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# Average Volume of Alcohol Consumption, Drinking Patterns and Related Burden of Mortality in Young People in Established Market Economies of Europe

Jürgen Rehm<sup>a-c</sup> Gerhard Gmel<sup>d</sup> Robin Room<sup>e</sup> Ulrich Frick<sup>f</sup>

<sup>a</sup>Addiction Research Institute, Zürich, Switzerland; <sup>b</sup>Centre for Addictions and Mental Health, Toronto, Ont., and <sup>c</sup>Department of Public Health Sciences, University of Toronto, Ont., Canada; <sup>d</sup>Swiss Institute for the Prevention of Alcohol and Other Drug Problems, Lausanne, Switzerland; <sup>e</sup>Stockholm University, Stockholm, Sweden, and <sup>f</sup>University of Regensburg, Germany

## Key Words

Alcohol · Average consumption · Patterns of drinking · Unrecorded consumption · Mortality · Young people · Europe

## Abstract

**Objective:** To determine the burden of mortality in young people (age 15–29) in established market economies in Europe in 1999, which is attributable to alcohol consumption. Two dimensions of alcohol consumption were considered: average volume of consumption, and patterns of drinking. **Methods:** Mortality data were obtained from the WHO EIP data bank, average volume data from the WHO global databank on alcohol, pattern of drinking data from a questionnaire sent out to experts, from the published literature and from the WHO global databank. Methods are explained and discussed in detail in two other contributions to this volume. **Results:** More than 8,000 deaths of people aged 15–29 in Europe in 1999 were attributable to alcohol. Young males show a higher proportion of alcohol-attributable deaths (12.8%) than females (8.3%). Both average volume and patterns of drinking contribute to alcohol-related death. **Conclusions:** Alcohol-related deaths constitute a considerable burden in young people in Europe.

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## Introduction

Alcohol is a major risk factor for mortality, which in 1990 accounted worldwide for more disease burden than tobacco or illicit drugs [1]. Many alcohol-related causes of death occur relatively early in life [1, 2]. This article tries to estimate the alcohol-related mortality for young people in established market economies in Europe for the year 1999. Consistent with definitions for the WHO-EU Stockholm conference of 2001, young people were defined as being between 15 and 29 years of age.

Alcohol has causal relations to more than 60 disease consequences [2–5]. These relations concern chronic and acute outcomes, which are in part beneficial [6] and in part detrimental, and which depend on the average volume of alcohol consumed as well as on other aspects of drinking usually summarized as ‘patterns of drinking’ [7].

Patterns of drinking are in particular related to accidents and injuries [2, 8, 9]. In addition, pattern-related assessment measures of alcohol consumption have been shown to be more substantially associated with mortality and other forms of alcohol-related harm than pure volume measures [10]. Thus, alcohol epidemiologists have repeatedly made a case for the inclusion of patterns into studies involving alcohol as a risk factor [11, 12].

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Prof. Dr Jürgen Rehm  
Addiction Research Institute  
Konradstrasse 32, PO Box  
CH–8031 Zürich (Switzerland)  
E-Mail [jtrehm@isf.unizh.ch](mailto:jtrehm@isf.unizh.ch) or [jtrehm@aol.com](mailto:jtrehm@aol.com)

Consequently, patterns of drinking were included in the current analyses. Patterns can be seen as a weighting factor, which modifies the influence of average volume on mortality and other disease outcomes. Unfortunately, whereas there are series on meta-analyses on the influence of the average volume of alcohol consumption on different causes of mortality [2–4], nothing comparable exists for patterns. The reason for this gap may be the recency of the discussion on the influence of patterns of drinking on mortality [7], so that most medical epidemiological studies published have not yet included measures for patterns [13, 14]. To derive a pattern weight for this study despite these problems, an aggregate-level analysis was performed on data from European countries. A recent paper by Rehm and Gmel [15] gives a detailed description of the rationale and theoretical underpinnings of this analysis. The contribution of Gutjahr et al. [5] in this volume compares the results of several statistical methods for undertaking this analysis.

## Methods

### Data

In order to arrive at estimates of the proportion of deaths attributable to alcohol, the following data elements are necessary: (1) mortality data for established market economies in Europe for 1999 by sex and cause of death; (2) an estimate of the relative risk of cause-specific mortality associated with the average volume of consumption; (3) an estimate of the average volume of consumption for each country, and (4) a pattern weight for each country, e.g. a factor modifying the influence of average volume.

Mortality data were obtained from the WHO EIP mortality databank. Estimates of relative risk were taken from the Swiss cost study [4], which itself was based on English et al. [3] and Single et al. [2]. Per capita consumption served as an indicator for the average volume of alcohol consumption. Per capita data were taken from the Global Database on Alcohol [16]. Patterns of drinking data were taken from a survey on relevant drinking characteristics of key informants by WHO in 2000 [17] (the questionnaire is reproduced in appendix 1 of this volume).

The data on patterns of drinking were statistically analyzed by means of optimal scaling analysis [18]. The procedure is described in detail in the contribution of Rehm et al. [17] in this volume. For patterns of drinking on the basis of our data, one dimension was identified which we labelled 'detrimental impact of patterns'. Countries could be quantitatively scaled on this variable. Based on these scale values, the countries were classified into quartiles and assigned values from 1 (lowest impact) to 4 (highest impact). Countries without pattern data were estimated based on regional proximity and cultural similarity and the results were made available on the WHO list-serve to allow experts to discuss and critique our results (see also appendix 2 for a revised document containing information on more countries). The revised pattern values were then entered into statistical analyses to determine the pattern weight. These analyses are described in detail elsewhere [17].

For the overall estimate (table 1) for all established market economies in Europe, all countries with data available were combined. Established market economies in Europe were defined in accordance with the WHO definition for the World Health Report, based on clustering adult and child mortality rates around the world [19]. The following EURO A (very low child and very low adult mortality) countries were included: Andorra, Austria, Belgium, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxembourg, Malta, Monaco, Netherlands, Norway, Portugal, San Marino, Slovenia, Spain, Sweden, Switzerland, United Kingdom.

### Descriptive Characteristics of Data

**Mortality.** In the age group considered (15–29 years of age), there was a clear effect for sex (table 1). Males showed a higher mortality rate than females, in total more than twice as high.

**Alcohol Consumption.** Table 1 also gives an overview of the alcohol indicators by country. Patterns of drinking are relatively favorable in most of these countries, and unrecorded consumption is relatively low compared to other regions in Europe and around the world.

These analyses are described in detail elsewhere [20].

### Estimation of Attributable Fractions and Alcohol-Attributable Deaths

Relative risk estimates for chronic causes of death dependent on the per capita consumption were derived from the meta-analysis of Gutjahr and Gmel [4], and relative risk estimates for accidents and injuries were indirectly derived from the attributable fractions (AFs) of the published literature. The relative risk estimates were then multiplied by the pattern weight and the average volume estimates for each country for the period after 1995 to derive sex- and cause-specific AFs per country. Average volume was estimated by adding recorded and unrecorded consumption.

The AFs per region were calculated as population-weighted averages of the country AFs, and mortality attributable to alcohol by region was estimated as the sum of cause-specific mortality (i.e., adding up the cause-specific attributable deaths, which were calculated by multiplying the region- and sex-specific fraction with the number of dead people for each cause).

A description of the procedure without pattern weights can be found in the CRA guidelines (<http://www.ctr.u.auckland.ac.nz/CRA/main.html>) or Single et al. [2].

## Results

In total 6,688 male deaths (12.8% of all deaths in this age group) and 1,523 female deaths (8.3%) were estimated to be attributable to alcohol. For males 6,292 were attributable to recorded (12.0%), and 396 to unrecorded consumption (0.8%). For females the respective figures were 1,438 (7.8%) and 85 (0.5%). Unrecorded consumption thus is not a determining factor on mortality for this part of the world.

In terms of causes of death attributed to alcohol, transport accidents clearly constitute the main cause of death

**Table 1.** Alcohol consumption, patterns of drinking and mortality in the 1990s in Europe an established market economies

Country	Standardized mortality rates per 1'000 males aged 15–29	Standardized mortality rates per 1'000 females aged 15–29	Total recorded consumption	Patterns of drinking	Unrecorded consumption
Austria	1.11	0.35	12.15	2.00	1.00
Belgium	1.15	0.41	11.76	2.00	0.50
Czech Republic	1.05	0.37	12.12	3.00	1.00
Denmark	0.82	0.33	11.93	2.00	2.00
Finland	1.16	0.36	8.82	4.00	2.00
France	1.16	0.41	14.62	1.00	1.00
Germany	0.88	0.34	13.21	2.00	1.00
Greece	1.05	0.33	10.74	2.00	2.00
Iceland	0.95	0.26	4.86	4.00	1.00
Ireland	1.01	0.34	11.56	4.00	1.00
Israel <sup>1</sup>	0.78	0.30	1.28	2.00	1.00
Italy	1.05	0.34	10.33	1.00	1.50
Luxembourg	1.27	0.45	14.86	3.00	0.00
Malta	0.73	0.20	6.89	1.00	0.00
Netherlands	0.64	0.31	9.96	2.00	0.50
Norway	0.86	0.31	4.88	4.00	2.00
Portugal	1.78	0.51	14.95	1.00	1.00
Spain	1.21	0.39	12.26	1.00	1.00
Sweden	0.68	0.29	6.59	3.00	2.00
Switzerland	1.18	0.42	12.18	1.00	0.50
United Kingdom	0.84	0.33	9.37	2.00	2.00
All established market economies <sup>2</sup>	1.24	0.45	12.2	1.7	1.3

<sup>1</sup> According to WHO categories, Israel is part of WHO Euro.

<sup>2</sup> Population weighted average.

attributed to alcohol for both sexes (3,826 or 57.2% of all deaths for males and 901 or 59.2% of all deaths for females). The next highest cause of death was self-inflicted injuries with 771 deaths for males (11.5%) and 143 for females (9.4%). Chronic diseases did not figure largely in this age group either as deaths caused by alcohol or as potential lives saved by moderate consumption (e.g., all cancers together: 40 males deaths or 0.6% of all deaths, 29 female deaths or 1.9% of all female deaths; the difference in proportions between males and females is due to breast cancer).

## Discussion

Alcohol in both dimensions, average volume and patterns of drinking, was found to influence the overall mortality attributable to alcohol to a considerable degree in

young people in Europe. This result is theoretically not surprising, as young people often die from acute causes of death, especially accidents, and accidents have been clearly linked to patterns of drinking. What is surprising seems to be the preponderance of work on the volume of drinking only in alcohol epidemiology. This tendency may be linked to the slow change in introducing pattern variables into standard medical epidemiology [12, 14].

It may also be linked to a general tendency to concentrate on topics which we already know most about and have data easily available. For instance, even though many new articles on average consumption and mortality do not produce much additional knowledge, this topic continues to be a 'hot' topic in alcohol epidemiology [21]. In contrast alcohol-related disability may be suspected to be more important in terms of overall burden [1, 22] but it is almost nonexistent in the literature [15]. One incidence may illustrate this tendency: in the discussions leading to

this paper on alcohol-related burden of disease, the hottest discussion was around the pattern values of Sweden vs. Norway (2 vs. 3) and their unrecorded consumption (1.5 vs. 2.0 liters), both topics which are minor in the larger picture worldwide or even in Europe. Thus, in some ways alcohol epidemiology resembles the drunk who lost his keys in the dark but looks for them under a lantern because the light is brighter there.

What is needed in alcohol epidemiology is the courage to take on other themes, and in case of a lack of data to start producing a solid database for relevant issues like patterns and disability. We hope that this contribution will help to pave the way in this direction.

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