



## EDITORIALS

## Alcohol and cardiovascular disease

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Big data puts the link between moderate drinking and lower risk under the microscope

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Over four decades ago, Klatsky and his colleagues published perhaps the first carefully conducted epidemiological investigation of alcohol consumption and risk of myocardial infarction,<sup>1</sup> a case-control study nested within the health records of the Kaiser Foundation Health Plan in California. Taking advantage of some 120 000 health plan members who completed a standardized set of over 500 individual questions, the authors identified 464 members who sustained an incident myocardial infarction at local Kaiser hospitals. They compared the alcohol consumption reported on a previous questionnaire among these members with that of two sets of controls drawn from the same source population. Among non-smokers, the odds of myocardial infarction were about twice as high among non-drinkers as among drinkers, raising the possibility that alcohol consumption could lower risk of coronary heart disease.<sup>1</sup>

In subsequent analyses of members of the Kaiser-Permanente health maintenance organization, Klatsky and colleagues went on to show that alcohol consumption has diverse associations with various forms of cardiovascular disease and its risk factors, including a roughly inverse association with coronary heart disease, a U shaped association with ischemic stroke, and roughly direct associations with hypertension and hemorrhagic stroke.<sup>2-5</sup>

In a linked article, Bell and colleagues have now extended Klatsky's work in two directions (doi:10.1136/bmj.j909).<sup>6</sup> In a retrospective cohort study of about two million adults seen in general practices throughout England, they linked alcohol information coded by treating clinicians in the Clinical Practice Research Datalink with cardiovascular outcomes identified in a series of British health registers to ascertain the dose-response relations between alcohol consumption and first incidence of several cardiovascular conditions. This large scale effort extends the topic, both in its use of clinical records to assess alcohol consumption and in the multiplicity of outcomes that can be assessed.

The first leap forward is the estimation of a patient's actual alcohol consumption (in five categories) from clinical data, rather than from structured assessment tools like those applied in Kaiser-Permanente. Unfortunately, as the authors' examples illustrate, this requires creative extrapolation and will not be easy to export to settings outside the UK. The passive approach, however, enables studies of massive sample size. While it also introduces both random and systematic measurement error, the large sample can overcome random misclassification of alcohol consumption, albeit at the cost of hazard ratios that could be underestimated in magnitude. Systematic error is more pernicious and contributed to both by intentional under-reporting by patients and by difficult choices forced by imperfect clinical information. For example, patients found to have alcohol on their breath by a general practitioner were classified as "moderate drinkers," but without formal validation, this categorization seems uncertain at best. Equally problematic are missing data. In this study, information on alcohol consumption was missing in 43% of the overall sample, with the potential for bias in any direction.

The second step forward, which draws directly on the first, is the panoply of outcomes that can be assessed with so large a sample size. Bell and colleagues examined a diverse, if quizzical, set of endpoints that would be difficult to study with precision in smaller cohorts.<sup>6</sup> They largely reproduce previous findings from the Kaiser-Permanente studies but add risk estimates for subtypes of myocardial infarction, stable and unstable angina, and abdominal aortic aneurysm, among others. Clearly, this approach is particularly attractive for rarer health outcomes, although these tend to be least important for overall public health.

This work by Bell and colleagues fits into a burgeoning new generation of studies that propose to adapt classic cohort designs to general practice settings by using data collected in electronic health records and large registries. These studies, which rely on advances in the information technology infrastructure embedded

in healthcare settings, represent a promising convergence between medicine, public health, and research. As epidemiologists identify social and behavioral factors that determine health in populations, individual clinicians and healthcare systems will need to incorporate those factors into the care of specific patients and thus into patients' electronic health records. These records can, in turn, be used to conduct a new round of further studies in a feed forward cycle.<sup>7</sup>

The new study does not offer a materially new view of the associations between alcohol consumed within recommended limits and risk of cardiovascular disease. They report lower rates of essentially every meaningful cardiovascular outcome except hemorrhagic stroke among moderate drinkers than among abstainers. Four decades of epidemiological studies have largely found the same. This work, however, sets the stage for ever larger and more sophisticated studies that will attempt to harness the flood of big data into a stream of useful, reliable, and unbiased findings that can inform public health, clinical care, and the direction of future research.

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