

Critique 124: The J-shaped curve for the relation of alcohol consumption to mortality — 17 September 2013

Plunk AD, Syed-Mohammed H, Cavazos-Rehg P, Bierut LJ, Gruzza RA. Alcohol consumption, heavy drinking, and mortality: Rethinking the J-shaped curve. *Alcohol Clin Exp Res* 2013;pre-publication: DOI: 10.1111/acer.12250

Authors' Abstract

Background: High average daily consumption of alcohol has been associated with elevated mortality risk, but more moderate consumption, relative to abstinence, has been associated with reduced mortality risk. However, average daily consumption can be complicated to assess, limiting its usefulness in both research and clinical practice. There are also concerns that average consumption fails to capture the risk associated with certain drinking patterns, such as heavy episodic drinking. This study assessed mortality associated with drinking pattern, operationalized as the frequency of both heavy and nonheavy drinking occasions.

Methods: Data from the 1997 to 2001 administrations of the National Health Interview Survey (NHIS; n = 111,511) were paired with the current release of the NHIS Linked Mortality Files, which provided mortality follow-up data through the end of 2006. We estimated the impact of drinking pattern on all-cause mortality, operationalized as the frequency of heavy (5+ drinks) and nonheavy (<5 drinks) drinking occasions. Other covariates in the model included survey wave, sex, age, race/ethnicity, ratio of family income to poverty threshold, educational attainment, body mass index, and smoking status.

Results: Over a third of past-year drinkers reported heavy drinking. Mortality risk increased steadily as heavy drinking frequency increased; daily heavy drinkers exhibited an almost 2-fold risk of death compared with abstainers ($p < 0.001$). Regular nonheavy drinking was associated with decreased mortality, similar to the “J-shaped curve” highlighted in past research on alcohol mortality; this potential protective effect peaked around 2 nonheavy occasions per week.

Conclusions: Any heavy drinking likely elevates mortality risk, and substantial health benefits could be realized by reducing heavy drinking occasions or limiting overall drinking. Heavy and nonheavy drinking frequencies are valid targets for clinical screening and could be helpful in assessing risk and promoting less harmful drinking behavior.

Forum Comments

Background: The so-called “J-shaped curve” describing the association between alcohol consumption and total mortality has been known for decades, and more recent prospective epidemiologic research continues to support such a relation. While heavy drinking is generally found to relate to a greater risk of mortality, light-to-moderate consumption is associated with a lower risk of total mortality, especially mortality related to cardiovascular disease.

Most early studies have related only the *average amount* of alcohol consumed over a period of time (usually one week) as the indicator of alcohol consumption; many newer studies have emphasized that the pattern of drinking may be a better indication of alcohol exposure. A number of studies have shown that the “healthiest” pattern of drinking is the consumption of small amounts of alcohol (usually defined as 1 to 3 typical drinks/day) on a frequent basis (either daily or at least on several occasions per week).

The present very large study had very reasonable estimates of alcohol intake and the authors were able to separate subjects as lifetime abstainers or ex-drinkers. They used data primarily from the National Death Index to identify more than 3,000 subjects who had died. They were able to adjust for most lifestyle factors known to relate to mortality.

The study uses the number of drinks per drinking session, and the frequency of such sessions, as the measure of alcohol intake. It defines subjects reporting up to 5 drinks/occasion as exhibiting “nonheavy drinking.” Nevertheless, despite the rather high cut-point of intake, the study shows that subjects in this category (reporting up to 5 drinks/occasion) show a J-shaped curve for the risk of mortality, with lower mortality than abstainers for those reporting up to 4 such drinking occasions per week. The risk of mortality was greater than that of abstainers for those reporting 5 or more nonheavy drinking episodes per week. Subjects reporting the consumption of >5 drinks/occasion showed a linear increase in mortality in relation to alcohol consumption.

Specific comments on this paper by Forum Members: Forum member Finkel stated that “The study reported in this paper basically again confirms the J-shaped curve and the danger of binge drinking — of course, this is not at all new. However, I like the attention given to the truths that may be hidden within broad averages; for example, one may drink in binges yet fall within moderate total consumption. It is interesting and deserving of further study that sex and age appeared not to have influenced results in this analysis. And, as so often the case, type of beverage and other potentially confounding variables could not be quantified.”

Reviewer Skovenborg pointed out that the results of this study support that of a Danish paper (not referred to by the present authors) showing that occasional binge drinking embedded in a moderate drinking pattern is not associated with adverse health effects [Skov-Etrup LS, Eliassen M, Ekholm O, Grønbæk M, Tolstrup JS. Binge drinking, drinking frequency, and risk of ischaemic heart disease: A population-based cohort study. *Scand J Public Health* 2011;39:880 (DOI: 10.1177/1403494811425605).]

Reviewer De Gaetano agreed that “This paper shows no real novelty, but is interesting in that a J-shaped curve is also apparent when the mortality is correlated with the consumption frequency rather than the daily quantities consumed. Such an inverse correlation is only apparent in moderate drinkers, while the mortality risk increases linearly with the increase of frequency of drinking occasions and for subjects consuming 5 or more drinks/occasion. In this sense, the latter direct correlation resembles that observed between smoking and acute myocardial infarction risk, as shown in the INTERHEART Study (Yusuf et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries, the INTERHEART study: A case-control study. *Lancet* 2004;364:937-952): as stated by the authors of that study, ‘A strong, graded relation was seen between number of cigarettes smoked and risk of AMI, with the risk increasing at every increment.’”

Reviewer De Gaetano also stated that “According to our own previous meta-analysis (Di Castelnuovo et al, Alcohol dosing and total mortality in men and women: an updated meta-analysis of 34 prospective studies. *Archives of Int Med* 2006;166:2437-2445), the consumption of 4 drinks per day is just at the upper limit of moderation.” He added: “Another interesting point is that the protection by moderate drinking is only seen in people who declare to have a non-poor health status. This remains unexplained.”

Forum member Van Velden stated: “I find this to be a well written paper confirming previous findings about the J-shaped curve. It is important to stress that heavy drinking, and I find 5

drinks/day quite heavy, has definitely detrimental effects on health. People with genetic intolerance to alcohol digestion may experience the toxic effect of high alcohol levels more, but again, they tend not to drink.”

Forum reviewers agreed with the authors that it is especially important to consider the pattern of drinking when evaluating the relation of alcohol to mortality. The authors conclude that “Promoting less harmful drinking patterns by reducing heavy drinking frequency is an appropriate harm reduction strategy, and assessing drinking pattern by determining the frequency of heavy and nonheavy drinking is a simple and fast way to determine risk and promote less risky drinking behavior.”

Forum Summary

An analysis based on data from more than 110,000 subjects in the USA, of whom 3,364 died during a follow-up period of up to 9 years, was used to evaluate the relation of “heavy drinking” and “nonheavy drinking” to the risk of all-cause mortality. The authors defined heavy drinking as 5 or more drinks/occasion, and recorded the frequency in which subjects consumed such amounts. Subjects consuming < 5 drinks/occasion were classified as nonheavy drinkers.

The key findings of the analyses were that there was a positive and linear increase in risk of mortality for subjects consuming heavy amounts of alcohol, with the risk increasing as drinking at this level was more frequent. For nonheavy drinkers, there was a J-shaped relation with mortality. The point at which the nonheavy drinkers’ risk of mortality exceeded that of abstainers was between 4 and 5 drinking occasions/week.

Forum reviewers thought that this was a well-done analysis that emphasizes the importance of the pattern of drinking, and not just the average weekly intake. Although the upper limits of drinks/occasion exceeded that usually considered as “moderate,” a J-shaped curve between alcohol and mortality for these drinkers was demonstrated. This is the pattern usually seen in prospective epidemiologic studies when “moderate” is defined at somewhat lower levels of alcohol intake.

Forum reviewers agreed with the conclusions of the authors regarding the importance of considering the pattern of drinking when evaluating the health effects of alcohol. The authors concluded: “Promoting less harmful drinking patterns by reducing heavy drinking frequency is an appropriate harm reduction strategy, and assessing drinking pattern by determining the frequency of heavy and nonheavy drinking is a simple and fast way to determine risk and promote less risky drinking behavior.”

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Contributions to this critique by the International Scientific Forum on Alcohol Research were provided by the following members:

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