

## Social dimensions of mortality from external causes in Lithuania: do education and place of residence matter?

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### Summary

**Objectives:** To assess inequalities in mortality from external causes by the level of education and the place of residence during the period of socio-economic transition in Lithuania.

**Methods:** Information on deaths, place of residence, and the level of education of persons aged 25 and older was derived from the National Database of Lithuania and censuses for 1989 (n = 3537) and 2001 (n = 4790).

**Results:** Mortality from external causes of Lithuanian urban and rural populations was strongly associated with the level of education. Educational inequalities increased throughout the period of socio-economic transition. In urban areas, mortality among the least educated population was 3.20 times higher in 1989 and 3.37 times higher in 2001, compared to those with university-level education. In rural areas the educational mortality rate ratios reached 3.47 and 4.33, respectively. The greatest educational inequalities were observed in suicide mortality, especially among males.

**Conclusions:** The results of this study disclosed increasing inequalities in mortality from external causes. Less educated populations, especially in rural areas, should receive particular attention in the development of strategies for the prevention of mortality from external causes.

**Keywords:** External causes – Mortality – Education – Urban/rural – Lithuania.

Tackling social inequities in health is a major challenge, identified in the strategies for reforming health systems in both industrialized and developing countries (WHO, 1999). Associations between health and the level of education have

been reported over time within different countries (Fox 1989; Kunst & Mackenbach 1994; Evans et al. 2001; Marmot & Wilkinson 1999; Huisman 2005). This issue is of particular importance in countries that are undergoing economic and political transition. In these countries, rapid political and economic changes greatly influence social, demographic, and health situations. Since the initiation of political and economic reforms in 1989, and after the collapse of the Soviet Union, the population of Lithuania has been exposed to a new and unfamiliar social environment and, consequently, experienced tremendous stress (UNICEF 1994; Keep 1995; Kalediene & Petrauskiene 2004(i)). Mortality from external causes in Lithuania is substantially higher than in other countries of Europe and is a leading cause of death among able-bodied males (WHO/Europe, HFA Database, 2004; Kalediene 2000). A most critical point for external cause-related mortality in Lithuania occurred in 1994, when, after the dramatic growth, an increasing trend in all-cause mortality reversed to a decreasing one, mainly due to a reduction in suicide mortality (Kalediene, Starkuviene & Petrauskiene 2004). Nevertheless, suicide mortality is still among the highest in the World (WHO/Europe, HFA Database, 2004). This is thought to be largely the result of economic challenges, relatively low living standards, and insufficient financing of health and social services. This grave public health problem requires particular attention and investigations into possible causes. However, accumulation of reliable data on income or occupational status is rather problematic in Lithuania. Such characteristics tend to change rapidly; furthermore, people do not willingly disclose such information about themselves on a candid basis. Therefore, measures based on the level of education can be used more reliably because such information is stored in national data banks, and tends to remain stable throughout the course of an individual's life, which does not apply to occupation or income. It is noteworthy that, unlike occupa-

tional class, the education level allows for the classification of unemployed individuals. Thus, the level of education on its own can be used as an important indicator of the population's socioeconomic position in Lithuania.

The aim of the study was to assess inequalities in mortality from external causes by the level of education and the place of residence (urban/rural) during the period of socio-economic transition in Lithuania. This is the first such study to have been performed in Lithuania to date.

## Methods

The analysis performed within the framework of this study involved the entire country. Information gathered on deaths was obtained from the National Database of Lithuania. 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-E807 and ICD-10 V01-V99), suicides and intentional self-harm (ICD-9: E950-959 and ICD-10: X60-X84), as well as homicides (ICD-9 E960-E978 and ICD-10 X85-Y09).

Records from the censuses of 1989 and 2001 provided data on the distributions of sex, age, and the place of residence in the population; the data were stratified according to the level of achieved education. The study included exclusively the population over 25 years of age, because it was likely that the younger age groups had not yet completed their educations, and thus the data on younger groups would not be reliable. The censuses of both 1989 and 2001 used the Lithuanian classification of educational degrees in order to define the achieved level of education. Since this classification of educational levels slightly differed between these two census periods, the educational groups of 1989 were adjusted to those of 2001 for this study, and mortality rates were recalculated by education for 1989, according to the new classification system. Our study employed four major levels of achieved education, as defined by Lithuanian regulations: 1) university education – graduates with diplomas or degrees from an institute or a university; 2) incomplete university, vocational, and secondary education – vocational or special technical schooling, secondary education with 11–12 years of school, or some university education with no degree of graduation; 3) incomplete secondary; and 4) primary or lower education – up to 4 years of school and no degree of graduation. The data were also analyzed with respect to the place of residence. Urban and rural populations were categorized on the basis of the Lithuanian classification supplied by the Lithuanian Department of Statistics; the categorization was as follows: 1) urban population – refers to those persons who live in cities and towns, i.e. in the population areas with closely built perma-

nent 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 signs of a town or a city (small towns, villages and steadings) (Statistics Lithuania 2002).

When calculating mortality rates, the numbers of those who died during a calendar year were used as the numerator and were classified by sex, age, place of residence, and educational level according to information on death certificates. Corresponding population numbers were used as the denominator (information was gathered from population censuses). Mortality rates were age-standardized, using the European standard, as recommended by the World Health Organization. The educational effect on mortality was explored using ratios of standardized rates. These ratios of standardized rates were assessed between different educational groups vs. mortality of overall Lithuanian population, as well as between those with primary or lower education vs. university education, and between years 2001 vs. 1989. Statistical analysis was performed using the statistical software package SPSS for Windows 10.0.

## Results

The population of Lithuania is relatively homogeneous in terms of most social factors, such as religious affiliation and migration patterns. Population size was rather stable throughout the period under investigation, totaling to 3.67 million inhabitants in 1989, and 3.48 million in 2001, with 2/3 of the population living in urban, and 1/3 in rural areas.

The figures of the level of education for the Lithuanian population changed in 2001 as compared to 1989. The proportion of the population with primary or lower education decreased: – from 25 % to 14 % among males, and from 35 % to 20 % among females, while the proportion of persons with secondary education increased up to 56 % among males, and to 53 % – among females. The increase was recorded in the proportion of population with university education (for males – up to 15 %, and for females – up to 17 %) in 2001.

Among the population aged over 25 years, 3 537 deaths due to external causes were registered in Lithuania (2 770 – among males, and 767 – among females) in 1989, while in 2001 this number increased up to 4 790 (3 748 – among males, and 1 042 – among females). The numbers of deaths and the age-standardized rates of mortality from external causes in different educational groups of the Lithuanian urban and rural populations are presented in table 1. In all educational groups of urban and rural populations mortality was higher in 2001 in comparison to 1989, with the exception of urban university-educated females, mortality of whom decreased throughout

**Table 1** Numbers of deaths and age-standardized mortality rates from external causes of Lithuanian urban and rural populations (over 25 years of age) of different educational groups (Lithuania, 1989 (n = 3537) and 2001 (n = 4790))

Education	1989				2001			
	Urban		Rural		Urban		Rural	
	No of deaths	Mortality/ 100 000	No of deaths	Mortality/ 100 000	No of deaths	Mortality/ 100 000	No of deaths	Mortality/ 100 000
<b>Males</b>								
University	90	82.54	25	131.86	178	138.15	54	235.38
Incomplete university/ vocational/secondary	700	212.30	411	289.71	1201	325.49	681	366.35
Incomplete secondary	364	330.92	380	586.82	504	670.55	462	688.69
Primary/lower	333	315.60	467	436.37	199	356.86	469	853.47
Total	1487	219.02	1283	378.61	2082	322.33	1666	484.45
<b>Females</b>								
University	27	42.30	5	23.78	52	30.98	13	67.20
Incomplete university/ vocational/secondary	164	55.24	79	68.20	310	65.86	133	69.78
Incomplete secondary	61	65.93	46	96.57	135	212.85	60	138.50
Primary/lower	207	53.50	178	63.39	135	155.79	204	276.04
Total	459	55.13	308	72.99	632	72.65	410	95.60

the study period. External cause mortality in rural areas was higher than that in urban in all educational groups, apart from females with university education in 1989 and incomplete secondary education in 2001, whose mortality was higher in urban areas.

In 1989, in the structure of external cause mortality, suicide – the most important external cause of death – accounted for 26.6% of deaths in males, and for 21.8% – in females. In 2001, during the study period, the proportion of suicides increased up to 29.8% among males, and up to 24.6% – among females. In 2001, traffic accidents were the second leading cause, amounting to 13.3% of deaths for males, and to 14.9% for females. The proportion of traffic accidents among all external causes of death decreased considerably over the entire period under investigation. Within the structure of the external causes mortality for 2001, the changes in the incidence of homicides (totaling 5.9% for males, and 8.0% – for females), were small, comparing to the data for 1989.

The comparison between mortality from external causes in urban and rural populations by different educational groups, and mortality from external causes in overall Lithuanian population of over 25 years is presented in table 2. In 1989 and 2001, mortality among males and females with incomplete secondary education residing in the urban and rural areas exceeded those of overall Lithuanian population of the corresponding demographic groups (i.e. age, sex, place of residence). Even though mortality from external causes in the least educated urban and rural populations in 1989 did not

**Table 2** Comparison of mortality from external causes of Lithuanian urban and rural populations of different educational groups with mortality from external causes of the Lithuanian population (denominator is the mortality from external causes of the Lithuanian population) (Lithuania, 1989 (n = 3537) and 2001 (n = 4790))

Education	Ratios of Standardized Mortality Rates			
	1989		2001	
	Urban	Rural	Urban	Rural
<b>Males</b>				
University	0.38	0.35	0.43	0.49
Incomplete university/ vocational/secondary	0.97	0.77	1.01	0.76
Incomplete secondary	1.51	1.55	2.08	1.42
Primary/lower	1.44	1.15	1.11	1.76
<b>Females</b>				
University	0.77	0.33	0.43	0.70
Incomplete university/ vocational/secondary	1.00	0.93	0.91	0.73
Incomplete secondary	1.20	1.32	2.93	1.45
Primary/lower	0.97	0.87	2.14	2.89

differ much from that in the general Lithuanian population, marked inequalities were observed for rural males as well as for urban and rural females in 2001. The ratio of standardized rates among males in the lowest educational groups amounted to 1.76, and among females – to 2.89 vs. the respective mean

**Table 3** Comparison of mortality from major external causes of Lithuanian urban and rural populations with primary/lower and university education (denominator is the mortality of the university education group) (Lithuania, 1989 (n = 3537) and 2001 (n = 4790))

Causes of death	Ratios of Standardized Mortality Rates			
	1989		2001	
	Urban	Rural	Urban	Rural
<b>Males</b>				
All external causes	3.82	3.31	2.58	3.63
Suicides	8.41	4.76	3.66	6.25
Traffic accidents	1.99	1.73	1.99	2.65
Homicides	2.27	No case of homicide in university education group	1.99	1.50
<b>Females</b>				
All external causes	1.26	2.67	5.03	4.11
Suicides	4.34	0.81	1.08	5.74
Traffic accidents	0.71	1.97	5.14	5.42
Homicides	1.47	No case of homicide in university education group	16.12	No case of homicide in university education group

value for Lithuanian rural populations. The mortality among higher-educated, especially university-educated urban and rural males and females was lower in comparison to the total Lithuanian urban and rural population in 1989 and 2001.

Mortality from external causes in Lithuanian urban and rural populations differed considerably by the educational level. In urban areas, the mortality ratio of the group with primary education vs. university-educated population was 3.20 in 1989, and 3.37 in 2001, while in rural areas the ratio of standardized mortality rates correspondingly reached 3.47 in 1989, and 4.33 in 2001.

Inequalities in mortality due to major external causes of death by the level of education are presented in the table 3, where mortality in the group with university education is used as a reference. Among males and females, educational inequalities for external cause mortality were observed both in urban and rural areas. The greatest ratios of standardized rates were observed in suicides among males. In urban males, age-standardized suicide mortality in the least educated group exceeded more than eight times that in the group of the university-level education in 1989, and by more than three times in 2001. Suicide mortality ratio of low-educated rural population vs. population with university education increased to 6.3 in males and 5.74 in females in 2001. Educational disparities in mortality from traffic accidents in rural males as well as in urban and rural females increased. Extremely high ratio of homicide mortality rates in urban females in 2001 could be caused by small number of cases.

We compared the age-standardized external cause mortality rates by education and the place of residence in 2001 with those in 1989 (mortality in 1989 was used as a reference

**Table 4** Comparison of changes in mortality from external causes of Lithuanian urban and rural populations of different educational groups in 2001 with mortality from external causes in 1989 (denominator is the mortality from external causes in 1989) (Lithuania, 1989 (n = 3537) and 2001 (n = 4790))

Education	Ratios of Standardized Mortality Rates	
	Urban	Rural
<b>Males</b>		
University	1.67	1.79
Primary/lower	1.13	1.96
<b>Females</b>		
University	0.73	2.83
Primary/lower	2.91	4.35

group) (Table 4). Changes in mortality from all external causes throughout the study period were not uniform in different educational groups. The most obvious increase was noted in the rural populations for the lowest education level: the mortality ratio among males in 2001 vs. 1989 was 1.96, while among females 4.35; whereas changes in mortality were smaller in urban areas. Among those with university education, mortality increased both in urban and rural areas, except for that among urban females which became lower in 2001, compared to 1989.

### Discussion

This is one of the few studies performed in the Eastern part of Europe that analyses the changes of inequalities in mortality

while combining the major social variables. Similar findings were reported in the survey on health inequalities in Estonia, which demonstrated growing educational differences in mortality (Kunst et al. 2002). Nonetheless, the novelty of our survey lies in the analysis of both educational and residential inequalities in mortality from external causes. The assessment of the socio-economic status in the countries of transition is rather complicated due to limited availability of data. Therefore, the level of education and the place of residence were used as a proxy for the socio-economic status.

The explanatory factors through which socio-economic status influences the risk of dying from external causes are complex. Explanations of educational and urban/rural inequalities in health can be elaborated at several levels. Such models emphasizing cultural, economic, material, and psychosocial factors, have all been substantiated (Wilkinson 1996; Macintyre 1997; Graham 2000). The evidence of considerably higher mortality within the same educational groups in rural areas, particularly among males, points to the living environment as a very important determinant of health. Individual socio-economic position may not protect the health of people who are better off if they live in socio-economically disadvantaged environments. Mortality from external causes has the most plausible link to the socio-economic environment of the community, compared to other causes of mortality. Urban or rural residence impacts on the rate of external causes mortality, partly due to the exposure to different risks. It seems that people from rural areas (particularly the low-educated) experience lesser opportunities for safety, and lesser opportunities for the avoidance of risks.

One of the most common explanations of widening health inequalities is the difference in health-related behaviors. Identification of social inequalities in mortality from external causes focuses attention on a particular risk factor – alcohol. The issue of alcohol as playing the major role in fluctuating mortality and health inequalities in Lithuania has been widely discussed (Leon et al. 1997; Kalediene & Petrauskiene 2004(i)). The role of alcohol in suicides is obvious (Kalediene & Petrauskiene 2004 (ii)). The binge drinking culture that exists in Lithuania, as well as the growth of alcoholism rank among the most distressing social problems directly related to the mortality from external causes. Indirect observations suggest that low-educated and rural populations experience greater social stress, which might contribute to a higher prevalence of unhealthy lifestyles and, consequently, to higher risk for destructive behaviors.

There is no doubt that “material” factors, such as low income (which is more common among low-educated and rural populations) are a part of the explanation (Graham 2000). In rural areas, the economic situation is generally worse. The largest

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proportion of households living in good or excellent conditions is concentrated in the cities (WHO 1998). The same applies to higher-educated population moving to the cities, serving as engines of economic growth. The organization of work and occupational exposure might be another dominant set of explanatory factors. Alienation, job control, and strain, as well as physical hazards associated with working conditions, have been shown to be contributors to injuries (Shannon, Robson & Sale 2001). Psychosocial factors might also play an important role (Wilkinson 1996). These factors are one set of variables that may account for socio-economic inequalities in mortality from external causes, e.g., poverty stressors and intentional injuries, unemployment-related social isolation, and suicide.

Lithuania, like other countries in transition, experienced certain factors that had the potential for increasing the risk of mortality from external causes (a sudden increase in motor vehicles and consequent traffic, uncontrolled accessibility to drugs, inefficient policing of crime, etc.). Different political systems may encourage different forms of response to injuries: the centralized political system of former Soviet Union did not provide a ground for the development and engagement of civil social organizations, which should be required in order to put the issues of safety on the agenda, while rapid decentralization resulted in distrust and the lack of readiness to manage the changing environment.

It is thought that inequalities in health can disappear with greater economic prosperity and the development of a welfare state. Because of a generally improving standard of living in Lithuania (WHO/Europe, HFA Database, 2004), the expectation was that social differences in mortality would diminish. In the context of reforms, the evidence on educational and urban/rural stratifications in health suggests quite clearly that, although mortality started to decline in Lithuania, it did not decline equally for all. However, educational inequalities in mortality among urban and rural populations widened during the period of transition, especially for males, and mainly due to the more rapidly increasing mortality from external causes among the lowest-educated rural populations.

Numerous socio-economic problems and even political instability resulted in delays and deviations from the implementation of the health policy in Lithuania. The Lithuanian Health Program was first adopted by the Parliament in 1998, with specific objectives and targets on equity in health and health care (Lithuanian Health Program 1998). In addition to that, in 1998, the National Board of Health (the highest-level institution coordinating health policy and accountable to the parliament) presented the first annual report to the parliament, focusing on inequalities in health (National Board of Health of Lithuania 1998). Thus, the problem of inequalities in

health is finally on the political agenda. However, economic constraints, the lack of inter-sector cooperation, and frequent changes in government have not allowed for a more systematic implementation of the strategies and for the reduction of inequalities in health.

### Limitations

External causes (especially suicides) are rather specific causes of death, which may be masked by other causes due to either complicated identification of some cases or the sensitivity of the society to such diagnosis. The analysis of the reliability of the statistics of suicide in the republics of the former Soviet Union during the period of 1970–1990 demonstrated that suicide mortality statistics were reliable in the Baltic countries (Wasserman & Varnik 1998). Nevertheless, in general, suicide mortality data can underestimate the real number of such cases – suicide can be voluntarily hidden to avoid stigmatization, for social convenience, or because it was masked as an accident or an undetermined cause of death. On the other hand, it can be suspected that some homicides could be masked by the diagnosis of suicide due to inability to disclose the real circumstances. However, studies on the reliability of statistics for external causes of mortality have only recently been initiated in Lithuania.

Education as a socioeconomic indicator also has several disadvantages. Individuals usually achieve their final education early in adult life, and thus their educational level might not accurately indicate their current socioeconomic position. The Lithuanian statistical system permits a study of differentials in mortality according to educational status using death certificates and population censuses, since the distribution of population by the level of education can only be obtained from these sources. The evaluation of mortality by education, based on routine statistics, has an important shortcoming since it does not guarantee accurate correspondence of the data on the population with the data on deaths, because the mortality information received from the relatives of a deceased person may differ from self-identification on the census questionnaires (Valkonen 1993). The problem of biases has been studied in Great Britain (Goldblatt 1989). It has been suggested that such biases are unlikely to seriously distort estimates of the social class effects when a few broad socioeconomic categories are used (Marmot & McDowal 1986). Unfortunately, we were not able to link individual data on deaths to individual data from censuses, since this level of information is unavailable in Lithuania. This was the

reason for choosing broad categories of education levels and the place of residence for this study. However, surveys on the accuracy of census data and mortality information received from the relatives of deceased persons have never been performed in Lithuania.

In summary, this study adds to the growing evidence of inequalities in health, nevertheless the situation requires more extensive studies of this negative phenomenon. In order to advance the understanding of the reasons of inequalities in mortality from external causes beyond the basic level, it is necessary to initiate in-depth research surveys. Although, at an aggregate level, it is impossible to disclose the reasons of inequalities in mortality from external causes, the findings of this study are helpful for the determination of the gap between the most and the least advantaged groups of society, for identifying the populations at the greatest risk, and for suggesting hypotheses concerning the etiology of mortality from external causes, which is inevitable for the development of effective preventive programs.

### Conclusions

This study revealed the changes in educational level, and mortality from external causes in relation to education during the period of rapid socio-economic transition, and disclosed the unfavorable situation of growing disparities in mortality, especially in rural areas, where educational inequalities increased with relation to all major external causes of death. It has been demonstrated that the rates of mortality related to external causes are very strongly associated with the socioeconomic status as measured by educational achievement. It became apparent that groups that are most disadvantaged in education suffered considerably in terms of the increasing mortality rates reported.

On the basis of the considerations discussed in this study, the conclusion is that some negative changes in the pattern relevant to education, among young members of the population, and considerably increasing mortality among persons with the lowest education level predict increasing inequalities in mortality from external causes in the nearest future. Therefore, low-educated groups, as well as rural population, should be highlighted for particular attention in the development of policies for the prevention of mortality from external causes, especially suicides and traffic accidents. Hopefully, with the society entering a higher stage of social and economic development, inequalities in mortality related to external causes will gradually level off, resulting in the decline in mortality.

## Zusammenfassung

### Soziale Dimensionen der Mortalität aufgrund äusserer Einflüsse in Litauen: spielen Bildung und Wohnort eine Rolle?

**Fragestellung:** Die Ungleichheit bezüglich der Sterblichkeit aufgrund äusserer Einflüsse nach Bildung und Wohnort während der sozio-ökonomischen Übergangszeit in Litauen sollte untersucht und beurteilt werden.

**Methoden:** Angaben zu Todesfällen, Wohnort und Bildungsstand von Personen von 25 Jahren oder älter wurden anhand der National Database of Lithuania und der Volkszählung von 1989 (n = 3 537) und 2001 (n = 4 790) erhoben.

**Ergebnisse:** Die Mortalität aufgrund äusserer Einflüsse in der litauischen städtischen und ländlichen Bevölkerung stehen in einem deutlichen Zusammenhang mit dem Bildungsstand. Bildungsbedingte Ungleichheiten nahmen während der sozio-ökonomischen Übergangsphase zu. In urbanen Gebieten war die Sterblichkeit bei den am wenigsten Ausgebildeten 1989 3,2-mal und 2001 3,37-mal höher als jene der akademisch Gebildeten, während in ländlichen Gebieten die bildungsbezogenen Sterblichkeitsraten bei Faktor 3,47 beziehungsweise 4,33 lagen. Die grössten bildungsmässigen Ungleichheiten wurden bei Suiziden festgestellt, insbesondere bei Männern.

**Schlussfolgerungen:** Die Resultate dieser Studie zeigen eine zunehmende Ungleichheit bezüglich der Sterblichkeit aufgrund äusserer Einflüsse auf. Weniger gebildeten Bevölkerungsteilen, besonders in ländlichen Gebieten, sollte besondere Aufmerksamkeit zuteil werden bei der Entwicklung von Präventionsstrategien bezüglich der Sterblichkeit aufgrund äusserer Einflüsse.

## Résumé

Dimensions sociales de la mortalité due à des causes externes en Lituanie: effets de l'éducation et du lieu de résidence

**Objectifs:** Estimer les inégalités de mortalité due à des causes externes selon le niveau d'éducation et le lieu de résidence durant la période de transition économique en Lituanie.

**Méthodes:** Données concernant les morts, les lieux de résidence et le niveau d'éducation de personnes âgées de 25 ans et plus. Données tirées de la Base de Données Nationale de Lituanie et des recensements pour les années 1989 (n = 3 537) et 2001 (n = 4 790).

**Résultats:** La mortalité due à des causes externes dans les populations urbaines et rurales de Lituanie était fortement associée avec le niveau d'éducation. Les inégalités en matière d'éducation se sont creusées durant la période de transition économique. Dans les zones urbaines, la mortalité des populations les moins éduquées était en 1989 3.20 fois et, en 2001, 3.37 fois plus élevée que celle des personnes bénéficiant d'une formation de niveau universitaire. Dans les régions rurales, la mortalité était respectivement 3.47 et 4.33 fois plus élevée. Les inégalités sociales les plus importantes ont été observées pour la mortalité par suicide, particulièrement chez les hommes.

**Conclusions:** Les inégalités pour la mortalité due à des causes externes sont en augmentation: les populations les moins éduquées, particulièrement dans les régions rurales, devraient bénéficier d'une attention particulière lors du développement de stratégies de prévention.

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