

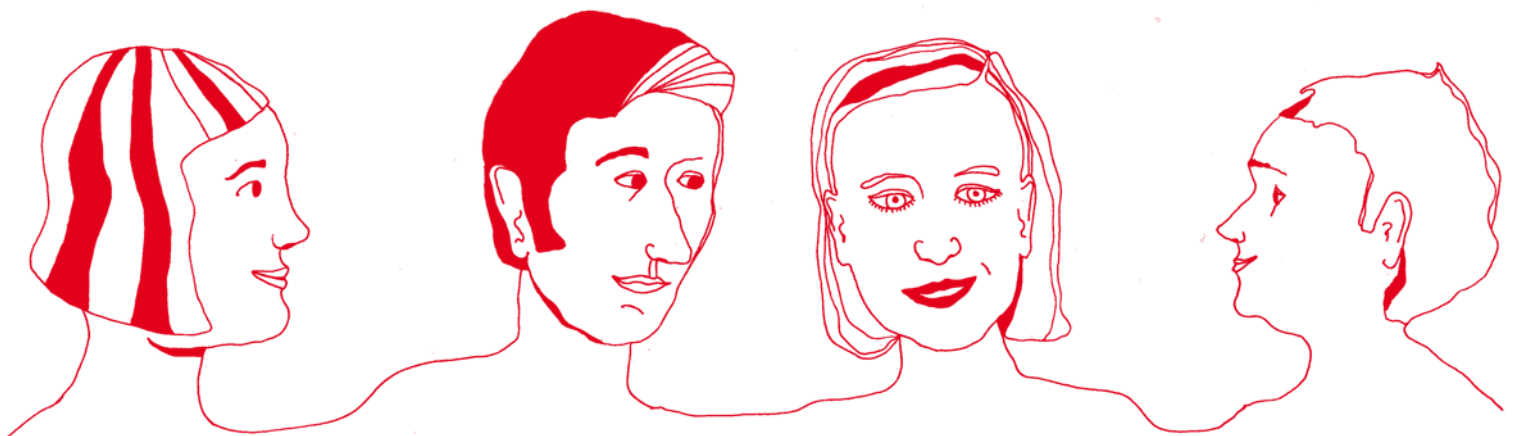
Childhood injuries in Lithuania

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– Essay –

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Abstract

The aim of the study was to analyse mortality and morbidity from external causes among Lithuanian children and adolescents.

Methods. Information on deaths from major external causes during the period of 1988-2000 for Lithuanian children and adolescents aged 0-19 was obtained from the Department of Statistics. Information on the number of admissions to health care institutions due to injuries for children aged 0-14 years was gathered from Lithuanian Health Information Center. International comparisons were performed using data from the WHO/Europe Health for All Database. Mortality rates were age-standardized using the European standard, and analysed by sex, age, and place of residence. Years of life lost due to external causes were calculated. Mortality and morbidity trends were explored using the regression analysis.

Results. External causes were the most common causes of death among Lithuanian children and adolescents aged up to 19 years, accounting for 36.5% of overall mortality during the period of 1988-2000. Children or adolescents lost approximately 330,000 (23.7 per 1,000 population) years of life due to external causes in 1988-2000, or every dead child or adolescent lost, on the average, close to 60 years of life. Age-standardized mortality from external causes of Lithuanian children and adolescents was 40.1 per 100 000 population in 1988-2000. Considerable inequalities in mortality by sex, age, and place of residence were disclosed, pointing out boys, children under one year of age, adolescents aged 15-19 years, and residents of rural areas as the most vulnerable groups. Throughout the study period mortality from external causes was decreasing, while the number of admissions to health care institutions and hospital discharges due to injuries was increasing. Despite a recent decline, mortality from external causes among children and adolescents remains at extremely high level in Lithuania as compared to other countries of Europe.

Conclusions. High mortality rates due to external causes, and an increasing number of non-fatal injuries among Lithuanian children and adolescents demonstrate the great need for a definite, well-coordinated, and competent injury prevention strategy.

Key words: External causes, injuries, accidents, mortality, morbidity, children, adolescents.

Table of contents

Introduction	7
The aim and objectives of the study	10
Methods	10
Data	10
Statistical analysis	11
Ethical considerations	12
Results	13
Mortality from external causes	13
Mortality from external causes in urban and rural areas	15
Mortality trends during 1988-2000	17
Years of life lost	19
Morbidity trends during 1988-2000	21
International comparisons	21
Discussion	25
Conclusions	33
Recommendations	34
Acknowledgements	35
References	36
List of abbreviations	42

Introduction

Injuries sustained from accidents are considered to be among the largest medical, psychological, social and financial public health problems worldwide. They are one of the five most common causes of death throughout the world (1), a significant contributor to disability and the major cause of potential loss of the years of life (2). About 5.8 million people (97.9 per 100,000 population) die of injuries worldwide each year, and it causes 16% of the global burden of disease (3). Injuries account for one in seven healthy life years lost in the world. By 2020 they will account for one in five, with low and middle-income countries bearing the brunt of this increase (4). Around 88% of traffic-related deaths, 86% of suicides, and 95% of homicides occur in low and middle-income countries (5). In Europe, injuries are the third most common cause of death (6) and account for about 80 million cases of injuries per year requiring medical attention (7). In Lithuania, external causes compose 13.6% of the overall mortality (8).

Injuries, as a cause of mortality, morbidity and disability are relatively more important in the first half of the individual's lifespan, and especially so in childhood and adolescence. Injury has been identified as a major child health problem in developed countries for more than four decades (9), and accounts for almost 40% of annual deaths in children aged 1 to 14 (10). In the European Union, every day approximately 14 children die due to an injury, another 2,240 are admitted to a hospital, and another 28,000 receive treatment in an emergency and accident department (11). The injury-related death in children occurs at twice the rate of a death from cancer, or eight times that of respiratory-related death (12). On the disability-adjusted life years scale, childhood injuries account for approximately one-third of the total burden of disease among the industrialized world's children aged 5-14 (13). The burden of child injury is also multiple, including the economic impacts of managing and treating injuries. It has been estimated that the overall socio-economic burden of all injuries in Europe is almost 400 billion Euros annually (11). The death of a child also means the loss of the youngest member of the society - the one who had the greatest number of years to contribute as a healthy and able individual. Yet most importantly, the tragic death of a young child has devastating effects to their immediate family, often dismantling the family unit itself.

Accidents among youth are a substantial public health problem in Lithuania as well as in other countries. Approximately 150 of Lithuanian children under 14 years of age die each year as a result of unintentional and intentional injuries (8). Mortality from external causes is several times higher in Lithuania than in most European countries. In comparison to Sweden, where childhood injury mortality rates are among the lowest in the world (14), mortality of 0-4 year-old Lithuanian children is nearly nine, and that of 5-19 year old children – by four times higher (15). While the number of injury deaths remains unacceptably high, they generally represent less than one percent of all injuries – only the tip of the iceberg, and when we look deeper into the true size of the injury problem, it multiplies exponentially (10). For example in Netherlands, for every one childhood death from injury sustained at home, there were 160 hospitalisations, 2,000 injuries were treated at the emergency department, and thousands of mild injuries were treated at the general practitioners' or paediatricians' office (16). Population-based studies indicate that approximately 25% of children and adolescents under 19 years of

age receive medical care for an injury each year (17). Of these, 2.5% require hospitalisation, and in 55% of cases, injuries result in at least temporary disability.

Deaths from injury account for almost the entire East-West gap in the European region, concerning the overall child mortality (18). If rates of mortality from these causes in childhood were reduced to the average for the European Union, depending upon age, up to 80% of the difference in total mortality in childhood between East and West would be eliminated, and nearly 32,000 deaths in the age group of 1-19 years would be prevented each year (4). There would be a 74% reduction in the total excess mortality among boys aged 1-4 years between the Baltic countries and Western European countries if rates from external causes were reduced to the average observed among boys of the same age in the West, while among boys aged 15-19 years, the reduction in the total excess mortality would be 95%.

The most important causes of injury-related death in childhood and youth are traffic accidents, drowning, fires, poisonings, falls, and intentional injuries; their relative importance varies from country to country and as age increases (19). Injuries resulting from traffic collisions are a major cause of childhood death, hospitalization, and disability throughout the world (20), and it accounts for more than 40% of deaths from external causes among children aged 1-14 years (18). In the European Union, traffic accidents compose nearly half of deaths from external causes of 1-14 year-old children (11). In Lithuania, 540 children less than 16 years of age died, and 9,694 were injured during traffic accidents since 1991 till 2000 (21). Half of them were injured because of the fault of the driver. Considerable part (22%) of traffic accidents in Lithuania in 2000 occurred because of drunken drivers. If compared to the same rate of the other European countries, it is one of the worst.

The aetiology of injury involves a complex interplay between human and environmental factors. Patterns of injury vary according to demographic factors including age, sex, residence, and socio-economic status, all of which are difficult to modify (22). The contribution of injuries to the social-mortality differential, particularly in childhood (but also among youth), is considerable in many countries. The same also largely applies to injury morbidity (19, 23). Consequently, behavioural explanations of the aetiology of injury are popular in some prevention circles (22). Childhood and adolescence is the time of experimentation as young people begin to exert their independence. These are the periods that contain certain risks because of the characteristics of the transition to adult status (24). A number of studies analysing relationships between adolescent injuries and risk behaviours, such as drinking (25), drug use (26), and different types of sexual behaviour (27) have been accomplished in the world. Some research examined the associations between smoking and injury-related fatalities as well as between injuries and aggressive sporting behaviours (28, 29).

Looking at the reasons why children die from injuries, it is important to reflect on why, so far, this topic has received so little attention from policy makers. There are three main reasons (18). The first one is that this is, typically, an invisible condition. The second problem is that injuries, as a policy issue, have no owner, because the effective policies needed to reduce injuries require concentrated action by a wide range of people.

The third problem, which is related to the second, is that injuries are still seen as something that just happens, and there is nothing that can be done about them.

Childhood injuries can be characterized as resulting in high mortality, hospital discharges and disability rates, but in many cases they can be prevented and there are a number of ways to do this (19). When we look at the experience of other countries, the scope for prevention is immediately apparent. A fundamental aspect of the World Health Organization (WHO) Health for All strategy and the WHO Global Program on Accident Prevention and Injury Control says, “All human beings have an equal right to health and safety” (1). This premise has led to community actions around the world and encouraged formulating policies for safety promotion and injury control. The best example here could be Sweden, which has demonstrated how injury control could be undertaken on all levels – the community-based model, adapting interventions to the local cultural, social and organizational environment, and emphasizing broad community participation. Implementation of such interventions helped to reduce the number of injuries by 30% in Sweden during last two decades (30). Firstly, injury prevention professionals in health departments, community agencies and other organizations need to have data about the situation, which can help in deciding on the priorities for the implementation of interventions. The risk factors have to be identified, as well, followed by the development of measures for prevention and risk reduction. Community-based interventions offer a promising solution for reducing child and adolescent injuries. By focusing on altering behaviour, promoting environmental change within the community, or passing and enforcing legislation, these interventions seek to change social norms of acceptable safety behaviours (14, 31). A combination of these measures is likely to result in improved safety and a reduction in associated injury.

This study can contribute to better understanding of inequalities in children’s health determined by injuries in Lithuania. It can serve as a scientific basis for the development of safety promotion and injury prevention activities among children and adolescents on the local, regional and national levels, implementation of which is of a major public health importance in the country. It is expected that the results of this study will encourage all, who take responsibility for the health and well-being of youth to be more active in injury prevention and safety promotion.

The aim and objectives of the study

The aim of the study was to analyse mortality and morbidity from external causes among Lithuanian children and adolescents.

Objectives:

- To analyse mortality from external causes by age, sex and place of residence among children and adolescents aged 0-19 years, and to assess mortality trends throughout the period of 1988-2000.
- To assess years of life lost due to external causes among children and adolescents.
- To investigate morbidity from external causes among children aged 0-14 during 1988-2000.
- To compare mortality from external causes among children and adolescents in Lithuania with some Nordic and other Baltic countries.

Methods

Data

The population of Lithuania is relatively homogeneous in terms of many cultural factors, such as religious affiliation, migration patterns, and others. Population size was rather stable throughout the period under investigation, with 3.7 million inhabitants in 2000, of whom 27% were children and adolescents under 19 years of age. More than two-thirds of the population lives in urban areas.

The analysis for this study covered the entire country. Data about the population and the decedents from external causes during the period of 1988-2000 for children and adolescents aged 0-19 was obtained from computerized database of the Lithuanian Department of Statistics. Causes of death were coded according to the truncated version of the International Classification of Diseases (ICD)-9 till 1993, during 1993-1997 - according to the ICD-9. The ICD 10th revision was applied in 1998. The analysis included established cases of all external causes of death (ICD-9 E800-E999 and ICD-10 V01-Y98), traffic accidents (ICD-9 E800-E848 and ICD-10 V01-V99), drowning (ICD-9 E910 and ICD-10 W65-W74), suicides (ICD-9 E950-E959 and ICD-10 X60-X84), suffocations (ICD-9 E911-E913 and ICD-10 W75-W84), homicides (ICD-9 E960-E978 and ICD-10 X85-Y09), fires (ICD-9 E890-E899 and ICD-10 X00-X09), and falls (ICD-9 E880-E888 and ICD-10 W00-W19). All other external causes of death were linked and analysed as other causes. Since ICD has changed during the investigated period, codes were adjusted according to ICD-9. Mortality of children and adolescents aged 0, 1-4, 5-9, 10-14, 15-19, 0-14, and 0-19 years, of boys and girls, of urban and rural populations was analysed separately due to the expected differences in mortality rates and trends by age, sex and place of residence. Urban and

rural populations were categorized using the Lithuanian classification supplied by Lithuanian Department of Statistics as follows: 1) urban population – refers to those persons, who live in cities and towns, i.e. in the population areas with closely built permanent dwellings and with the resident population of more than 3,000; 2) rural population - refers to those persons, who live in the population areas without any town and city signs (small towns, villages and homesteads). As suicides are rather rare in childhood, only the age groups over ten years of age were included in the study when analysing suicides. Mortality trends were tabulated by five-year age groups and a single calendar year for the period of 1988-2000.

The numbers of admissions to the health care institutions due to injuries throughout the period of 1988-2000 for children aged 0-14 years were obtained from the Lithuanian Health Information Center.

International comparisons of the mortality from external causes were made using data from the WHO/Europe Health for All Database (15), and concerning mortality from suicides – from Nordic/Baltic Health Statistics 2002 (32).

Statistical analysis

Mortality rates are presented per 100,000 children or adolescents, and morbidity – per 1,000. Mortality indicators were age-standardized using the direct method and European standard population, as recommended by the WHO.

The effect of place of residence on mortality was explored using ratio statistics and 95% confidence intervals (CI). The rate ratios were assessed between mortality of rural children or adolescents vs. mortality of urban children or adolescents.

Losses due to the external causes of death were estimated using rates of years of life lost (YLL). The following formula was applied for the calculation of YLL:

$$YLL = \sum_{i=0}^{19} m_i e_i$$

where: m_i – number of deaths within a given interval of age $[i, i + 1)$;
 e_i – life expectancy at age i .

Four types of rates of YLL were calculated: 1) YLL in absolute numbers; 2) YLL per 1,000 children or adolescents; 3) YLL standardized by age, sex, and place of residence per 1,000 children or adolescents; 4) average number of YLL of one dead child or adolescent and its 95% CI.

Life expectancy of males and females in the year 2000 was used for the calculation of YLL. Life expectancy at birth of males was 67.6 and of females - 77.9 years in the year 2000. Overall Lithuanian life expectancy of males and females was applied when calculating life expectancy of urban and rural populations. Rates of YLL were

standardized using average structure of age, sex, and place of residence of children or adolescents during 1988-2000. When comparing urban and rural populations, rates were standardized by age and sex, while when comparing boys and girls – by age and place of residence. Rates of YLL were calculated for all causes of death, all external causes, traffic accidents, drowning, suffocations, suicides, homicides, fires, and falls.

Mortality and morbidity trends during the 13-year observation period (from 1988 to 2000) were analysed by applying the Poisson regression models using the event rate under concern as outcome variable (33):

$$\log r = a + b \cdot t + e$$

where: r – mortality (standardized) and morbidity rates;
 $\log$ – logarithm;
 t – year;
 e – error;
 b – coefficient of logarithmic regression, which presents average annual change (multiplied by 100, was presented as the average annual change in percents).

Time trends of mortality from major external causes of children and adolescents aged 0, 1-4, 5-9, 10-14, 15-19, 0-14, and 0-19 years, of boys and girls, and of urban and rural populations were analysed separately. Morbidity trends were calculated for children under 14 years of age for admissions to health care institutions and for hospital discharges. The 95% CI for the average annual changes were calculated.

For all statistical analyses, a significance level (p) of less than 0.05 (in a two-tailed test) was considered to be significant. Statistical analysis was performed with the Statistical Package for Social Sciences (SPSS) for Windows, version 10.0.

Ethical considerations

This is a register study, and thus no approval from local ethical commission was required.

Results

Mortality from external causes

Throughout the period of 1988-2000, 5,506 Lithuanian children and adolescents 0 to 19 years of age died due to unintentional and intentional injuries, on the average, 460 per year. There were 3,916 (71.1%) deaths among boys and 1,590 (28.9%) deaths among girls registered. The distribution of the decedents and mortality rates per 100,000 population from external causes by age and sex are presented in Table 1.

Table 1. Numbers of deaths and mortality rates from external causes among children and adolescents by age and sex in Lithuania, 1988-2000.

Age, years	Boys		Girls		Both sexes	
	n	Mortality per 100,000	n	Mortality per 100,000	n	Mortality per 100,000
0-0	213	69.1	166	57.0	379	63.2
1-4	633	46.7	380	29.4	1013	38.3
5-9	592	31.9	290	16.3	882	24.3
10-14	504	27.7	212	12.1	716	20.0
15-19	1974	111.9	542	31.7	2516	72.5
0-19	3916	55.5	1590	24.1	5506	40.1

External causes were the most common causes of death among Lithuanian children and adolescents, accounting for 36.5% of overall mortality during the period of 1988-2000. In the overall mortality among boys, external causes took more considerable part than that among girls: 42.2% and 27.4%, respectively. The proportion of the external causes in the mortality increased throughout the period of the study (Figure 1).

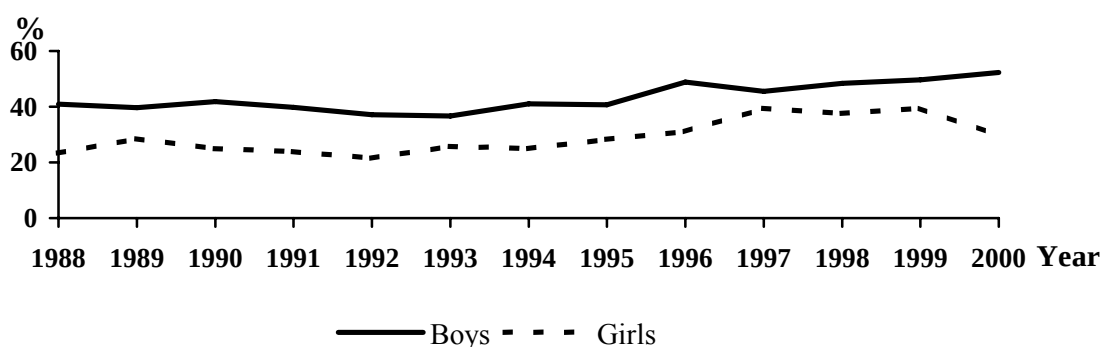


Figure 1. Proportion of external causes of death in relation to all deaths in children and adolescents (0-19 years old) in Lithuania, 1988-2000.

Among boys, the proportion of the external causes in the overall mortality increased from 41% in 1988 to 52% in 2000, while among girls the corresponding figures were 23% to 30%. The proportion varied by age and sex. Among children under one year of age, it took the smallest part (5%) and was increasing with age. The largest proportion in the mortality resulting from external causes was at the age of 15-19 years (81% among boys and 63% among girls).

The leading causes of injury-related death by age are presented in eight subgroups in the Figure 2. Traffic accidents were the major subgroup (32%) in the external mortality of children and adolescents under 19 years of age during the period of 1988-2000. The second most common cause was drowning – 22%. More than ten percent of children or adolescents who died from external causes were committing suicides. Suffocations made up 6% of cases in the external mortality. More than five percent of children and adolescents died from homicides. The remaining part in the external mortality was attributed to fires, falls and other causes.

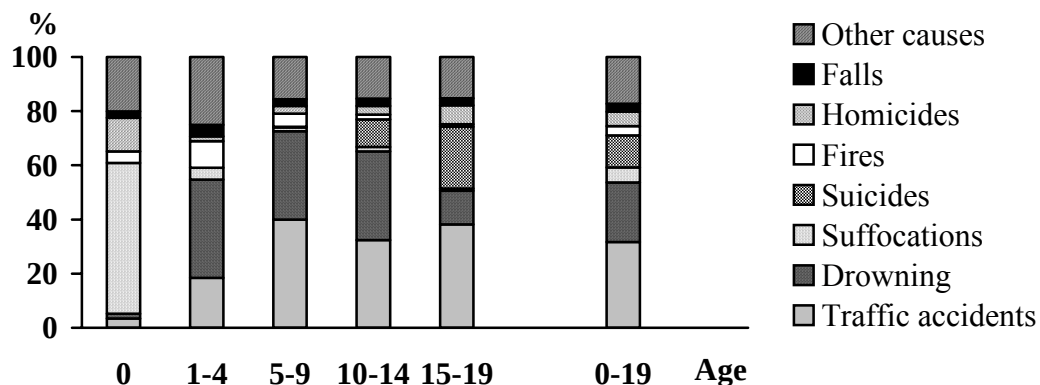


Figure 2. Distribution of external causes of death (%) in eight classes among children and adolescents by age in Lithuania, 1988-2000.

While every child is at risk for injury, certain types of injuries appear to affect particular groups more frequently. Age-related differences in the distribution of external causes of death were observed. Suffocations were prevailing in infancy and accounted for more than one-half (55%) of all deaths from external causes. The structure of external causes of death at the age of 1-4 years changed, and drowning started to dominate – it comprised 36% of all cases. A considerable part was taken by traffic accidents – 18%. In comparison to other age groups, the proportion of children dying in fires was the most considerable (10%) at the age of 1-4. The proportion of traffic accidents was increasing with an increase in age, and at the age of 5-9 years, approximately 40% of children dying from external causes died from traffic accidents. Almost one-third of children who died at the age of 5-9 years, drowned. Traffic accidents and drowning at the age of 10-14 years composed the biggest part in the external mortality; the same applied to children aged 5-9 years. Ten percent of 10-14 year-old children committed suicides. At the age of 15-19, traffic accidents comprised

the major (38%) part in mortality from external causes. The second largest cause was suicide, while drowning composed 12% in the external mortality of this age group.

The analysis of the external mortality structure of boys and girls separately disclosed only minor differences between genders.

Age-standardized mortality from external causes of Lithuanian children and adolescents (0-19 years old) was 40.1 per 100,000 population in 1988-2000, although considerable disparities in the mortality of boys and girls and different age groups were estimated (Figure 3). High mortality was observed in infancy (69.1 boys and 57.0 girls per 100,000 population). The mortality of girls was the highest in infancy. Mortality was decreasing from infancy till the age of 15 with sudden increase in the age group of 15-19 years, where mortality among boys reached the highest level (111.9 per 100,000 population), in comparison to other age groups.

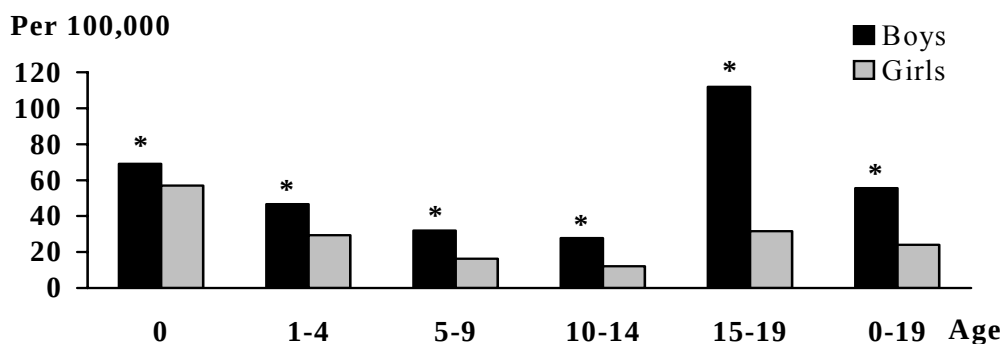


Figure 3. Mortality from external causes among children and adolescents by sex and age in Lithuania, 1988-2000.

* $p < 0.05$ comparing sexes.

Statistically significant differences in mortality of boys and girls were observed: mortality among boys was considerably higher in all age groups, compared to girls. This difference was increasing with an increase in age, and reached the maximum level at the age of 15-19 (by 3.5 times). Age-standardized mortality from external causes of boys aged 0-19 was by 2.3 times higher than that of girls (55.5 and 24.1 per 100,000 population, respectively).

Mortality from external causes in urban and rural areas

Throughout the period of the investigation, 2,903 injury-related deaths (2,060 among boys, and 843 - among girls) were registered in urban areas, and 2,606 (1,858 among boys, and 748 - among girls) – in rural areas. The analysis according to the place of residence clearly demonstrated considerable inequalities in mortality from external causes. The ratio statistics disclosed that mortality related to external causes among

rural children or adolescents exceeded statistically significantly that among the urban population of the same age during 1988-2000 (Figure 4). The most considerable differences in mortality were noted in 1-4 year-old boys and girls (rural/urban mortality rate ratios were around three). Mortality differences in urban and rural areas among boys aged five years and older were more considerable than those among girls.

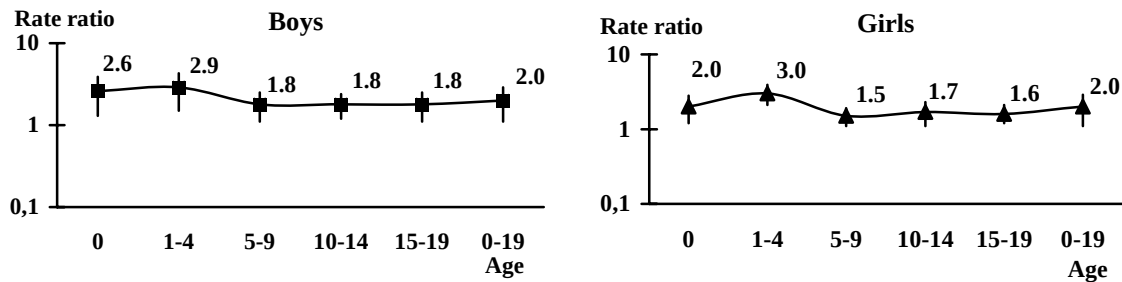


Figure 4. Mortality rate ratios and their 95% confidence intervals from external causes among urban and rural children and adolescents by sex and age in Lithuania, 1988-2000 (mortality among urban children and adolescents = 1).

Age-standardized mortality of children and adolescents (0-19 years old) in rural areas was twice as high as that in the urban areas (among boys, 83.7 and 42.1 per 100,000 population, respectively; among girls, 36.1 and 18.4 per 100,000 population, respectively). The highest mortality from external causes among boys was observed in rural areas in the age group of 15-19 years (159.5 per 100,000 population), while among girls, it reached the highest level in the rural areas in infancy (83.5 per 100,000 population).

Mortality rates from traffic accidents among children and adolescents older than one year were statistically significantly higher in rural than that in urban areas. The greatest difference was noted in the age group of 15-19 years – the mortality from traffic accidents among rural adolescents by twofold exceeded that among urban (among urban boys it was 30.8, and among rural boys – 63.3 per 100,000 population, while among girls – 11.3 and 21.3 per 100,000 population, respectively). Mortality of children under one year of age was significantly lower in rural areas.

The analysis of mortality from drowning also demonstrated significant differences between urban and rural areas. The mortality of boys from drowning was statistically significantly higher in rural areas in all age groups (Figure 5). The most considerable difference was observed among boys under one year of age and at the age of 1-4 years (rural/urban mortality rate ratio close to four). The highest mortality was estimated among rural boys aged 1-4 years (32.9 per 100,000 population). Mortality of girls from drowning was also significantly higher in rural areas at all ages with an exception of the age groups of under one year and 15-19 years, where mortality was significantly higher in urban areas. The most considerable difference was noted in the age group of 1-4

years (rural/urban mortality rate ratio more than five). The highest mortality was observed among 1-4 year-old rural girls – 17.8 per 100,000 population.

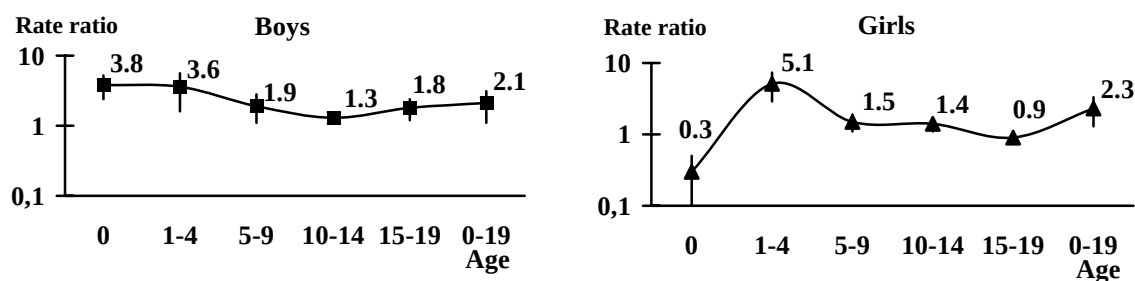


Figure 5. Mortality rate ratios and their 95% confidence intervals from drowning among urban and rural children and adolescents by sex and age in Lithuania, 1988-2000 (mortality among urban children and adolescents = 1).

Suicide rates among rural boys in the age groups of 10-14 and 15-19 years, and among rural girls aged 15-19 years were significantly higher than those among urban children and adolescents. The most considerable difference was observed among adolescents aged 15-19, especially among girls: mortality from suicides among rural boys was 36.0, and among urban boys – 20.6 per 100,000 population, while among rural girls it was 12.9, and among urban girls – 5.6 per 100,000 population. Suicide among girls was significantly higher in urban areas in the age group of 10-14 years.

Mortality trends during 1988-2000

Trends in age-standardized mortality rates from external causes in Lithuanian children and adolescents under 19 years of age are presented in the Figure 6. Considerable fluctuations were noted among boys with subsequent increase in 1991-1992, reaching the highest level in 1991 (67.2 per 100,000 population). Among girls, a quite stable trend was observed.

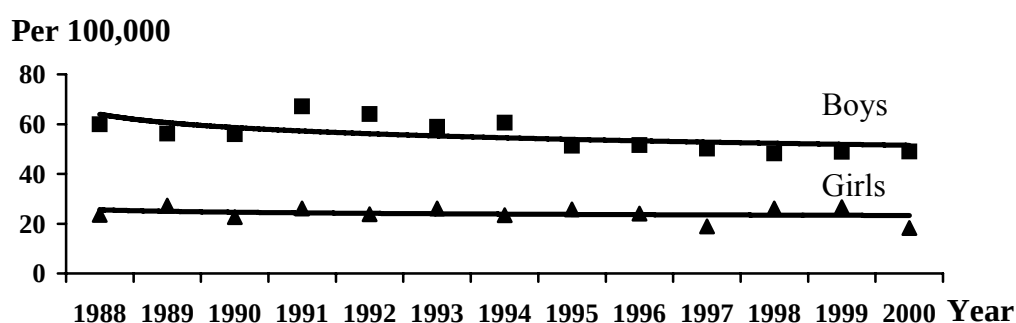


Figure 6. Trends in age-standardized mortality rates from external causes among boys and girls (0-19 years old) in Lithuania, 1988-2000.

Throughout the whole period of the study, average annual changes in mortality in different age groups were analysed (Table 2). Mortality from external causes among children and adolescents (0-19 years old) was decreasing, on the average, by 1.8% per year ($p<0.05$). Mortality of boys was decreasing by 2.2% per year ($p<0.05$), while that of girls also had a decreasing tendency. Significant average annual decrease in mortality appeared in age groups of 1-4, 5-9, and 10-14 years among boys, and in age groups of 0-4 and 5-9 years - among girls. The most considerable decrease was noted in the mortality of 5-9 year-old boys, and in 1-4 year-old girls. Mortality of boys under one year of age increased statistically significantly by almost seven percent per year, and among girls of the same age, the tendency of an increase was observed.

Table 2. Average annual changes (%) in mortality from external causes among children and adolescents at different ages in Lithuania, 1988-2000.

Age, years	Average annual changes, % (95% CI)		
	Boys	Girls	Both sexes
0-0	6.65* (1.7; 11.5)	4.00 (-1.8; 9.9)	5.44* (0.9; 9.9)
1-4	-3.05* (-5.8; -0.3)	-5.19* (-7.5; -2.9)	-3.74* (-5.3; -2.1)
5-9	-5.53* (-8.6; -2.5)	-4.10* (-7.4; -0.8)	-5.06* (-7.6; -2.5)
10-14	-4.95* (-8.1; -1.8)	0.46 (-3.6; 4.5)	-3.27* (-6.1; -0.5)
15-19	-1.58 (-3.3; 0.1)	0.94 (-2.1; 4.0)	-1.02 (-2.7; 0.7)
0-14	-1.22 (-3.9; 1.4)	-0.74 (-2.1; 0.6)	-0.99 (-2.7; 0.7)
0-19	-2.17* (-3.4; -1.0)	-1.13 (-3.1; 0.9)	-1.84* (-2.9; -0.8)

* Changes from 0, $p<0.05$.

Average annual changes in mortality from external causes among urban and rural children and adolescents were not uniform. Throughout the period of investigation, mortality of rural boys decreased significantly by 3.1% per year and had a decreasing tendency among both urban boys and rural and urban girls.

The analysis of average annual changes by the major external causes revealed that mortality among boys from traffic accidents and drowning decreased significantly, while among girls it had a decreasing tendency (Table 3). Nevertheless, suicides increased significantly both in boys and girls.

Table 3. Average annual changes (%) in mortality from the major external causes among children and adolescents (0-19 years old) in Lithuania, 1988-2000.

Causes of death	Average annual changes, % (95% CI)		
	Boys	Girls	Both sexes
Traffic accidents	-4.90* (-7.6; -2.2)	-2.47 (-5.4; 0.5)	-4.12* (-6.5; -1.8)
Drowning	-3.82* (-6.6; -1.0)	-2.26 (-7.5; 3.0)	-3.33* (-6.1; -0.5)
Suicides**	4.32* (1.2; 7.4)	8.60* (2.2; 15.0)	5.04* (2.3; 7.7)

* Changes significant from 0, $p<0.05$;

** Rates calculated for children and adolescents aged 10-19.

Years of life lost

From a safety perspective, potential life lost due to injuries is of importance. During 1988-2000, Lithuanian children or adolescents lost 329,608 (23.7 per 1,000 population) years of life due to external causes. Boys lost 219,829 (30.8 per 1,000 population), and girls – 109,779 (16.1 per 1,000 population) years of life. YLL due to external causes comprised 33.1% of YLL from all causes of death (38.7% among boys, and 25.6% - among girls). Traffic accidents, drowning and suicides comprised the major part of YLL due to external causes (Table 4).

Table 4. Years of life lost (YLL) due to external causes among children and adolescents (0-19 years old) in Lithuania, 1988-2000.

Causes of death	% From all external causes of YLL		
	Boys	Girls	Both sexes
Traffic accidents	30.6	31.0	30.7
Drowning	23.8	18.6	22.1
Suffocations	5.6	8.2	6.5
Suicides	11.7	8.3	10.6
Homicides	5.1	5.2	5.2
Fires	3.3	5.0	3.9
Falls	2.7	3.8	3.1
Other causes	17.2	19.9	17.9
All external causes	100.0	100.0	100.0

Boys lost more years of life from all analysed causes of death in comparison to girls (Table 5). The rate of YLL, standardized by age and place of residence was statistically significantly higher among boys than that among girls for traffic accidents, drowning, suicides and homicides. The rate of YLL due to all external causes among boys was almost twice as high as that among girls ($p<0.05$).

The comparison of YLL between urban and rural areas was conducted. The age and sex-standardized rate of YLL due to all external causes among rural children and adolescents was statistically significantly by two times higher than that among urban children (Table 6). When analysing separate external causes, significantly higher rates of YLL for traffic accidents, drowning, suffocations, suicides and fires were estimated among rural children, comparing to urban children.

Standardized rates of YLL due to external causes among all analysed social and demographic groups of children or adolescents had the same tendencies of trends as external causes mortality trends during 1988-2000.

Every dead child or adolescent lost, on the average, 59.9 years of life due to external causes: boys – 56.2 (95% CI: 56.0; 56.4), and girls – 69.0 (95% CI: 68.7; 69.3). The results of this analysis demonstrated that every dead girl lost, on the average, more years from all analysed causes of death, in comparison to every dead boy ($p<0.05$). Due

to all external causes, every dead girl lost, on the average, by approximately 13 years of life more than every dead boy, which can be explained by longer life expectancy of girls.

Table 5. Years of life lost (YLL) and standardized** YLL per 1,000 population among children and adolescents (0-19 years old) in Lithuania, 1988 – 2000.

Causes of death	Boys		Girls		Both sexes	
	YLL n	Standardized YLL/1,000	YLL n	Standardized YLL/1,000	YLL n	Standardized YLL/1,000
Traffic accidents	67262	9.4	34057	5.0*	101319	7.3
Drowning	52235	7.3	20444	3.0*	72679	5.2
Suffocations	12216	1.7	9049	1.3	21265	1.5
Suicides	25779	3.6	9087	1.3*	34866	2.5
Homicides	11232	1.6	5762	0.8*	16994	1.2
Fires	7277	1.0	5523	0.8	12800	0.9
Falls	5946	0.8	4172	0.6	10118	0.7
All external causes	219829	30.8	109779	16.1*	329608	23.7
All causes of death	567807	79.6	428026	63.0*	995834	71.5

* p<0.05 in comparison to rate of YLL of boys;

** YLL standardized by age and place of residence, and analysing both sexes – also by sex.

Table 6. Years of life lost (YLL) and standardized by age and sex YLL per 1,000 population among urban and rural children and adolescents (0-19 years old) in Lithuania, 1988 – 2000.

Causes of death	Urban		Rural	
	YLL n	Standardized YLL/1,000	YLL n	Standardized YLL/1,000
Traffic accidents	56950	5.9	44369	10.3*
Drowning	34267	3.6	38412	8.5*
Suffocations	8938	1.0	12326	2.6*
Suicides	19674	2.0	15192	3.6*
Homicides	11061	1.2	5933	1.3
Fires	3247	0.3	9553	2.1*
Falls	7387	0.8	2731	0.6
All external causes	171508	18.0	158100	35.5*
All causes of death	580264	62.7	415570	89.5*

* p<0.05 in comparison to rate of YLL of urban children and adolescents.

The average number of YLL of one dead child or adolescent due to all external causes in rural areas was statistically significantly higher than that in urban areas. The analysis of YLL of one dead child or adolescent due to specific external causes disclosed

statistically significantly higher rates of drowning among rural boys and girls, and from fires – among rural boys, in comparison to urban children and adolescents.

Morbidity trends during 1988-2000

The trend in admissions to health care institutions due to injuries, poisonings and certain other consequences of external causes in Lithuania is presented in the Figure 7. The number of admissions among children under 14 years of age was increasing, on the average, by 3.5% annually ($p<0.05$), reaching the highest level in 2000 (100.6 per 1,000 population). In 1997, the rates of admissions to health care institutions started to increase markedly, which can be associated with the enacted Health Insurance Law in Lithuania. The average annual changes were not significant during 1988-1996, while during 1997-2000, the number of admissions was increasing, on the average, by 13.9% per year ($p<0.05$).

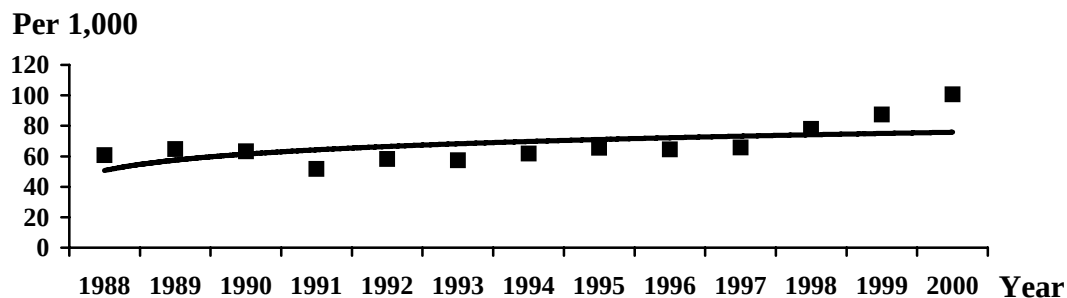


Figure 7. Trends in admissions to health care institutions due to external causes among children (0-14 years old) in Lithuania, 1988-2000.

The proportion of children who were admitted to health care institutions and were hospitalised due to external causes decreased during the recent years. However, the number of hospital discharges per 1,000 population due to external causes was increasing statistically significantly - by 2.4% annually. Similar tendencies in fluctuations in hospital discharges, as well as in admissions, were found: only the tendency of an increase was found during 1988-1996, and during 1997-2000, the number of hospital discharges was increasing by 7.1% ($p<0.05$) per year.

International comparisons

The assessment of the patterns of mortality due to external causes in the Baltic States, Sweden, and Finland demonstrated unfavourable situation in all three Baltic States. In the age group of 0 to 4 years, mortality rates due to injuries in the Baltic States were approximately by eight times higher in comparison to the rates of fatal injuries in Sweden, and by more than six times higher than those in Finland during 1988-2000. Throughout the period of the study, the average mortality rate in Sweden was 5.5,

while in Lithuania – 43.4 per 100,000 population. In 2000, injury-related mortality among 0-4 year-old children in Lithuania exceeded that in Sweden by almost 14 times (in Sweden, the mortality rate was 2.8, while in Lithuania - 38.7 per 100,000 population). The comparison of the three Baltic countries revealed that mortality from external causes has been similar in all of them; however, the highest mortality rates were observed in Latvia (e.g. in 1998 - 51.0 per 100,000). Injury death rates were higher among children aged 0-4 years if compared to the age group of 5-19 years in all selected countries.

The mortality from external causes among boys and girls aged 0-4 years in the Baltic States, Finland and Sweden throughout the period of 1988-2000 are presented in Figure 8. Mortality of boys and girls in the Baltic States significantly exceeded that in Sweden. The greatest differences were observed in mortality among Estonian boys and girls (by more than nine times), while mortality in Finland exceeded that in Sweden only by 1.5 times. Mortality rates of children in Lithuania in comparison to Sweden were close to eight times higher than the rates in Sweden.

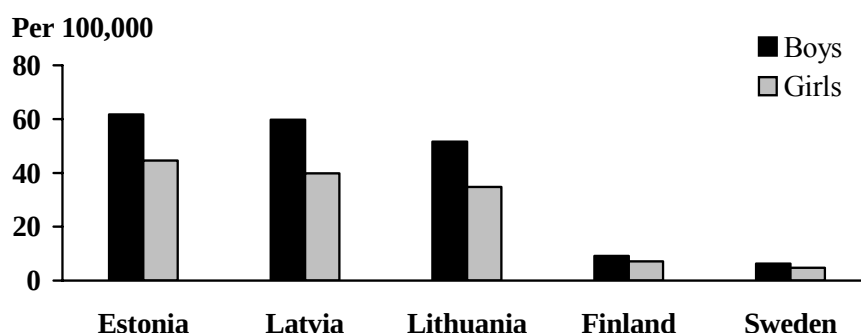


Figure 8. Mortality from external causes among children 0-4 years old by sex in selected countries, 1988-2000.

Similar tendencies were observed in age group of 5-19 years. The rates of mortality due to external causes in Lithuania were by more than five times higher than the rates in Sweden, and by more than three times higher than those in Finland. The average mortality rate from external causes in Sweden was 5.1, and in Lithuania - 26.6 per 100,000 population throughout the period of 1988-2000. Injury-related death rates in Latvia were also the highest among the selected countries.

Average mortality rates from external causes among boys and girls aged 5-19 years in the Baltic States markedly exceeded those in Sweden during 1988-2000 (Figure 9). Among Lithuanian boys, age-standardized mortality was higher by nearly six times, and in girls – by 4.5 times than the rate in Sweden, while mortality in Finland exceeded that in Sweden by approximately 1.5 times.

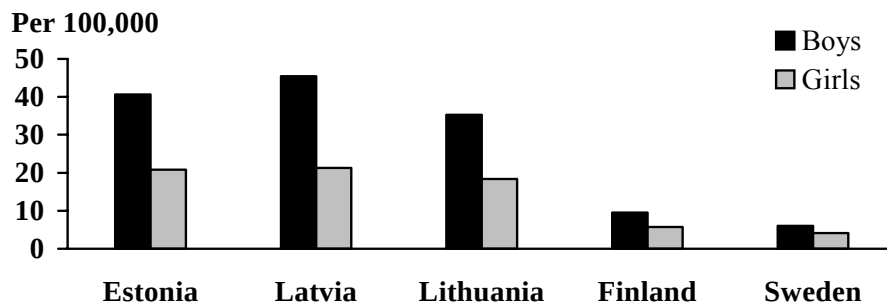


Figure 9. Mortality from external causes among children and adolescents 5-19 years old by sex in selected countries, 1988-2000.

Average annual changes in mortality from all external causes among 0-4 and 5-19 year-old children and adolescents throughout the study period in selected countries are presented in Table 7 and Table 8.

Table 7. Average annual changes (%) in mortality from external causes among children 0-4 years old in selected countries, 1988-2000.

Country	Average annual changes, % (95% CI)		
	Boys	Girls	Both sexes
Lithuania	-3.96 (-3.1; 2.3)	-2.29 (-4.9; 0.3)	-1.07 (-2.5; 0.4)
Latvia	-2.88 (-6.0; 0.3)	-2.44 (-5.1; 0.3)	-2.70* (-5.1; -0.3)
Estonia	-4.00* (-7.0; -1.0)	-4.82 (-10.1; 0.4)	-4.21* (-7.5; -0.9)
Finland	-6.25* (-10.2; -2.3)	-8.35* (-14.5; -2.2)	-6.54* (-8.5; -4.6)
Sweden	-8.42* (-12.3; -4.6)	-9.55* (-14.2; -4.9)	-8.55* (-10.5; -6.6)

* Changes significant from 0, $p < 0.05$.

Table 8. Average annual changes (%) in mortality from external causes among children and adolescents 5-19 years old in selected countries, 1988-2000.

Country	Average annual changes, % (95% CI)		
	Boys	Girls	Both sexes
Lithuania	-3.29* (-5.9; -0.7)	-3.49* (-5.8; -1.2)	-3.83* (-5.4; -2.3)
Latvia	-4.81* (-6.8; -2.8)	-4.49* (-7.5; -1.5)	-4.70* (-6.6; -2.8)
Estonia	-6.04* (-9.1; -3.0)	-5.42* (-10.0; -0.8)	-5.75* (-8.1; -3.4)
Finland	-4.98* (-6.8; -3.2)	-2.63 (-7.0; 1.7)	-4.10* (-6.3; -1.9)
Sweden	-5.92* (-8.6; -3.2)	-6.14* (-8.9; -3.4)	-6.09* (-7.9; -4.3)

* Changes significant from 0, $p < 0.05$.

Significant average annual decrease in mortality was estimated in both genders aggregated in the age group of 0-4 years, as well as in the age group of 5-19 years in all the countries with an exception of Lithuanian children aged 0-4 years – no significant changes in mortality were registered among them during 1988-2000. The most obvious decrease was noted in both age groups of children and adolescents in Sweden –

mortality of 0-4 year-old children decreased, on the average, by nearly nine percent per year, and mortality of children aged 5-19 years decreased by six percent annually. Although the mortality of Lithuanian children aged 5-19 years was decreasing significantly by more than three percent per year, the average annual decrease was more pronounced in other selected countries, compared to that in Lithuania.

Suicide is an important health issue for teenagers aged 10-19 years. During 1990-2000, suicide rates were considerably higher among boys than among girls (Figure 10 and Figure 11). The lowest suicide rates among boys were observed in Sweden, while in Lithuania the rates were by more than three times higher (in 2000 - 4.0 per 100,000 in Sweden, and 15.3 per 100,000 population - in Lithuania).

Similar tendencies were found among girls of the same age group. Average suicide mortality rate among girls in Lithuania was double than that in Sweden. Suicide mortality was increasing in Lithuanian girls and was the highest among the selected countries in recent years.

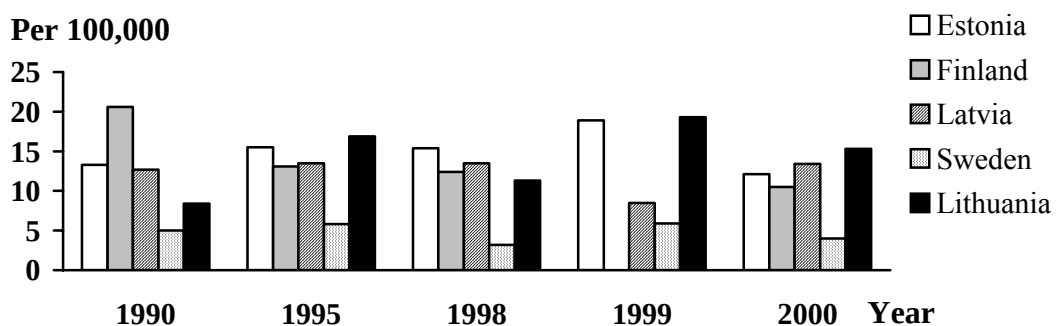


Figure 10. Mortality from suicides among boys 10-19 years old in selected countries, 1990-2000.

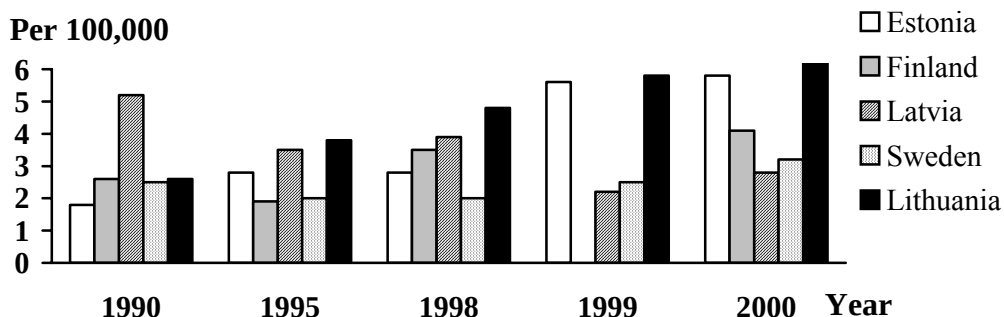


Figure 11. Mortality from suicides among girls 10-19 years old in selected countries, 1990-2000.

The analysis of average annual changes in mortality from suicides among boys and girls aged 10-19 years old during 1988-2000 was performed. Throughout the study period, there were no statistically significant changes in suicides among boys in all the selected countries with an exception of Finland, where suicide mortality decreased, on the average, by 6.5% per year ($p<0.05$). In Latvia and Sweden, suicide rates showed the tendency to decrease, while an increasing tendency was observed in Lithuania and Estonia. In the meantime, mortality due to suicides among girls increased sharply in Estonia (by 11.1% annually, $p<0.05$) and Lithuania (by 9.8% annually, $p<0.05$). Average annual changes in suicide mortality of girls were not statistically significant in Latvia, Finland, or Sweden.

Discussion

This study is based on national mortality and morbidity statistics of Lithuania, and thus it is important to discuss the reliability and validity of the statistical data.

Although mortality statistics is considered to be the most valuable source for assessing the health of a nation (34), some data errors can occur. A number of factors affects the reliability and completeness of mortality data: geographic location - urban areas are likely to be more complete than rural areas; social class and income - those of higher social class are more likely to have sought and obtained medical care prior to death, and to have a detailed cause of death recorded; and the cause of death - particular causes may be easier to recognise or may be less socially stigmatised and therefore more readily recorded (4). The percentage of possible mortality data errors is generally considered to be not more than five percent for Baltic States (35). Previous studies of the validity of mortality statistics in Lithuania found that unreliable death certificates cause only a small part of differences in death rates, and mortality statistics is rather accurate and reliable (36); however, the validity and reliability of the statistics of mortality resulting from external causes has not been investigated. On the other hand, it is important to discuss some limitations of the mortality data. Data on the injury-related mortality provide a pointer to problems requiring attention, but in their own right are limited and make only a part of the picture. The lack of detailed information on injury events means that mortality data are of limited use in developing injury prevention programs (2). Also it is important to note that some of the differences between countries described in this paper may be due to differences in death registration.

Registration of intentional injuries requires special attention. The determination of intentionality is, however, imprecise and many forms of injury such as poisoning, drowning or firearm injuries may be caused either intentionally or unintentionally, at times with relatively little information upon which to precisely classify a given event. Cultural and social norms in each country may also influence the decision to register a suicide or other intentional injury (37). Suicide mortality data can very likely be underestimated – suicide can be voluntarily hidden to avoid stigmatisation, for social convenience, or because it was masked as an accident or undetermined cause of death. On the other hand, some homicides could be diagnosed as suicides owing to an inability to establish actual circumstances.

In Lithuania, population morbidity is registered according to referral to health care institutions. However, morbidity data are not informative enough because this type of registering mostly shows the work scope of health care institutions, but not the real population morbidity. Compared to the recording of injury-related mortality, the recording of injury-related morbidity is far more variable given that those experiencing minor injuries may be treated at home and may never seek care, and those who seek medical care will be greatly influenced by the severity of the injury, and access to such care (4). It also must be taken into consideration that whether an individual goes to an emergency department, family physician, or seen pre-hospitally, depends on host cultural and economic factors other than severity of injury. During the last ten years, the increase in the morbidity of both adults and children in Lithuania was nearly twofold. Having introduced health insurance, “hyper-registration” of morbidity is observed, in an attempt to justify the amount of prescribed medicine and the scope of the work done. In addition to that, duplication of the registration of diseases in different institutions remains a problem (38). In the absence of reliably collected and standardized data on morbidity, and because of different recording systems, comparisons between countries may not provide an unbiased picture of differences in the occurrence of injuries.

The most prominent place in the structure of overall mortality among the Lithuanian adult population is taken by cardiovascular diseases (39); meanwhile, among children and adolescents under 19 years of age, the main causes of death are external. The mortality structure of Lithuanian children and adolescents is similar to that in other developed countries, but the contribution of external causes of death to total mortality is much higher in Lithuania than in other European countries. For example, in Lithuania, over 54% of boys’ and 47% of girls’ deaths in the age group of 1-4 years are attributable to external causes, while in Scandinavia, the respective numbers are 28% among boys and 22% among girls (4).

The study disclosed considerable variations in rates of mortality due to external causes by age, sex, and the place of residence. High mortality was observed in infancy. Among girls, mortality rates peak in infancy and decrease thereafter, while among boys there are peaks in both infant and adolescent (15-19 years old) age groups. Additional research is needed to understand factors that contribute to disparities in risks of dying from injury among different age groups in Lithuania, although the results reported by other authors suggest that sociodemographic predictors of injury-related mortality among infants, including maternal age, education, number of other children, marital status, and infant birth weight, may play a role (40). Injuries associated with alcohol intoxication and other risk-taking behaviour may contribute to much higher rates of injury-related mortality among boys in the age group of 15-19 years (4).

Our study demonstrated that having aggregated all external causes, mortality of boys was higher than that of girls at all ages. The biggest difference (by 3.5 times) was observed in the age group of 15-19 years. Similar tendencies are reported when analysing overall mortality of Lithuanian children and adolescents: the rate ratio of boys’ and girls’ mortality is highest in age group of 15-19 years, and up to 60% of the difference is conditioned by external causes (39). Although the reasons for gender-based

differences in mortality from external causes are unclear, it has been hypothesized that they may include inborn differences in motor skills and in behaviour (19). Sex differences in behaviour begin to appear at the same age as the differences in injury rates, and correlate with injury type (41). Sex differences in behaviour are not only about the volition of children, but are also about differences in the way in which adults relate to boys and girls. It is important to note that subtle variations in socialization also might produce gender differences in risk-taking and in risk exposure (42). The first of these hypotheses is supported by the observation that the ratio of male to female injuries is highest for child-initiated activities, while the ratio is closer to one for cases where the child has no influence over his or her risk exposure, such as in motor-vehicle-occupant injuries. Some authors have reported an increase in the male-female mortality ratio over the past few decades (43), while a recent study from Sweden indicates that the injury-related mortality gap between boys and girls is reduced and the gender pattern is the same for suicides and for violence (44).

Comparisons between rural and urban injury-related deaths provide important information that can be used to guide prevention strategies. Mortality from external causes among Lithuanian children and adolescents under 19 years of age is twice as high in rural as in urban areas. Considerable inequalities in mortality rates and in life expectancy of urban and rural populations in most countries of the Eastern Europe are estimated (45). It can be associated with the differences in social, economic, and cultural environments, as well as with access to health care in urban and rural areas (39). Urban and rural location may have an impact on injury occurrence, in part through differences in exposure to risk (46). Traditionally, rural residents are slower to accept new ideas and to alter current practices than urban residents (47). Lifestyle factors, such as alcohol consumption or smoking, are more prevalent among Lithuanian adolescents in rural areas, which can be related to higher injury rates (48). Mortality after sustained injury depends on many factors, although the quality of pre-hospital care and ambulance services are among the most important ones. The estimated mean time of ambulance arrival in Lithuania is 7.3 ± 0.6 min in urban areas, and 24.8 ± 3.3 min - in rural areas, and time for health status evaluation in cases of trauma is almost twice longer in comparison to other European countries (49).

Mortality from the most common external causes – traffic accidents, drowning, and suicides – differs considerably between urban and rural Lithuanian children and adolescents. This study cannot determine the reasons for this, but it allows for some suggestions. Higher mortality from traffic accidents among rural children and adolescents older than one year, especially among older boys, can be associated with unsafe driving, often after the intake of alcohol, poor quality of roads and vehicles, and lack of supervision. Traffic flows may be much lower in rural than in urban areas, nevertheless the speed at which vehicles travel through areas in which children may be playing may be higher. Some studies indicate that in urban areas, where traffic intensity is high, traffic accidents and related mortality is higher than in rural areas (50). Higher rates of drowning in rural areas, especially in the young age group (1-4 years), suggests that access to unfenced expanses of water or wells, inability to swim, and/or lack of supervision of children under 5 years of age in these environments may play a role. Drowning associated with alcohol intoxication may contribute to much higher rates

among rural boys in the age group of 15-19 years (48). It is estimated that alcohol might be involved in 30% to 50% of cases of drowning among adolescents (51). Although the prevalence of adolescent suicidal attempts do not differ in urban and rural areas in Lithuania (24), this study disclosed higher suicide rates in rural areas. It is apparent that risks of suicide are often higher among adolescents of lower socio-economic status and those living in poorer environment conditions (19), which is more prevalent in Lithuanian rural population (45).

There has been a substantial decline over the past century, and especially over the last 20 years, in the overall rate of death due to injury in developed countries of the world (52). Mortality from external causes among Lithuanian children and adolescents was decreasing by 1.8% per year during 1988-2000. Although overall infant mortality is decreasing in Lithuania (53), our study disclosed significantly increasing infant mortality from external causes. Even though this study does not allow assessing the impact of particular factors on increasing infant injury mortality, explanation could lie on unfavourable socio-demographic characteristics of the family, which are reported to be significant predictors of injury and injury-related mortality in infancy (40). While many different factors may contribute to the decreasing injury-related mortality rates among Lithuanian children and adolescents, including the progress in medical technologies and health care organization, better health care accessibility, and even less severe injuries sustained, however, no decrease in the prevalence of injuries among children and adolescents is reported in Lithuania.

Motor vehicle injury is the most common cause of serious and fatal injury among children and adolescents (54). As in most developed countries, mortality from traffic accidents among Lithuanian children and adolescents was declining, on the average, by more than four percent per year throughout the period of the investigation. While only a tendency of a decline in road traffic accidents and a rapid increase in the number of the cars has been observed in the country during last decade (21), declining mortality could be associated with improved quality of roads and vehicles as well as with better survival after the sustained injuries. According to other authors, declining childhood mortality due to traffic accidents can be explained by a substantial decrease in the walking and cycling activities (55), because fatal pedestrian injuries are more common than fatal occupant injuries in preschool and school-aged children (56). A study from England and Wales demonstrated that between 1985 and 1992, the average distance walked in a year by a child aged 0-14 years declined by 20%, and the average distance cycled - by 26%. In contrast, the average distance that children travelled by car in a year increased by 40% (55). However, the number of persons killed per 100 injured during traffic accidents (14-19 per 100 injured) is by 4-10 times higher in Lithuania than in Western European countries. The probability of an accident on the Lithuanian roads is by six times bigger than that in Scandinavia (57). The analysis of the safety habits among 11-15 year-old Lithuanian schoolchildren disclosed that although seatbelts are legally required, only 36% of those who are riding a car always wore seatbelts, and only around one percent of bicyclists answered that they always wore helmets when bicycling (58). A number of solutions are possible in reducing motor vehicle injuries. The effectiveness of bicycle helmets is demonstrated in the prevention of bicycle-related injuries. In 1990, following ten years of cycle helmet promotion campaigns, the state of Victoria in

Australia introduced the first law in the world requiring cyclists to wear helmets. During a one-year period after the passing of the legislation, the average helmet-wearing rate increased from 31 to 75 percent (59). The number of bicyclists killed or admitted to hospital fell by 23% over the first year that followed the legislation, and by 28% - over two years. The corresponding reductions in head injuries were 48% after one year, and 70% - after two years. Helmet promotion programs that are organized by community-wide coalitions and use a variety of educational and publicity strategies have been shown to be effective as well (60). There is considerable evidence that child car seat restrains (for young children) when properly used, reduce car occupant injuries. In the United States, the use of child passenger restraint and motor vehicle-related fatalities among children have been studied (61). In 1990, child safety seats were used for an estimated 83% of infants and 84% of toddlers, compared with 60% and 38%, respectively, in 1983. The use of child safety seats reduced the likelihood of fatal injury by an estimated 69% for infants, and 47% - for toddlers. Campaigns to promote booster seat use, messages from health care providers, emergency medical services, or law enforcement can be the most effective (62). In reducing motor vehicle injuries, attention should be paid to community-level interventions, and major focus of these interventions should be to change the environment to make it safer for pedestrians. Changes will likely involve some sort of traffic calming, as has been done in Europe and some cities in the United States (63). The speed at which a car is driven affects the severity of pedestrian injuries (20 miles per hour (mph) leads to 5% likelihood of death; 30 mph – 45%; and 40mph – 85%) (30). Therefore transport policies aiming at reducing excessive car speeds may be effective.

Mortality from drowning was also decreasing in Lithuania during 1988-2000, which can be related to improved quality of health care services, especially emergency, because the likelihood that a child will survive a drowning is largely determined by events occurring within the first ten minutes of the accident (64). There are a number of preventive measures that appear to have impact on the reduction of drowning rates in childhood. Close supervision of young children around any water, the presence of lifeguards, the use of approved personal flotation devices in older children, and fencing of pools and isolation of other water bodies increases the chance of a favourable outcome. Immediate resuscitation at the site of a submersion incident before the arrival of the ambulance is an important means of secondary prevention and is associated with a significantly better neurological outcome in children with submersion injury. However, there is no data to show that swimming lessons actually decrease the risk of drowning (65).

However, suicide mortality was increasing among Lithuanian adolescents (10-19 years old) by more than five percent per year, mostly among girls. Suicide mortality among Lithuanian adult population also followed an increasing trend throughout the same period (66). This phenomenon can be closely associated with the growth of suicidal ideation and suicide attempts among Lithuanian adolescents, as well as with perception of a suicide as a norm (52). Among adults, mental illness is considered to be an important factor for the commitment of suicide, whereas children and adolescents quite rarely (in less than 20% of cases) have mental disorders before they commit a suicide (67). Some countries also report increasing suicide rates among children and

adolescents; however, these rates are much lower than those in Lithuania. For example in Sweden, self-inflicted injuries increased in both sexes, but mostly for girls during 1987-2001, although suicide rates were considerably lower than those in Lithuania (44). In England and Wales, no significant changes occurred in suicide rates among children under 15 years of age since 1980, while among adolescent aged 15-19 years, mortality from suicides was increasing, on the average, by one percent per year (68). Many of the factors that cause unintentional injuries are closely associated with violent and abusive behaviour. Therefore injury prevention and control addresses both unintentional and intentional injuries.

The number of potential years of life lost due to children, adolescents and young adults being killed and injured is also of importance from the safety perspective. The concept of years of life lost involves estimating the mean time a person would have lived had he or she not died prematurely (69). This measure is used to help quantify social and economic loss owing to premature death, and it has been promoted to emphasize specific causes of death affecting younger age groups. Years of life lost inherently incorporate age at death, and its calculation mathematically weights the total deaths by applying values to death at each age. The study revealed that one girl who died because of an injury lost, on the average, 69.0 years of life, while one boy – 56.2 years of life ($p < 0.05$). The methodology of the calculation could influence the higher average number of years of life lost of one girl than that of one boy, since life expectancy for the year 2000 was applied for the calculation of the rate, and this life expectancy was 67.6 years for males and 77.9 years - for females (38).

Increasing rates of admissions to health care institutions and hospital discharges due to injuries among Lithuanian children are extremely difficult to interpret; some suggestions on this are presented above, although the cross-national study on health behaviour among Lithuanian schoolchildren also demonstrated the notably increasing percentage of schoolchildren who reported at least one injury requiring medical attention in the previous 12 months throughout 1994-2002. According to 1994 survey, the frequency of injuries was 23%, in 1998 – 39%, and in 2002 – as much as 50%. The proportion of schoolchildren who were injured four and more times also increased in 2002, comparing to previous surveys (58).

The probability of dying from injury in childhood is far more common in Lithuania than it is in Western Europe, and it reveals a complex problem that cannot have a simple, single explanation. This perhaps can be illustrated by looking at a neighbouring country, one that shares the same climatic and environmental conditions but has pursued very different social policies in the second half of the 20th century. Injury deaths in childhood are almost by four to 14 times more common depending on age and year in Lithuania than in Sweden. However, even among countries with similar political and cultural contexts there are considerable differences. Death rates in Denmark, which has long pursued policies of deregulation, are almost twice as high as those in the neighbouring Sweden (2). When discussing high childhood injury mortality rates in Lithuania, it is noteworthy that the country experienced enormous political, social, and economic changes during the last decade of the 20th century, shifting from being a highly centralized republic of the Soviet Union to an independent state with a newly

developing market economy. These changes greatly influenced social, demographic, and health situations. The population of the country has been exposed to a new and unfamiliar social environment, relatively low living standards, insufficient financing of health and social services and, consequently, experienced tremendous stress (70). Lithuania, like other countries in transition, experienced certain factors that had the potential to increase the risk of mortality from external causes (a sudden increase in the number of motor vehicles and consequent traffic, uncontrolled accessibility to drugs, inefficient policing of crime, and so on). However, in Lithuania and other transition countries there is no systematic information on the associations of childhood injuries with socio-economic indicators, while it has been demonstrated that in the West, external cause mortality rates among children and adolescents are very strongly associated with socio-economic position, varying inversely with income, education and wealth of their parents (19, 71). Alcohol, a well-known risk factor for injury-related mortality in all ages, is a painful social problem in Lithuania. Alcohol consumption in litres per capita is at least twice as high as that in Sweden. Road traffic injuries involving alcohol per 100,000 population is approximately by three times higher in the Baltic States in comparison to Sweden (15). In the meantime, policy implementation systems established by the previous regime were distrusted, resulting in some delays before their replacement with new ones that could successfully manage the changing environment. New legislation was developed (such as speed limits, helmet requirements, and substance abuse and crime controls), but the implementation of proper enforcement took more time. Injury prevention and safety promotion programs are generally transient or cover all age groups and all high-risk situations. Lithuania have irregular or minimal injury prevention infrastructure, and support from local government authorities is in general weak or absent. The main explanation for the low childhood injury mortality rates in Sweden probably lies in the increasingly favourable economic and social conditions and application of a national strategy for safety promotion. There are many different forms of successful injury prevention activities in Sweden, such as improvements in traffic infrastructure, child restraint systems, bicycle helmet use, safety planning in residential areas, swimming competence, use of life vests in recreational maritime activities, the availability of public child care, and increasingly skilled emergency services (44).

Higher injury-related mortality levels in childhood in Lithuania are not simply the consequence of the upheaval and problems of the transition process itself. One of the reasons why external cause mortality is higher in the Eastern Europe may reflect differences in how threats or risks are perceived. People's views as to what is acceptable, or at least inevitable, may be conditioned by the level of injury and violence (41). In addition to that, the environment in the East may present considerably more hazards to children than those of the West. However, the way in which children relate to and act within any given environment is crucial.

According to article 19 in the United Nations Charter of Children's Rights, parties shall take all appropriate legislative, administrative, social, and educational measures to protect the child from all forms of physical or mental violence, injury, or abuse (72). There has been a great deal of research during the last two decades on effective injury prevention and safety promotion activities among children and adolescents. In order to

develop effective interventions for the child injury prevention, we need a better understanding of the antecedents of accidents, the environments in which injuries are produced, and the behaviours that make accidents more likely. Without this understanding and without understanding the social world in which child accidents take place, we are unlikely to progress far in effective prevention (73). A comprehensive surveillance system to monitor both fatal and nonfatal injuries is a necessity to focus prevention efforts on the most important problems, as well as to evaluate whether they are successful (14). The greatest challenge for the field of injury control is to translate knowledge how to reduce the incidence and severity of injuries into effective programs and policies that are economically, socially, and politically acceptable and sustainable (53). During the last decades, the relative merits of different preventive strategies in injury prevention have been discussed and even if behavioural changes improve safety, the expected impact on safety improvement will come mainly through environmental and legislation changes, which are often regarded as superior and more effective approaches to those involving health education (30). However, all these types of interventions are necessary. Actions on the environment can favour safe behaviours while respecting rights and freedoms. On the other hand, actions on behaviours can favour a safe environment - especially through the social norm - which allows sustainable structural changes (74).

While limited causal insights can be claimed from routine statistical data, this study does not disclose the reasons for high mortality due to external causes among children and adolescents, or the existing demographic and social injury inequalities in Lithuania. Lithuania, being a country with particularly high childhood injury rates, requires more extensive studies of this negative phenomenon. However, the findings of this study may be helpful in developing in-depth research surveys and effective injury prevention strategies. Evidence-based, community and population-wide preventive interventions deserve attention. A lack of primary preventive programmes during the transition period resulted in dramatically high mortality from these causes among children and adolescents, and therefore the major priority is to persuade all the different sectors at community and national levels to commit to the establishment of a national policy for accident, violence, and suicide prevention. Partnerships between sectors would ensure proper allocation of resources for the prevention efforts.

Conclusions

1. In 1988-2000, external causes were the most common causes of death among Lithuanian children and adolescents up to 19 years of age. Traffic accidents, drowning, and suicides took the major part in the external mortality structure.
2. The study disclosed large-scale demographic and social disparities in mortality from external causes among Lithuanian children and adolescents, pointing out boys, children under 1 year of age, adolescents aged 15-19 years, and residents of rural areas as the most vulnerable groups.
3. Throughout the entire study period, mortality from all external causes was decreasing. Mortality from traffic accidents and drowning was decreasing, while mortality from suicides was increasing.
4. Children or adolescents in Lithuania lost approximately 330 thousand (23.7 per 1,000 population) years of life due to external causes in 1988-2000, or every dead child or adolescent lost, on the average, close to 60 years of life.
5. The number of admissions to health care institutions and hospital discharges of children under the age of 14 years due to injuries was increasing during the period of 1988-2000.
6. Mortality from external causes among children and adolescents is very high in Lithuania as compared to other countries of Europe, which demonstrates a great need for definite, well-coordinated, and competent injury prevention strategy, setting priorities for the most vulnerable groups of children and adolescents, as identified by this study.

Recommendations

Based on the results of this survey, the following safety promotion and injury prevention strategies should be implemented in order to reduce the number of injuries among children and adolescents in Lithuania:

Visibility of the issue should be increased:

- the evidence that injuries in children and adolescents are the major challenge in Lithuania, needs to be widely disseminated at the national and international level, and the basic scheme for action should be established;
- the attention of the media, policy-makers and service providers to the problem of injuries in children and adolescents should be attracted;
- information that highlights the burden of injuries and the effective injury prevention should be disseminated.

Particular attention should be paid to most vulnerable groups of children and adolescents:

- children under 1 year and adolescents 15-19 years of age, who are at the highest risk of dying from external causes;
- children aged 1-4 years as having an increased risk of drowning, compared to other age groups of children and adolescents;
- children and adolescents living in rural areas, particularly boys above five years of age, as having higher risk of dying from external causes, compared to those living in urban areas;
- certain childhood injuries, such as traffic accidents, drowning and suicides, as the most common external causes of death, should be pointed out when planning injury prevention interventions.

More detailed information should be obtained and research expanded in the following areas:

- the injury surveillance system that contains not only traditional injury indicators, but also data concerning circumstances and risk factors of injuries among children and adolescents should be developed;
- the analysis of the validity and reliability of the existing injury data (mortality, morbidity, surveys) among children and adolescents should be performed on the regular basis;
- more detailed information on the occurrence and circumstances of particular types of injuries should be collected and analysed for the development of effective interventions;
- associations between socio-economic status and injuries of children and adolescents should be estimated;
- losses due to children's and adolescent's injuries for the state and the society in terms of direct and indirect costs should be assessed and presented;
- international and national comparative studies on the effectiveness of injury prevention measures among children and adolescents should be developed.

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LIST OF ABBREVIATIONS

CI	– confidence interval
ICD	– International Classification of Diseases
p	– significance level
WHO	– World Health Organization
YLL	– years of life lost

