Are alcohol-attributable mortality estimates reliable?

The paper by Guérin et al. on alcohol-attributable mortality in France deals with a major public health issue. It shows higher estimates than recent ones obtained in France or by the World Health Organization.

In this paper, and this is the case in similar studies, the main part of accounted deaths is due to conditions that are not directly but only partly attributable to alcohol. Attributable fractions are obtained by means of a statistical calculation. Data used to perform such a calculation are of three different types:

1. Risk functions putting alcohol consumption level into relation with mortality incidence from a given cause, obtained from epidemiological studies,
2. Alcohol consumption distribution in the general population, obtained from population surveys,
3. Mortality by cause of death, obtained from the national mortality register.

Many sources of uncertainty lead to the use of these data with care:
First, the data types (i) and (ii) have to be compatible to be combined, i.e. alcohol consumption data have to be measured in a comparable manner in both sources. The international literature systematically identifies a strong under-estimation of alcohol consumption in self-reported surveys. To take this potential bias into account, the central estimate proposed by Guérin et al. is based on population alcohol consumption data adjusted so that the mean consumption of the population is equal to national sales data. Such an adjustment has a major impact on the estimates, as it nearly doubles them (from 28 000 to 49 000 deaths without and with adjustment, respectively). However, it may also be a source of incompatibility between epidemiological and population data, as both of them are subject to under-reporting alcohol consumption. This is discussed by Guérin et al., who highlighted that under-reporting is likely to be stronger in population data than in epidemiological data. Nevertheless, to date, very few elements can formally determine which of adjusted or unadjusted estimates are the most realistic. In this respect, the high sensitivity of alcohol consumption distribution to the type and the context of the questionnaire used questions the compatibility of sources.

Second, the data types (i) and (iii) also have to be compatible to be combined. As reported in many other studies before, Guérin et al. adopted a risk combination approach. It consists in using risk functions of mortality by cause and, for several conditions, risk functions of incidence, assimilated to risk functions of mortality. Such assimilation may result in overestimating mortality if heavy alcohol drinkers cumulate several conditions, because they only die once. Moreover, deaths are only accounted for one cause (the underlying cause), whereas one may die from a combination of conditions. This could lead to spurious estimates of alcohol-attributable mortality and generates uncertainties that are not taken into account by usual variance estimates.

Another possible approach, the direct approach, only uses one all-cause mortality risk function rather than several condition-specific morbidity and mortality risk functions, thus avoiding this data-type incompatibility. The results are also very sensitive to the choice of approach. To give another illustration of the difference between both approaches, the risk combination approach combined with the weight of each condition in mortality data was used to estimate the all-cause mortality risk as a function of alcohol consumption level in a recent study. Such an approach leads to a quite different function than the one directly calculated with all-cause mortality in cohort studies. Specifically, the protective effect of low dose consumption usually observed in the direct approach disappeared in the risk combination one. Yet, this protective effect is still subject to a scientific debate, and several hypotheses are susceptible to explain it. There again, both approaches lead to quite different results, and no element can formally determine which is the best, given their respective advantages and disadvantages.

Third, each risk function estimate is surrounded by statistical uncertainty, generally increasing with the consumption level because of the small number of subjects declaring a heavy alcohol consumption in surveys. The proportion taken by the strongest drinker category in the overall alcohol-attributable mortality is very large in the paper by Guérin et al. (93% for males, 69% for females, excluding external causes). Thus, the estimate of the number of deaths attributable to alcohol is expected to be specifically imprecise for this category of drinkers, and hence for the overall estimate. This uncertainty should be taken into account. Moreover, the main reason invoked by the authors to justify the large gap between the estimates of number of alcohol-attributable deaths and previous estimates is that they used more recent risk functions than in a previous study. The high sensitivity of estimates to the choice of relative risks questions their precision.

Overall, current methods for estimating alcohol-attributable mortality are questionable. The use of heterogeneous data sources may lead to biased and imprecise estimates.

It is the responsibility of the scientific community to not only obtain the best estimate but also to assess the level of its precision to give the public the relevant related precautions. Without calling into question the well-established harm of excessive alcohol consumption on health, it seems inadvisable to deduce new estimates for public health and prevention policy from imprecise methodologies. An important effort toward standardization of sources is needed.

A pragmatic solution, now more and more feasible, would consist in linking data from general population surveys recording alcohol consumption (like Enquête Santé et Protection Social or Baromètre santé in France) with vital status of the respondents, and secondary with their causes of death. This would provide estimates of cause-specific mortality hazard functions and attributable fractions in the general population, and eliminate biases inherent to the use of disparate sources.

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