Letters to the Editor

Alcohol and All-Cause Mortality

From JÜRGEN REHM

Sir—Recently, Duffy¹ presented a meta-analysis of seven prospective studies on alcohol consumption and all-cause mortality. Unfortunately, 'lack of detail in the published data sets precluded adjustment for age'.² Nevertheless, Duffy went on to draw conclusions about ‘optimal’ consumption and potential protective effective- effects linked to various levels of consumption. It is the aim of this paper to show that these conclusions are not justified and that age is so strong a confounder in the alcohol-mortality relationship that no analysis should be undertaken without age adjustment.

A confounding variable is defined by:

a) being a risk factor for the outcome (in this case all-cause mortality);
b) being associated with the exposure under study (in this case alcohol consumption) in the population from which the cases derive; and

c) not constituting an intermediate step in the causal path between exposure and outcome.³

Age is fulfilling all three criteria. It is related to all-cause mortality, it is associated with alcohol consumption in most industrialized countries, and it is not an intermediate effect between alcohol consumption and all-cause mortality.

To estimate the effects of not adjusting for age we used a sample with characteristics similar to Duffy's samples: male, white Americans (three out of seven studies in Duffy’s analysis were conducted in the US) aged 40–75 years at baseline interview. The average follow-up time amounted to 15 years. This sample stems from the NHEFS study, and is representative for the US. Its details have been described elsewhere.⁴⁻⁷

Cox proportional hazard analysis without age adjustment reaches similar results as reported by Duffy (Figure 1). However, after age adjustment, the picture changes completely and the apparent beneficial effect of drinking more than 14 drinks/week disappears.

Instead, drinking 15–28 drinks per week significantly increases the risk of all-cause mortality by 33%, and drinking 29 drinks per week or more increases this risk by 44% (compared to life-time abstainers, see Table 1).

Thus, Duffy’s conclusion mainly interprets the confounding effects of age. As others have pointed out, additional confounding by smoking⁸ and social integration⁹ may further change the exact shape of the curve, in shifting the value for lowest risk to even lower levels of alcohol consumption.

Furthermore, conclusions about moderate drinking guidelines or preventive action in general should not be based on mortality studies only. Prevention of alcohol problems must be based on the full spectrum of epidemiological and metabolic research, including relevant results on mortality, morbidity, social consequences, and quality of life in general.¹⁰

REFERENCES

¹ Duffy J C. Alcohol consumption and all-cause mortality. Int J Epidemiol 1995; 24: 100-05.
TABLE 1  Age-adjusted relative mortality risks for different alcohol consumption levels

<table>
<thead>
<tr>
<th>Drinking category</th>
<th>Beta</th>
<th>Standard error</th>
<th>t-value</th>
<th>Relative risk*</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2 drinks a week/no abstainer</td>
<td>-0.032503</td>
<td>0.100640</td>
<td>-0.32296</td>
<td>0.968020</td>
</tr>
<tr>
<td>2-7 drinks/week</td>
<td>-0.120746</td>
<td>0.110474</td>
<td>-1.09299</td>
<td>0.886259</td>
</tr>
<tr>
<td>8-14 drinks/week</td>
<td>-0.021034</td>
<td>0.138639</td>
<td>-0.15172</td>
<td>0.979186</td>
</tr>
<tr>
<td>15-28 drinks/week</td>
<td>0.283497</td>
<td>0.142180</td>
<td>1.99393</td>
<td>1.327765</td>
</tr>
<tr>
<td>&gt;29 drinks/week</td>
<td>0.366334</td>
<td>0.159895</td>
<td>2.29109</td>
<td>1.442437</td>
</tr>
<tr>
<td>abstained during last year</td>
<td>0.111793</td>
<td>0.117642</td>
<td>0.95028</td>
<td>1.118281</td>
</tr>
</tbody>
</table>

N = 2989, number of deaths in the observed 15-year time interval: 1072 (35.9%).

* The reference category were life-time abstainers. Relative risks were derived from a Cox proportional hazard model, adjusted for age in years at baseline. The overall effect of the independent variables is highly significant: $\chi^2 = 27.6$, d.f. = 6, $P < 0.001$.

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**Figure 1** Alcohol and all-cause mortality in white American males age 40–75

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