 (0.8)	754	8.3 (1.0)	2823	9.1 (0.6)	990	4.6 (0.7)	1473	6.5 (0.7)
1–3/month	692	11.5 (1.2)	1069	10.0 (0.9)	1031	9.4 (0.9)	959	11.3 (1.1)	1183	5.1 (0.6)	890	7.4 (1.0)
≥1/week	2319	13.1 (0.7)	1111	10.5 (1.0)	1905	10.8 (0.7)	396	14.5 (2.2)	1818	6.1 (0.6)	541	7.2 (1.2)
P for trend		0.15		0.76		<0.01		0.01		0.08		0.10
CAGE score ≥2												
No	3534	11.9 (0.5)	4298	9.8 (0.5)	3447	8.7 (0.5)	5015	9.7 (0.4)	4011	4.8 (0.3)	3908	6.2 (0.4)
Yes	360	17.0 (2.0)	92	12.7 (3.6)	816	12.3 (1.2)	73	16.1 (7.5)	455	9.4 (1.5)	51	18.4 (5.1)
P for heterogeneity		0.01		0.05		<0.01		0.34		<0.01		<0.01

SE – standard error

a: For age, non-standardized prevalence is reported

models controlling for age, gender and country. Additional controlling for drinking frequency or problem drinking did not change substantially the estimated effects of socio-economic factors.

Table 4 shows the final model of SEP and alcohol effects on injury prevalence in the pooled data. After controlling for all variables analysed, being unmarried, possessing fewer household items, higher education and frequent and problem drinking were all associated with being injured in the last year. In further analyses, body mass index, smoking status and time spent on physical activity were not associated with all-cause injuries in our sample (data not shown).

Discussion

In these large urban population samples from three former communist countries, we found relatively large differences in 12-month rates of non-fatal injuries, with the lowest levels observed in Poland and the highest in the Czech Republic. Although, due to the outcome definition (see below), these figures may not be strictly comparable across countries, they provide an order of magnitude estimate. Within populations, where the prevalence should be much more comparable, injuries were associated with several socio-economic characteristics. Somewhat surprisingly, alcohol,

Table 2 Age-adjusted period prevalence of injuries by place, mechanism, intention and medical treatment in Russian and Polish participants

	Men				Women			
	Russian (*N* = 4264)		Polish (*N* = 5124)		Russian (*N* = 5088)		Polish (*N* = 5407)	
	Injured		Injured		Injured		Injured	
	N	Per 1000	*N*	Per 1000	*N*	Per 1000	*N*	Per 1000
All injuries	398	94.0	266	53.3	499	97.8	349	64.4
Injury place								
Home	82	19.8	73	14.7	137	26.9	99	18.4
Work	75	18.1	32	6.4	37	7.3	32	5.5
Other/unknown	241	56.6	161	32.2	325	63.7	218	40.1
Injury mechanism								
Fall	197	45.9	141	28.1	350	68.4	222	42.1
Traffic	22	5.1	28	21.1	26	5.1	22	16.4
Other/unknown	181	43.5	97	19.7	123	24.3	105	17.3
Injury intention								
Unintentional	352	83.6	252	50.1	465	91.2	314	58.6
Intentional	28	6.7	3	0.6	14	2.7	11	2.0
Other/unknown	18	4.2	11	2.9	20	4.1	24	1.8
Injury treatment								
Hospital	83	19.4	51	10.3	46	9.0	40	7.6
Out-patient	250	59.8	185	36.9	343	67.1	258	47.9
No treatment required/other/unknown	65	15.2	31	9.6	110	21.7	51	9.7

Table 3 Associations between all-cause injuries, socio-economic parameters and alcohol consumption characteristics: adjusted ORs and 95% CIs

	OR (95% CI)		
	Model 1[a]	Model 2[b]	Model 3[c]
Education			
Primary	0.86 (0.74–1.01)	0.89 (0.76–1.04)	0.82 (0.70–0.96)
Vocational	0.93 (0.83–1.04)	0.93 (0.83–1.05)	0.94 (0.83–1.05)
Secondary	0.88 (0.79–0.99)	0.89 (0.80–1.00)	0.88 (0.79–0.99)
University	1.00	1.00	1.00
P for trend	0.12	0.20	0.07
Marital status			
Married	1.00	1.00	1.00
Single	1.59 (1.31–1.92)	1.62 (1.34–1.96)	1.65 (1.35–2.01)
Divorced	1.39 (1.22–1.58)	1.40 (1.23–1.59)	1.36 (1.19–1.55)
Widowed	1.21 (1.06–1.39)	1.22 (1.06–1.40)	1.22 (1.06–1.41)
Household items number			
Top tertile	1.00	1.00	1.00
Middle tertile	1.14 (1.03–1.27)	1.16 (1.05–1.29)	1.16 (1.04–1.29)
Bottom tertile	1.27 (1.14–1.41)	1.30 (1.17–1.45)	1.28 (1.14–1.43)
P for trend	<0.01	<0.01	<0.01
Deprivation score			
0 (min)	1.00	1.00	1.00
1–2	1.12 (0.99–1.26)	1.13 (1.00–1.27)	1.12 (0.99–1.27)
3–5	1.26 (1.12–1.41)	1.26 (1.12–1.42)	1.26 (1.11–1.42)
6–12 (max.)	1.58 (1.41–1.77)	1.60 (1.43–1.80)	1.57 (1.39–1.76)
P for trend	<0.01	<0.01	<0.01
Economic activity[d]			
Men			
Working	1.00	1.00	1.00
Working pensioners	0.80 (0.63–1.00)	0.80 (0.63–1.01)	0.78 (0.62–1.00)
Non-working pensioners	0.78 (0.65–0.94)	0.83 (0.69–0.99)	0.82 (0.68–0.99)
Currently unemployed	1.29 (1.00–1.67)	1.31 (1.02–1.69)	1.23 (0.94–1.60)
Women			
Working	1.00	1.00	1.00
Working pensioners	1.15 (0.92–1.45)	1.18 (0.94–1.48)	1.09 (0.86–1.38)
Non-working pensioners	0.94 (0.78–1.14)	0.96 (0.79–1.16)	0.84 (0.69–1.03)
Housewives	0.74 (0.45–1.21)	0.70 (0.42–1.18)	0.73 (0.43–1.24)
Currently unemployed	1.46 (1.07–1.98)	1.47 (1.08–2.00)	1.46 (1.05–2.02)

a: Model 1: Adjustment for age, country and gender
b: Model 2: Adjustment for age, country, gender and drinking frequency
c: Model 3: Adjustment for age, country, gender and CAGE score ≥ 2
d: For economic activity, its interaction with gender ($P < 0.001$) is included in the model

Table 4 Final model[a] for the associations between all-cause injuries, socio-economic parameters and alcohol consumption characteristics: adjusted ORs and 95% CI

	OR (95% CI)
Education	
Primary	0.73 (0.62–0.88)
Vocational	0.89 (0.79–1.01)
Secondary	0.85 (0.75–0.95)
University	1.00
P for trend	0.01
Marital status	
Married	1.00
Single	1.52 (1.23–1.87)
Divorced	1.23 (0.96–1.31)
Widowed	1.12 (0.96–1.31)
Household items number	
Top tertile	1.00
Middle tertile	1.12 (1.003–1.26)
Bottom tertile	1.13 (0.99–1.29)
P for trend	0.06
Deprivation score	
0 (min)	1.00
1–2	1.15 (1.01–1.31)
3–5	1.23 (1.08–1.40)
6–12 (max)	1.57 (1.38–1.79)
P for trend	<0.01
Economic activity[b]	
Men	
Working	1.00
Working pensioners	0.69 (0.55–0.87)
Non-working pensioners	0.69 (0.58–0.72)
Currently unemployed men	1.04 (0.79–1.37)
Women	
Working	1.00
Working pensioners	1.27 (1.02–1.59)
Non-working pensioners	1.05 (0.87–1.25)
Housewives	0.79 (0.46–1.38)
Currently unemployed	1.38 (0.99–1.93)
Drinking frequency	
Never	1.00
<1/month	1.07 (0.93–1.24)
1–3/month	1.19 (1.01–1.39)
≥1/week	1.33 (1.14–1.56)
P for trend	<0.01
CAGE score ≥ 2	
No	1.00
Yes	1.44 (1.23–1.69)

a: Final model: Adjustment for age, gender, country, education, marital status, household items number, deprivation score, economic activity, drinking frequency and CAGE score ≥ 2
b: For economic activity, its interaction with gender (*P* < 0.001) is included in the model

although also associated with injuries, did not explain the socio-economic variations in injury prevalence.

Methodological considerations

In all centres, the HAPIEE study subjects were randomly selected from population registers (electoral lists in Russia). The populations of the Czech towns, Novosibirsk and Krakow more or less approximate the urban populations of the Czech Republic, Russia and Poland, respectively,[28] although they may not be representative of the national injury rates. In addition, a potentially lower participation rate among recently injured persons could bias the estimated prevalence of injury.

Another limitation of this study was the wording of the question on injuries. Specifically, it is possible that the meaning of the qualification 'serious enough to contact a doctor' differs between countries. Higher injury prevalence in the Czech Republic could be due to easier access to healthcare (particularly to emergency services) and to lower perceived threshold of what should be seen by a doctor. In Russia, on the other hand, both access to medical services and perceived seriousness of an injury may have led to relatively low consultation rates. It is likely that the injury prevalence differences between populations, as estimated in this study, are not reliable. Within populations, this bias should be less important, although it is possible that persons with low SEP or problem drinkers had worse access to healthcare. This bias could lead to an underestimation of the underlying associations between SEP, alcohol and injuries.

The cross-sectional design and retrospective reporting of injuries complicate the assessment of causality. The associations between socio-economic status, drinking and injuries found in this study could be partially due to reverse causation. However, the strong relationship, for example, between material deprivation and injury is unlikely to be explained by reverse causation alone.

The GF technique is a reliable method to assess drinking patterns;[29] to improve acceptability to our participants, we used local units of alcohol consumption.[28] Although in the Russian HAPIEE pilot study, self-reported alcohol consumption was strongly associated with serum gamma glutamyl transferase,[30] alcohol intake may have been misreported. Since we relied more on alcohol intake ranking, rather than on absolute levels, and we used the CAGE questionnaire to estimate problem drinking, it is unlikely that misclassification of alcohol intake introduced a major bias. However, we did not consider non-conventional measures of hazardous drinking, such as drinking surrogate alcohol, which could be more strongly related to both socio-economic disadvantage in Russia[31] and injury risk. This might have resulted in underestimating the impact of alcohol on the association between SEP and injury.

Injury prevalence

Between-population differences in injury period prevalence may be partly due to the wording of the question, which is sensitive to the access to health services and perception of injury seriousness. Overall, however, in our study the annual rates of non-fatal injury seem to be around 10%.

The prevalence of non-fatal injuries in our study could be compared with the results of other studies only indirectly, due to differences in injury definitions, recall times and other parameters. To our knowledge, only two other studies were more or less comparable with ours. First, non-fatal, medically certified injuries in our samples were less common than among Americans aged ≥55 years (~15%).[32] In this US study, the outcome included medically certified injuries, as well as traumas restricting usual activities of an individual; the latter category was not registered in our participants. The second study, among economically active population of north-eastern France aged ≥50 years, reported prevalence of self-reported non-fatal accidents in the last 2 years of 16.5%.[33] Considering the differences in economic activity and recall periods, our data appear generally consistent with these results, although the injury mortality is known to be higher in CEE than in Western Europe or USA.[1,4,5,34]

Social differentials in non-fatal injuries

Education is frequently reported as a core social parameter predicting non-fatal injuries.[4,34] Somewhat surprisingly, we did not observe an inverse educational gradient in our

participants. Similarly, educational level was not found to be a significant predictor of all-cause injury morbidity in different samples of American adults.[32,35,36] Although less-educated people might be at a higher risk of non-fatal injury occurrence, this could be counterbalanced by underreporting of less severe traumas, less access to medical care and a greater exposure to more lethal injury types.

Lower risk of non-fatal injuries was observed in married Americans.[35] In a Swedish sample, never married, divorced and widowed people had significantly higher odds of non-fatal all-cause injuries.[34] Our results are consistent with these data. However, some studies failed to support the link between marital status and non-fatal injuries,[36] which could be explained by local cultural and demographic characteristics. The contextual arrangement of marriage may reduce the injury risk, perhaps by instrumental support from a spouse/partner and by discouragement of risky behaviours.

Currently unemployed Russian men in our sample had increased prevalence of injury. Unemployment has been shown to be linked to burns and home injuries;[7,37] unfortunately, no individual-level studies on unemployment and non-fatal all-cause injuries in adults have been found.

In many previous studies, various measures of wealth/deprivation have failed to predict the risk of non-fatal injuries of various etiologies.[6,36,38] At the same time, poverty and lower income were associated with higher odds of non-fatal all-cause injuries in American and Swedish adults, respectively.[32,34] We used the indices of material deprivation and household items number as more proximal measures of household wealth. Interestingly, material deprivation was the strongest injury predictor in our study, even after controlling for other covariates. Although reporting bias and reverse causation cannot be entirely excluded, it seems that questions on material difficulties assess absolute deprivation more efficiently than other socio-economic indicators.

Alcohol

The drinking patterns in these populations, including significantly higher rates of problem drinking in Russian men than in Czechs or Poles, have been reported earlier.[28] In our sample, alcohol was associated with injury, but the strength of the association was modest. In addition, the associations between SEP parameters and non-fatal injuries did not change their direction or strength after additional adjustment for alcohol consumption measures. The absence of substantial confounding or interaction by alcohol on these associations was not entirely expected, but appears consistent with other studies.

For instance, in Dutch adults, significantly increased hazard ratios (HRs) for occupational, home and sports injuries (registered as one group) in lower educational strata were reduced but remained statistically significant after adjustment for excessive alcohol consumption and other factors.[39] Among economically active Frenchmen, increased risk of work accidents in lower occupational groups remained significant after additional controlling for excessive alcohol consumption and other covariates.[33] Adjusting for alcohol consumption and other factors did not change substantially the association between unmarried, divorced or widowed status and increased risk of falls in adult Finns.[40] Higher HRs of driver injury in less educated New Zealanders slightly decreased, but remained significant after additional adjustment for driving time and alcohol consumption.[38] None of these studies demonstrated significant interactions between SEP measures and drinking characteristics. Therefore, both the literature and our results confirm socio-economic parameters as important independent risk factors for non-fatal injury among adults.

Conclusions

To our knowledge, this was the first study on alcohol and socio-economic inequalities in non-fatal injuries in CEE population samples. The observed relationships between SEP, alcohol and injury are consistent with previous evidence and underscore the universality of the inequality phenomenon. Although the effect of drinking on injury risk in this study was weaker than expected, it is consistent with the overall conclusion that alcohol is a strong determinant of injuries and accidents.[21] Our results and the literature, however, suggest that the mediating role of alcohol in social differentials in injury remains an unresolved issue.

Key points

- There is limited evidence on the prevalence and socio-economic patterns of non-fatal injury in CEE, as well as on the potential role of alcohol in this association.
- In this study, among older middle-aged urban population samples in the Czech Republic, Russia and Poland, the prevalence of self-reported non-fatal injuries in the last year was ~10%.
- Injuries were associated with material deprivation, other socio-economic parameters and drinking. However, alcohol did not mediate the link between socio-economic status and injuries, suggesting that the role of alcohol in social differentials in non-fatal injury remains an unresolved issue.
- The results of this study underscore the universality of the inequality phenomenon and emphasize the importance of ensuring that public health policy tackles the underlying causes behind such social differences.

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