Traffic injury mortality trends in children and adolescents in Lithuania among road users

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This study analyzes traffic mortality trends among road users from 1998 to 2012 in children and adolescents aged 0-19 years in Lithuania. National mortality data of pedestrians, cyclists, motorcyclists, and car occupants were used to compare trend lines. The study revealed that 56% of the deceased in road traffic crashes were car occupants, while 24% were pedestrians. The incidence of death from traffic injury was 2.5 times higher in boys than girls. Traffic injury mortality and pedestrian mortality rates declined significantly in the total group. There was also a significant decline in mortality among cyclists for the total group and female subgroup. Trends in mortality rates among motorcyclists and car occupants showed no significant changes. A long-term decline is more likely to be affected by efforts in the promotion of sustainable and permanent road safety. The reduced risk exposure may also have been influenced by the economic recession.

Key words: ***traffic injury, mortality trends, children, adolescents, road safety.***

"Frequency of injuries and changes in frequency over a period of time are of the predictors of population health."

Barbara Barlow, MD

Nearly 2300 children die every day as a result of an unintentional or accidental injury. It is difficult to obtain reliable estimates of the scale and pattern of childhood injuries and deaths. Few countries have good data on childhood injuries. Road trauma kills 260,000 children a year and injures approximately 10 million. It is the leading cause of death among 10-19 year olds and is a leading cause of child disability[1,2].

The Global Status Report on Road Safety 2013 presents information on road safety from 182 countries and serves as a baseline for the Decade of Action for Road Safety 2011-2020. Low- and middle-income countries have higher road traffic fatality rates than high-income countries. However, less than 35% of those countries have policies in place to protect road users[3-5].

Road traffic injuries are also the leading cause of death among Europeans aged 5-19 years. In 2012, 28,000 people died on European Union (EU) roads. A road traffic injury is a fatal or non-fatal injury incurred as a result of a collision on a public road involving at least one moving vehicle. Children, pedestrians, cyclists, and the elderly are among the most vulnerable among road users. Among the entire EU population, one-third of fatal transport injury victims are vulnerable road users. Over one-third of road traffic deaths in low- and middle-income countries are among pedestrians and cyclists. According to the type of road users, the highest percentage of pedestrian deaths occurred in Lithuania (36%), motorcyclists' deaths in Malta (23%) and pedal cyclists' deaths in the Netherlands (22%). In the European region, in children aged 0-17 years, road death distribution by mode of road transport varies by country (for instance, pedestrians represent as much as 72% of the total in Kyrgyzstan and as little as 13% in Denmark)[5-7]. It reflects different risks for road users in different countries and differences in exposure, as well as relevance to the national prevention policies.

In Lithuania, injuries are the third leading

cause of death. Rates of all injuries for the total population are almost four times as high as those for the entire European Union. The leading causes of unintentional injury death in the country are transport injuries, followed by poisoning, falls, drowning, and fires[8]. In Lithuania, in 2012, 3,660 inhabitants died because of external causes of death (8.9% of all deaths); 392 of them died in traffic crashes (traffic injury mortality rate – 13.1 per 100,000 population). Total injury mortality rate per 100,000 population in 2012 was 122.3[9].

From previous studies in Lithuania, it is known that over three decades, the road traffic mortality rate for children and young people aged 0-19 years has remained much the same, while in children aged 1-4, 5-9, and 0-14 years, the rate decreased significantly. In children aged 10-14 years, no significant changes were observed, and in adolescents aged 15-19 years, increasing tendencies were shown[10-12]. These studies focused on age groups, while the type of road users was not highlighted. From the earlier study on road traffic injuries in Lithuania, it is known that from 1998-2007, the incidence of traffic injury increased, and of road traffic fatalities for the whole population, 50% were car occupants and 37% were pedestrians[13]. It would be of interest to determine the most vulnerable category of road users among children and adolescents as well as the mortality trends of child road users in the last few years, considering the economic situation in the country.

The purpose of this study was to analyze trends in road traffic injury mortality in children and adolescents aged 0-19 years among road users in Lithuania.

Material and Methods

Data on road traffic injury deaths were obtained from the Department of Statistics for the Government of the Republic of Lithuania. The road traffic deaths data for children and adolescents aged 0-19 years from 1998-2012 were investigated. All victims deceased in road traffic crashes, following the International Classification of Diseases - 10th revision (ICD-10), were divided by road user categories as: pedestrians (code V00-09), cyclists (code V10-19), motorcyclists (code V20-39), and in cars (code V40-79). Child injury mortality rates were calculated per 100,000 population. The population number available for the beginning of the year was used for the study. Regression analysis was used for estimating mortality rate trends. Linear regression was used for the study. The significance level of $p \leq 0.05$ was considered statistically significant. The Bioethics Committee approved the study.

Results

In total, 1319 children and adolescents (944, 72% boys; 375, 28% girls) aged 0-19 years were killed in road traffic crashes in Lithuania over the period 1998-2012 (Table I).

Road traffic mortality rates per 100,000 children and adolescents were calculated for the whole group, and separately for the male and female victims. Study results revealed that during the study period, traffic injury mortality rates trends declined significantly in the whole group aged 0-19 years ($R^2=0.374$, $p=0.015$) and in the male ($R^2=0.354$, $p=0.019$) and female ($R^2=0.274$, $p=0.045$) subgroups. Boys were killed nearly 2.5 times more frequently than girls (Fig. 1).

By gender, 508 (54%) boys were killed when travelling inside the car, 211 (22%) as pedestrians, 105 (11%) as motorcyclists, and 81 (9%) while cycling (Fig. 2a). Correspondingly, 233 girls (62%) were killed as car occupants, 102 (27%) as pedestrians, 16 (4%) as cyclists, and 9 (3%) as motorcyclists (Fig. 2b).

Totally, in the age group 0-19 years, car occupants (56%) were most affected, followed by pedestrians (24%), motorcyclists (9%) and cyclists (7%). Linear regression showed significantly decreasing trends for mortality rates among pedestrians ($R^2=0.659$; $p=0.000$) and cyclists ($R^2=0.431$; $p=0.008$), whereas

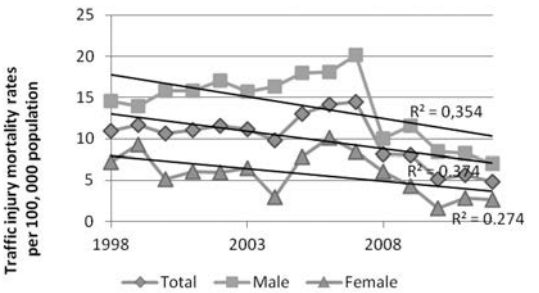

Fig. 1. Road traffic mortality rates per 100,000 population in Lithuania in the 0-19 years of age group according to gender (1998-2012).

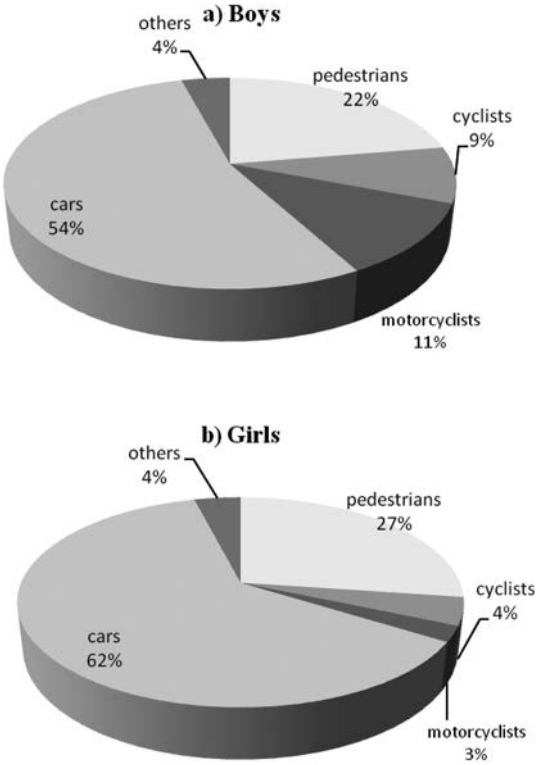

Fig. 2. Deaths in road traffic accidents among boys (a) and girls (b) aged 0-19 years in Lithuania (by road users) (1998-2012).

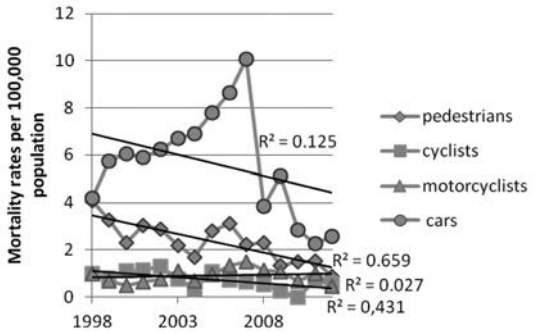

Fig. 3. Road traffic mortality rates per 100,000 population in Lithuania among children and adolescents aged 0-19 years (distribution according to road users) (1998-2012).

no significant change in mortality rate was observed for motorcyclists (R^2=0.027, p=0.549). For mortality among car occupants, there was an increase from the beginning of the study period, followed by a sudden steep decline after 2007. However, linear regression showed no significant change (R^2=0.125, p=0.196) (Fig. 3).

By gender and road user, linear regression showed a significant decrease for pedestrians in the male subgroup (R^2=0.548, p=0.002). For male cyclists (R^2=0.204, p=0.091) and

Table I. Road Traffic Deaths (in Absolute Numbers) by Type of Road Users in Lithuania in the Age Group 0-19 Years (1998-2012)

Year	Pedestrians	Cyclists	Motorcyclists	Cars
1998	42	10	10	43
1999	33	8	7	58
2000	23	11	5	60
2001	29	11	6	56
2002	27	12	7	58
2003	20	7	10	61
2004	15	3	6	61
2005	24	9	8	67
2006	26	6	11	72
2007	18	5	12	81
2008	18	4	9	30
2009	10	2	8	39
2010	11	0	5	21
2011	11	5	7	16
2012	6	4	3	18

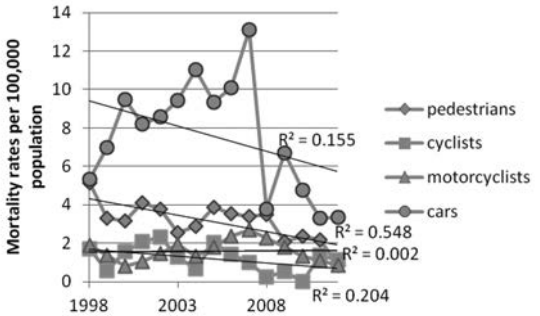

Fig. 4. Road traffic mortality rates per 100,000 population in Lithuania in boys aged 0-19 years (distribution according to road users) (1998-2012).

motorcyclists (R^2=0.002, p=0.876), no significant changes were determined. For boys in cars, mortality rates were increasing almost permanently up to 2007, followed by a sudden decrease, but linear regression showed no significant change (R^2=0.155, p=0.146) (Fig. 4).

For the female subgroup, linear regression showed significantly decreasing trends for pedestrians (R^2=0.533, p=0.002) and cyclists (R^2=0.24, p=0.05). No significant trends were shown for female motorcyclists (R^2=0.105, p=0.239). For female car occupants, an increase from 2004 to 2007 and then the sharp decline from 2007 was revealed, yet linear regression did not show a significant change (R^2=0.044, p=0.453) (Fig. 5).

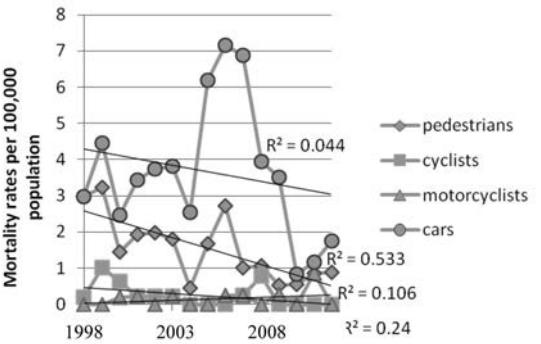

Fig. 5. Road traffic mortality rates per 100,000 population in Lithuania in girls aged 0-19 years (distribution according to road users) (1998-2012).

Discussion

The results of our study revealed that car occupants represent the majority of road traffic fatalities in children and young people aged 0-19 years in Lithuania (around half of the cases), followed by pedestrians (about one-fourth of all traffic deaths). Deaths among cyclists are much more common in males than females. Among motorcyclists, the distribution by gender was strongly dominated by boys.

The study shows that traffic injury death rates among boys exceeded that of girls by 2.5 times on average over the total study period. These findings are in line with other recent and earlier studies on injury mortality trends in transitional countries, where death rates in males are higher than in females, and where men are found more vulnerable to socioeconomic changes, macroeconomic fluctuations, and psychosocial influences[14,15].

Trend analysis of mortality rates among road traffic crashes was performed by linear regression. Our study showed that traffic injury mortality rates in Lithuania declined significantly in the age group 0-19 years over 15 years (1998-2012). Similar significant trends were observed in mortality trends from traffic crashes in the whole population. In all three Baltic countries (Lithuania, Latvia and Estonia), a significant decrease in traffic injury mortality rate trends in the whole population was observed (Fig. 6)[16].

The decreasing trends in traffic deaths rates, especially in pedestrians' mortality rates,

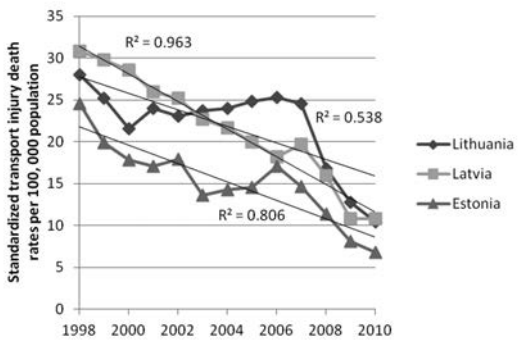

Fig. 6. Standardized transport injury death rates per 100,000 population (data from European Mortality Database (MDB). World Health Organization, Regional Office for Europe: http://data.euro.who.int/hfambd/).

are linked with safety promotion work, particularly public health teaching, education and information. Since its inception in 1995, the annual national traffic safety training/competition "Let's Save Young People's Lives on the Road" has annually involved 27,000 school children aged 7-19 years in 60 municipalities. The State Programs for Road Safety (approved in 2000 and 2005) were implemented, along with improvements in legislation, including speed restrictions, mandatory seat belt usage and child restraints. All these efforts may have been influential in the decrease in traffic injury mortality.

Decreasing traffic mortality trends were linked not only with safety promotion work, but also with reduced risk exposure during the economic recession in the country. For instance, for car injuries, a permanent increase was observed from the beginning of the study period in 1998 to 2007, and then a steep decline from 2007 until the present. One of possible explanations for the decrease from 2007 is the economic recession (along with decreased car usage). From the end of 2007 (4th quarter), GDP (gross domestic product) started to decline dramatically until the beginning of 2010 (from +11.1% in 2007 3rd to the -14.5% in 2009 4th)[17,18]. Economic changes may explain most of the sudden shifts in traffic mortality rates especially among young car occupants. The correlation between injury mortality and socioeconomic indices as well as relations between economic transitions and health and safety have been analyzed and discussed in previous studies[14,15,19,20].

Cycling is not very popular in Lithuania compared to other European countries. Traditions, unfavorable weather conditions most of the year, and lack of cycling routes may influence the popularity of this mode of transportation. Consequently, a low number of cyclists' deaths were recorded during the 15-year study period. The study results showed a significant decline in cyclists' mortality for the total group and for girls separately. For motorcyclists, the study results did not show any significant change in the total group or in male and female subgroups. Motorcyclists' deaths were almost totally dominated by boys, while this unsafe mode of transportation is not common among girls.

Our study confirmed that traffic injury mortality rates among children and adolescents are decreasing in Lithuania. Traffic mortality rates seem to be affected by the sustainable safety promotion efforts along with economic circumstances. Education and the creation of a safe environment, together with improved medical treatment, progress in emergency medicine, usage of modern intensive care equipment, and professional rehabilitation have contributed to the significant reduction in traffic injury deaths among children and young people. More attention should be given to road safety promotion among car occupants and motorcyclists aged 0-19 years.

A limitation of the study is the issue of data quality over time. The possibility of minimal mismatches is still possible, even if mortality data and statistical information in Lithuania are used by the World Health Organization and are generally considered reliable and internationally comparable[18,21,22].

In conclusion,

1. In children and adolescents aged 0-19 years, about one-half of those killed in road traffic crashes over 1998-2012 in Lithuania were car occupants, and about one-fourth were pedestrians. Boys died in road traffic crashes 2.5 times more frequently than girls.

2. During the study period, there was a declining trend in traffic injury mortality rates in the age group 0-19 years in the total group and in both subgroups (boys and girls).

3. Pedestrian and cyclist mortality rates declined significantly over the study period, while motorcyclist and car occupant mortality rates showed no significant changes.

4. A long-term decline is more likely to be affected by sustainable and permanent road safety promotion efforts. Reduced risk exposure may have been influenced as well by the economic recession.

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