COMMENTARY

The protective effects of moderate drinking: lies, damned lies, and… selection biases?

Selection biases may have led to beneficial effects of moderate drinking being over estimated; however, they are unlikely to entirely explain the J-shaped curve. Even if all beneficial effects were eliminated, our ranking of alcohol as a public health burden would not change, nor our efforts to limit its harm.

More than a decade ago it was almost taken for granted that moderate alcohol consumption conferred protective health effects, with those expressing scepticism grouped alongside 'doubters of manned lunar missions and members of the Flat Earth Society' [1]. Since then there has been a steady stream of studies that have set out to interrogate this association from multiple angles to determine the robustness of this claim [2–4]. Naimi *et al.* [5] add to this body of work by succinctly mapping out potential methodological issues that fall under the umbrella of selection biases.

In the interest of furthering this debate, we will attempt to play devil's advocate in this commentary.

To begin, we need to consider the bigger picture. Does this potential underestimation of harm from alcohol matter to our rating of alcohol as a public health burden, or are we simply tinkering around the edges? If the protective effects were convincingly dismissed, would people's drinking habits change?

It is estimated that world-wide alcohol use accounted for 2.8 million deaths in 2013 [6] and it was ranked 6th out of 25 leading risk factors in terms of disability adjusted life years (DALYS). Included in these estimates is a protective effect for diabetes, ischaemic heart disease and ischaemic stroke (amounting to an estimated 2.3 million fewer DALYS [7]). However, this represents a tiny proportion of all DALYS (1.5 billion). Even if we were to assume that all beneficial effects are wiped out due to selection in observational studies, these rankings would not change substantially.

It is also claimed widely that a randomized controlled trial (RCT) is the panacea for all concerns about testing the protective effects of alcohol consumption. However, even assuming that ethical hurdles can be surmounted, this view is too simplistic. Experimental studies (randomized or not) are still prone to selection biases, for example in terms of who participates, adherence to exposure, loss to follow-up and so on [8,9]. Dismissing evidence from observational studies as second-class is wrong, Naimi *et al.* even note that observational data analysed correctly can come to the same conclusion as RCTs [10,11] .

This requires researchers to move beyond simply repeating standard analyses of alcohol consumption measured at one point in time and health outcomes at a later date [12]. The selection biases outlined by Naimi and colleagues are not unique to alcohol epidemiology; they affect countless other risk factors [13–15] and we can learn a great deal from these fields. For example, we agree wholeheartedly with the need to examine associations between alcohol and health outcomes using a life-course perspective [16]. With longitudinal data we can attempt to measure the magnitude of selection bias using, for example, inverse probability weighting methods [17]. The probability of exiting a study (due to causes that are often related to ill health) is used to weight observed data to 'compensate' for selection. This method has been demonstrated neatly for estimates of cognitive decline in smokers compared to never-smokers, which were 56–86% larger after accounting for attrition [13].

We do not doubt that selection effects are a real phenomenon that may have led to protective effects of moderate drinking being over-estimated; however, they are unlikely to explain the ubiquitous J-shaped curve entirely [18]. If this were the case one would anticipate that protective effects would also be observed for alcohol-related cancers; however, this is not what is found [19]. Naimi *et al.* also frame their arguments in a hypothetical world whereby seemingly none of the issues of selection due to health status or early death apply to non-drinkers. The major challenges lying ahead are to understand when to anticipate selection bias, to determine the severity of the threat and to utilize available analytical methods to diminish its effect. In order for this field to progress we need to move beyond traditional analyses and account more effectively for the complex, dynamic relationship between alcohol consumption and health over the life-course—then, and only then, may we get closer to the truth.

Declaration of interests

None.

Acknowledgments

The alcohol life-course project (http://www.ucl.ac.uk/alcohol-lifecourse) is funded by grants from the European Research Council (ERC-StG-2012-309337_AlcoholLifecourse) and UK Medical Research Council/Alcohol Research UK (MR/M006638/1).

Keywords Alcohol, causal inference, life-course, longitudinal, selection bias, study design.

ANNIE BRITTON[1] & STEVEN BELL[2]
Department of Epidemiology and Public Health, University College London, London, UK[1] and Department of Public Health and Primary Care, University of Cambridge, Cambridge, UK[2]
E-mail: a.britton@ucl.ac.uk

References

1. Stockwell T. R. Alcohol and cardiovascular disease: still a research priority? *Med J Aust* 2000; **173**: 116–7.
2. Chikirzhs T., Fillmore K., Stockwell T. A healthy dose of scepticism: four good reasons to think again about protective effects of alcohol on coronary heart disease. *Drug Alcohol Rev* 2009; **28**: 441–4.
3. Chikritzhs T., Stockwell T., Naimi T., Andreasson S., Dangardt F., Liang W. Has the leaning tower of presumed health benefits from 'moderate' alcohol use finally collapsed? *Addiction* 2015; **110**: 726–7.
4. Fekjær H. O. Alcohol—a universal preventive agent? A critical analysis. *Addiction* 2013; **108**: 2051–7.
5. Naimi T. S., Stockwell T., Zhao J., Xuan Z., Dangardt F., Saitz R. *et al.* Selection biases in observational studies affect associations between 'moderate' alcohol consumption and mortality. *Addiction* 2016; DOI: 10.1111/add.13451.
6. Forouzanfar M. H., Alexander L., Anderson H. R., Bachman V. F., Biryukov S., Brauer M. *et al.* Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2015; **386**: 2287–323.
7. Rehm J. The risks associated with alcohol use and alcoholism. *Alcohol Res Health* 2011; **34**: 135–43.
8. Bell S., Britton A. A second-class science? A defence of observational epidemiology to make causal inferences. *Addiction* 2014; **109**: 163–4.
9. Hébert J. R., Frongillo E. A., Adams S. A., Turner-McGrievy G. M., Hurley T. G., Miller D. R. *et al.* Perspective: randomized controlled trials are not a panacea for diet-related research. *Adv Nutr Int Rev J* 2016; **7**: 423–32.
10. Hernán M. A., Alonso A., Logan R., Grodstein F., Michels K. B., Willett W. C. *et al.* Observational studies analyzed like randomized experiments: an application to postmenopausal hormone therapy and coronary heart disease. *Epidemiology* 2008; **19**: 766–79.
11. Delaney J. A. C., Daskalopoulou M. D. P., Stella S., Suissa S. Traditional versus marginal structural models to estimate the effectiveness of β-blocker use on mortality after myocardial infarction. *Pharmacoepidemiol Drug Saf* 2009; **18**: 1–6.
12. Roerecke M., Rehm J. Alcohol and ischaemic heart disease risk—finally moving beyond interpretation of observational epidemiology. *Addiction* 2015; **110**: 723–5.
13. Weuve J., Tchetgen E. J. T., Glymour M. M., Beck T. L., Aggarwal N. T., Wilson R. S. *et al.* Accounting for bias due to selective attrition: the example of smoking and cognitive decline. *Epidemiology* 2012; **23**: 119–28.
14. Banack H. R., Kaufman J. S. The 'Obesity Paradox' explained. *Epidemiology* 2013; **24**: 461–2.
15. Christensen A. I., Ekholm O., Gray L., Glümer C., Juel K. What is wrong with non-respondents? Alcohol-, drug- and smoking-related mortality and morbidity in a 12-year follow-up study of respondents and non-respondents in the Danish Health and Morbidity Survey. *Addiction* 2015; **110**: 1505–12.
16. Britton A., Ben-Shlomo Y., Benzeval M., Kuh D., Bell S. Life course trajectories of alcohol consumption in the United Kingdom using longitudinal data from nine cohort studies. *BMC Med* 2015; **13**: 47.
17. Hernán M. A., Hernández-Díaz S., Robins J. M. A structural approach to selection bias. *Epidemiology* 2004; **15**: 615–25.
18. Emberson J. R., Bennett D. A. Effect of alcohol on risk of coronary heart disease and stroke: causality, bias, or a bit of both? *Vasc Health Risk Manag* 2006; **2**: 239.
19. Bagnardi V., Rota M., Botteri E., Tramacere I., Islami F., Fedirko V. *et al.* Alcohol consumption and site-specific cancer risk: a comprehensive dose–response meta-analysis. *Br J Cancer* 2015; **112**: 580–93.

