Abstract for the Annual Meeting of the Population Association of America
Austin, TX ● April 10 – April 13, 2019

Do You Really Know Jack (Daniels)? Potential Underestimation in Alcohol-Attributed Mortality on Population Level: Findings from the German National Cohort Mortality Follow-up

Ronny Westerman[1], Jana Förster[2], Andrea Werdecker[1], Ulrich Mueller[1]

[1]Competence Center Mortality-Follow-Up, German National Cohort at Federal Institute for Population Research, Wiesbaden, Germany

[2]Center for Population and Health, Wiesbaden, Germany

Abstract:

Harmful alcohol consumption and premature alcohol-attributed mortality on population level are major concerns for public health research. Recent studies showed possible underestimation of alcohol consumption estimated in national self-report surveys. Large cohorts like the German National Cohort (GNC) may be also affected from specific underestimation in noxious alcohol use or expect lower premature alcohol attributed mortality compared to the general population of Germany. This study focus on alcohol attributed-fraction mortality estimates under consideration of original death certificates information from deceased participants of the German National Cohort for the period 2014-2018. These alcohol attributed-fraction mortality estimates will be compared with the official cause of death statistics from Germany. As the major outcome the alcohol-attributed mortality estimates in GNC should be lower compared to the general population of Germany. Explanations should be the impact of the lower level of deprivation in GNC which is caused by healthy selectivity effect mostly known from Cohort studies, a different cause of death profile and even inter-regional disparity.

Extended Abstract

Background

Harmful alcohol use and premature alcohol-attributed mortality on population level are major concerns for public health and demographic research. There are increasing mortality rates due to alcohol consumption mostly known for accidents, liver cirrhosis and cardiovascular diseases (Kraus et al., 2015; Piontek and Kraus, 2018). Otherwise the burden of alcohol-attributed mortality is still unclear if potential underreporting can be determined in the data.

Several studies argued that alcohol consumption and even alcohol-attributed mortality estimates from national self-reported survey mostly being biased while under-reporting by respondents and the abstraction of heavier drinkers in the sample are resulting in under coverage (Stockwell et al., 2016; Stockwell et al., 2018). In that context high levels of deprivation are associated with elevated alcohol consumption and other health challenging behavior including smoking, excess weight and poor diet and exercises (Bellis et al 2016). Together these can have multiplicative effects on risks of wholly (e.g. alcoholic liver disease) and partly alcohol-related conditions. Binge drinking in deprived individuals will also increase risks of injury and heart diseases despite the total alcohol consumption that is not differing from affluent counterparts in the general population (Bellis et al 2016, Pulford et al., 2018).

Also there is a discrepancy in defining alcohol attributed morbidity and mortality across studies. In most studies alcohol-attributed mortality will only study considering for the most common causes (Table1). The major convergence reveal only on 7 causes (ICD-10) including alcohol dependence syndrome (F10), degeneration of nervous system due to alcohol (G31.2), alcoholic polyneuropathy (G62.1), alcoholic myopathy (G72.1), alcoholic gastritis (K29.2), alcoholic liver disease (K70), alcoholic liver disease (K70), alcohol-induced chronic pancreatitis (K86.0). In contrast the study Rehm et al. 2017 supported that there about 52 causes needed to be considered for defining the complete alcohol-attributed burden on population level.

Although there might be potential underreporting in alcohol-attributed fraction on population level we want to compare estimates from a large cohort study the German National Cohort (GNC) with estimated from the general population of Germany. Our approach includes the full perspective of alcohol-attributed fraction followed by Rehm et al. 2017 that are responsible for premature death.

We defined also additional causes of death (ICD-10) including self-poisoning by and exposure to alcohol (X65), Poisoning by and exposure to alcohol, undetermined intent (Y15), esophageal varices (I85) and Ataxia, unspecified (R27.8).

Method

We have computed the alcohol-attributable fraction (AAF) using Levin's Formula (Rehm et al. 2007), for causes of death partly and full attributable to alcohol for, sex and age

$$\mathrm{AFF}_i = \frac{\sum_{i=1}^{n} p_i(RR_i - 1)}{1 + \sum_{i=1}^{n} p_i\,(RR_i - 1)}$$

with *n* the number of drinking categories, p the proportion of drinkers, and RR the relative risks of dying for each *i* alcohol consumption category. Alcohol consumption categories are in defined by four groups: 0–19, 20–39, 40–59, and 60 or more grams of pure alcohol consumed per day.

Data

We used data from the German National Cohort (GNC) a joint interdisciplinary endeavour of scientists from the Helmholtz and the Leibniz Association, universities, and other research institutes. Its aim is to investigate the causes for the development of major chronic diseases, i.e. cardiovascular diseases, cancer, diabetes, neurodegenerative/-psychiatric diseases, musculoskeletal diseases, respiratory and infectious diseases, and their pre-clinical stages or functional health impairments. Across Germany, a random sample of the general population will be drawn by 18 regional study centers, including a total of 100,000 women and 100,000 men aged 20-69 years. Further information regarding recruitment process can be found in the study from the German National Cohort (GNC) Consortium (German National Cohort Consortium, 2014). For the alcohol-attributed fraction estimates we have included the almost available mortality and cause-of data from the GNC Mortality- Follow-up covering the first 100.000 study participants. The mortality data is available for period 2014-2018. Information on socioeconomic status (for level of deprivation) and alcohol drinking habits are taken from the GNC questionnaire. As the reference we use the cause-of death information from the official cause of death statistics from Germany provided by the Federal Statistical Office of Germany.

PreliminaryResults

The mortality-Follow-up project provided 433 deaths until 01.07.2018 with approximated. 20% of alcohol attributed fraction in premature mortality estimates in GNC. The alcohol attributed-fraction mortality was lower in the German National Cohort compared to the general population of Germany. On the other hand we also identified higher alcohol-attributed fraction mortality in deprived regions located in the northeast of Germany. Also were are specific variations in cause of death with higher burden in self-poisoning by and exposure to alcohol (X65), Poisoning by and exposure to alcohol, undetermined intent (Y15), esophageal varices (I85) and Ataxia, unspecified (R27.8).

Conclusion

The alcohol-attributed mortality estimates in GNC is lower compared to the general population of Germany. Plausible explanation should be the lower level of deprivation which is caused by healthy selectivity effect mostly known from Cohort studies, a different cause of death profile and even inter-regional disparity.

References:

Bellis MA, Hughes K, Nicholls J, Sheron N, Gilmore I, Jones L. The alcohol harm paradox using a national survey to explore how to alcohol may disproportionately impact health in deprived individuals. BMC Public Health. 2016, 18(16):111.

German National Cohort (GNC) Consortium. The German National Cohort: aims, study design and organization. Eur J Epidemiol. 2014;29(5):371-82.

Kehoe T, Gmel G, Shield KD, Gmel G, Rehm J. Determining the best population-level alcohol consumption model and ist impact on estimates of alcohol-attributable harms. Population Health Metrics 2012, 10(1):6.

Kraus L, Pabst A, Piontek D, Gmel G, Shield KD, Frick H. Temporal changes in alcohol-related morbidity and mortality in Germany. Eur Addict Res 2015; 21:262-72.

Piontek D, Kraus L. Trends in alcohol-related mortality in East and West Germany, 1980-2014: age, period and cohort variations. Addiction. 2018; 113(5):836-844.

Pulford A, Gordon R, Graham L, Lewsey J, McCartney G, Robinson M. Do patients who die from an alcohol-related condition 'drift' into areas of greater deprivation? Alcohol-related mortality and health selection theory in Scotland. J Epidemiol Community Health. 2018;72(2):109-112.

Rehm J, Sulkowska U, Manczuk M, Boffetta P, Powles J, Popova S et al. Alcohol accounts for a high proportion of premature mortality in central and eastern Europe. Int J Epidemiol 2007; 36(2):458-467.

Rehm J, Gmel GE, Gmel G, Hasan OSM, Imtiaz S et al. The relationship between different dimensions of alcohol use and the burden of disease- an update. Addiction. 2017; 1123:968-1001.

Stockwell T, Zhao J, Greenfield T, Li J, Livingston M, Meng Y. Estimating under- and over-reporting of drinking in national surveys of alcohol consumption: identification of consistent biases across four Englisch-speaking countries. Addition 2016; 111(7):1203-1213.

Stockwell T, Zhao J, Sherk A, Rehm J, Shield K, Naimi T. Underestimation of alcohol consumption in cohort studies and implications for alcohol's contribution to the Global Burden of Disease. Addiction. 2018 Jul 17. doi: 10.1111/add.14392.

Trias-Llimós S, Martikainen P, Mäkelä P, Janssen F. Comparison of different approaches for estimating age-specific alcohol-attributable mortality: The cases of France and Finland. PLoS ONE. 2018;13(3): e0194478.

Table 1 Definitions of alcohol-attributed fraction from selected studies

Pionthek et al. 2018	**NRS, 2016**	**McCartney et al. 2011, Trias-Llimós et al. 2018**	**UK Health statistics, 2016**
Alcoholic-induced pseudo-Cushing syndrome (E24.4)		cancer of oesophagus (C15)	E24.4
Niancin deficiency (E52)		cancer of larynx (C32)	
alcohol dependence syndrome (F10)	**(F10)**	**(F10)**	**(F10)**
degeneration of nervous system due to alcohol (G31.2)	**(G31.2)**	**(G31.2)**	**(G31.2)**
alcoholic polyneuropathy (G62.1)	**(G62.1)**	**(G62.1)**	**(G62.1)**
alcoholic myopathy (G72.1)		**(G72.1)**	**(G72.1)**
alcohoholic cardiomyopathy (I42.6)	**(I42.6)**	**(I42.6)**	**(I42.6)**
alcoholic gastritis (K29.2)	**(K29.2)**	**(K29.2)**	**(K29.2)**
alcoholic liver disease (K70)	**(K70)**	**(K70)**	**(K70)**
alcohol-induce acute pancreatis (K85.2)		**(K85.2)**	**(K85.2)**
alcohol-induced chronic pancreatitis (K86.0)	**(K86.0)**	**(K860)**	**(K860)**
maternal care for (suspected) damage to fetus from alcohol (O35.4)	X	(O35.4)	
fetus and newborn affected by maternal use of alcohol (P04.3)		(P04.3)	
fetal alcohol syndrome (dysmorphic) (Q86.0)		(Q86.0)	(Q86.0)
finding of alcohol in blood (R78.0)	**Chronic hepatitis (K73)**	**(K73)**	**(K73)**
toxic effect: ethanol (T51.0)	**Hepatic fibrosis (K74)**	**(K74)**	**(K74)**
toxic effect: unspecified (T51.9)		Other diseases of liver (K76)	Excess alcohol blood levels (R78.0)
	Accidental poisoning by and expossure of alcohol (X45)	**(X45)**	**(X45)**
		other external cause of accidental injury (V00-V99), (W00-W99), (X00-X99), (Y00-Y99)	(X65)
			(Y15)
missing causes			
Intentional self-poisoning by and exposure to alcohol (X65)	X	X	
Poisoning by and exposure to alcohol, undetermined intent (Y15)	X	X	X
esophageal varices (I85)	X	X	X
Ataxia, unspecified (R27.8)	X	X	X

Green: the major convergence, yellow: partial convergence, X missing causes