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Diminishing Trend in Alcohol Poisoning Mortality in Estonia: Reality or Coding Peculiarity?

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Abstract — Aims: To examine whether the changes in coding practice could reduce alcohol poisoning mortality rates in Estonia.

Methods: Individual death records in 1983–2009 (age at death 25–64) were used to calculate the 3-year moving averages of age-standardized mortality rates. From 2000 onwards, there was a sharp increase in mortality from mental disorders due to alcohol, and at the same time a remarkable decrease in alcohol poisoning mortality. We calculated expected alcohol poisoning mortality rates for 2000–2009, assuming that mortality rate ratio of alcohol poisoning and mental disorders due to alcohol remained stable. Results: Alcohol poisoning mortality rates fluctuated considerably, being the lowest in 1988 and the highest in 1994–1995. A sharp decline started in 2000. Expected alcohol poisoning mortality rates continued their growth from 2000 onwards with a small decrease in 2006–2009. Mortality rates of mental disorders due to alcohol followed the same curve as alcohol poisoning rates up to 1999, being roughly 10 times lower than alcohol poisoning rates in both genders. From 2000 onwards, mortality from mental disorders due to alcohol increased rapidly, exceeding alcohol poisoning mortality in 2006. Conclusion: This study demonstrates an obvious mis-classification in coding of alcohol poisoning and mental disorders due to alcohol as underlying causes of death in the Estonian Causes of Death Registry.

INTRODUCTION

Estonia has been internationally newsworthy with problems connected to alcohol, such as alcohol-related deaths, the amount of alcohol consumed and cheap alcohol prices (BBC News, 2001, 2007; YLE News, 2010). Inarguably, excessive drinking causes harm to Estonian society (Lai et al., 2007; World Health Organization, 2010), although we find different figures on alcohol consumption, Estonia belongs to the ‘top five’ in Europe. Data on alcohol consumption were not collected by the same method in the two most recent time periods—the Soviet era and the re-independence period. The only comparable data that are published (Estonian Institute of Economic Research, 2010) are for the short time interval 2002–2009 (Fig. 1). To assess the prevalence of and time trends in harmful drinking, the most reliable and simply calculable estimates are alcohol-related mortality rates; these are sensitive to the changes in population drinking patterns (Norström and Ramstedt, 2005; Rehm et al., 2010). We observed an obvious downward trend in alcohol poisoning mortality (associated with heavy episodic drinking) in Estonia from 2000 onwards (Fig. 1). Could we be happy with this salutary development? At the same time, we also see a considerable increase in alcoholic liver cirrhosis mortality (Pärna and Rahu, 2010), which is known as the key indicator of volume of drinking in the population (Norström and Ramstedt, 2005; Ramstedt, 2007).

This study investigated whether the recent fall in alcohol poisoning mortality rates in Estonia can be accounted for by changes in coding practice.

METHODS

Individual death records were obtained from the Estonian scientific mortality database created by the Statistics Estonia and the National Institute for Health Development, including deaths recorded in Estonia from 1983 to the present. This is based on entries into the Estonian Causes of Death Registry (Vabariigi Valitsus, 2007). But differently from the latter, it combines death records from single time periods into a unified database with harmonized codes for major variables (Rahu et al., 2006).

Time trends in accidental alcohol poisoning, and mental disorders due to alcohol, as underlying cause of death were compared, to explore whether these trends were similar or divergent. During the study period (1983–2009), the classification for coding causes of death has been changed twice: an abridged Soviet classification (USSR State Committee of Statistics, 1980) was replaced by ICD-9 (World Health Organization, 1997) in 1994, and ICD-9 was replaced by ICD-10 (World Health Organization, 2004a) in 1997. Codes used for alcohol poisoning were 165 (1983–1987), 163 (1988–1993), E860 (1994–1996) and X45 (1997–2009). In order to ensure comparability of mortality rates over the whole study period, we included codes 73 and 75 (1983–1993), 291, 303 and 305.0 (1994–1996), and F10 and G31.2 (1997–2009) for mental disorders due to alcohol. Approximately for 1% of the records in the mortality database, the underlying cause of death was unknown. Among those could have been some cases related to our study.

In the Estonian Causes of Death Registry, for coding causes of death, the ACME (Automatic Classification of Medical Entities) software (Lu, 2003) and manual coding are used in parallel. For selecting the underlying cause of death, a mortality coder makes the final decision based on death certificate information, ACME software suggestion, and personal knowledge and experience.

In our study, in 26 death records, code F10.0 (acute intoxication by alcohol) has been changed to X45 as recommended by the World Health Organization (WHO) in 2002. According to WHO, F10.0 is included in the list of codes not to be used as underlying cause of death (World Health Organization, 2009). When the fourth digit was not

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coded in the death record (54 cases of F10), it was checked in the archives of paper death certificates.

We calculated age-standardized mortality rates for 1983–2009 with the European standard population (Waterhouse et al., 1976). Age was restricted to 25–64 years because there were only single cases beyond this age range. To smooth out short-term fluctuations, age-standardized rates for 3-year moving overlapping periods were used (2-year period for the beginning and the ending year).

There occurred since 2000, a simultaneous sharp increase in mortality from mental disorders due to alcohol, and a decrease in alcohol poisoning mortality. Considering this, we calculated expected alcohol poisoning mortality rates for the time period 2000–2009 on an assumption that mortality rate ratio of alcohol poisoning and mental disorders due to alcohol remained stable, and taking into account the combined mortality rate of both causes. The average mortality rate ratio (9.9 for men and 11.5 for women) in the preceding time period, when ICD-10 was already in use (1997–1999), was applied.

RESULTS

During 1983–2009, 4163 deaths from accidental alcohol poisoning in men and 1138 in women were registered. In addition, there were 1180 deaths from mental disorders due to alcohol in men and 331 in women. Alcohol poisoning formed a significant part of deaths due to external causes—13.5% in men and 16.5% in women.

Fig. 1. Trends in the age-standardized mortality rates (ASMR, European standard population; 3-year moving averages) for alcohol poisoning in Estonia 1983–2009, and alcohol consumption per capita 2002–2009. Key events in Estonian society influencing alcohol poisoning mortality: A—Gorbachev’s anti-alcohol campaign (Reitan, 2001); B—singing revolution (Thomson, 1992); C—regaining Estonian independence (Reitan, 2000); D—economic collapse, the lowest gross domestic product seen in the independent Estonia (United Nations Children’s Fund, 2006); E—stock market crash (Chen et al., 2006); F—methanol tragedy in South-West Estonia (Paasma et al., 2007); G—sharp economic growth, unemployment rate 4.7% in 2007 (European Commission, 2010); H—breakdown in economy, unemployment rate 13.8% in 2009 (European Commission, 2010).

Fig. 2. Trends in the ASMR (European standard population; 3-year moving averages) for alcohol poisoning and mental disorders due to alcohol in Estonia 1983–2009, age 25–64 years, men.
Alcohol poisoning mortality rates fluctuated considerably in both genders, being the lowest in 1988 and the highest in 1994–1995 (Figs 2 and 3). A sharp decline started in 2000 and the same 1988 level was achieved by the end of the study period. In general, mortality rates in men were five times higher than in women. Expected alcohol poisoning mortality rates continued their growth from 2000 onwards, with a small decrease in 2006–2009.

In both genders, mortality rates of mental disorders due to alcohol followed the same curve as alcohol poisoning mortality rates up to 1999, but were roughly 10 times lower than the latter (Figs 2 and 3). Mortality from mental disorders due to alcohol was extremely low in women in 1988–1992. From 2000 onwards, mortality rates steeply climbed up and exceeded alcohol poisoning rates in 2006. This rapid increase did not coincide with the changeover from ICD-9 to ICD-10 in 1997. In 2000–2009, 86.7% of deaths from mental disorders due to alcohol were coded as alcohol dependence syndrome (F10.2) as underlying cause of death, and 79.5% of these death certificates were issued by the forensic pathologists.

DISCUSSION

How to interpret the ups and downs in alcohol poisoning mortality? Generally, alcohol poisoning mortality followed the curve of overall mortality (Rahu et al., 2009) (Fig. 1): Gorbachev’s anti-alcohol campaign in 1985 (Reitan, 2001) had a direct effect on alcohol poisoning mortality; the Singing Revolution (1988–1991)—the period full of positive emotions and great hopes for the future (Thomson, 1992)—kept alcohol poisoning mortality low; regaining independence in 1991 brought along a turmoil of changes in Estonian society (Reitan, 2000), and high alcohol poisoning mortality; the peak was reached in 1994, after the year of the lowest gross domestic product seen in independent Estonia (United Nations Children’s Fund, 2006); in 1997, there was a local stock market crash (Chen et al., 2006) that shook the economy; a second peak in alcohol poisoning mortality was connected to the methanol tragedy in South-West Estonia in 2001 (55 methanol poisoning deaths in the age 25–64) (Paasma et al., 2007) (Fig. 1). It is tempting to explain the downward trend in the last decade, implying optimism, by steady economic growth. But contradictory data about the association between alcohol-related mortality and economic cycles have been published in neighbouring Finland (Mäkelä, 1999; Johansson et al., 2006).

However, the solution probably lies beyond the societal changes and the population’s drinking habits. Although based on rough data and a simplified approach, our study demonstrates an obvious misclassification of coding accidental alcohol poisoning and mental disorders due to alcohol as the underlying cause of death in the Estonian Causes of Death Registry from 2000 onwards. The mortality rate ratio of alcohol poisoning and mental disorders due to alcohol was stable up to 1999, but next to here was a trend in the opposite direction, which seems unlikely to reflect reality. Expected alcohol poisoning followed the curve of alcohol consumption better than the observed alcohol poisoning. It seems that altered coding practice improved the data on alcohol poisoning mortality trends.

The limitation of our work includes our inability to be sure that alcohol poisoning rates are underestimated only because X45 is coded as F10.2, but extremely high mortality rates of mental disorders due to alcohol (mostly F10.2) have made the problem visible. There are several ways in which alcohol poisoning can be hidden behind other underlying causes of death. For example in Russia, examining forensic autopsy records revealed that diseases of the circulatory system have been preferred to alcohol poisoning in selecting underlying cause of death (Zaridze et al., 2009b).

The problem of misclassification of alcohol poisoning in mortality statistics is widely recognized. A coding practice similar to that used in Estonia—alcohol dependence syndrome (F10.2) as underlying cause of death instead of alcohol poisoning (X45)—existed in Finland during the first 2 years of implementing ICD-10, and was clearly evident from the alcohol poisoning mortality trends (Lahti and Vuori, 2002; Kivistö et al., 2008). Although, ‘most typically,
acute alcohol poisoning is a complication of chronic alcoholism; an unaccustomed drinker usually does not reach a lethal level of blood alcohol concentration’ (Lahti and Vuori, 2002, p. 208). Norway admitted the problem of coding X45 as F10.0 in 1996–2002, if acute alcohol poisoning and chronic alcoholism were both certified. After the WHO recommendations in 2002, these deaths were transferred to X45 in the Norwegian Causes of Death Registry (Statistics Norway, 2009). In the Anamort project (Analysis of injury related mortality in Europe) using mortality data from 33 European countries in 2005–2008, it was found thatbiased selection of underlying cause of death reduced the alcohol poisoning mortality in most countries (Belanger and Ung, 2008). Yoon et al. (2003) reported that in the USA, alcohol poisoning deaths could have been misclassified as other alcohol-related causes, thus resulting in under-estimation of related mortality rates. Although this misclassification issue is addressed by WHO and Nordic experts (Nordic Centre for Classifications in Health Care, 2004; World Health Organization, 2004b, 2009), it still persists and even deepens in Estonia.

In a comparative study of external causes of mortality trends in the Baltic countries (Estonia, Latvia and Lithuania), validity of coding is considered to be good and stable in the period 1970–1997 (Värnik et al., 2001). It is known that the changeover to another revision of ICD causes discontinuities in mortality trends (Janssen and Kunst, 2004), but in the case of Estonia, changes in coding practice did not coincide with the application of ICD-10 in 1997. There was a 3-year lag time.

When abstracting the death certificates to obtain a missing fourth digit, we observed two mechanisms of under-coding alcohol poisoning. First, if the certifier had reported chronic alcoholism (instead of poisoning) on the death certificate, it was selected as an underlying cause of death, and queries were not sent out, although most of the deaths from mental disorders due to alcohol have passed through forensic examination, and the cause of death should have been well established. Second, not sufficient attention was paid to ‘heavy drunkenness’ in combination with some other condition on the death certificate.

On the other hand, additional cases of mental disorders due to alcohol arose when the code F10.2 was preferred in the following situation: alcoholic liver cirrhosis (K70) and renal failure (or alcoholic cardiomyopathy) were certified on the same line, and chronic alcoholism on the other one. In the WHO guidelines, it is clearly stated that: (a) if there is no reported sequence, the first-mentioned condition must be selected; (b) F10 with mention of K70—select K70 as underlying cause of death (World Health Organization, 2004b), meaning that F10 is a contributory cause (not an underlying cause) of death. Consequently, these cases must have been coded as K70 not F10.2. Taking this circumstance into account, registered high mortality rates of alcoholic liver cirrhosis in Estonia (Pärna and Rahu, 2010) should have been even higher.

In order to make Estonian mortality data internationally more comparable, a validation study of death certificates, like in other countries (Johansson and Westerling, 2000; Lu et al., 2000; Lahti and Penttilä, 2001; Harteloh et al., 2010; Winkler et al., 2010), has to be conducted. In the present situation, we can only group together mortality from alcohol poisoning and mental disorders due to alcohol, and call it ‘alcohol poisoning’ as in the study by Zaridze et al. (2009a).

In relation to the misclassification, mortality from external causes in the recent years is also under-estimated, as alcohol poisoning still forms a considerable part of it in Estonia. Our study points out how important it is to monitor continuity in mortality time trends, especially after the changeover to a new revision of ICD.

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