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The Net Effect of an Alcohol Tax Increase on Death Rates in Middle Age

By PHILIP J. COOK, JAN OSTERMANN, AND FRANK A. SLOAN*

Alcohol excise taxation increases prices and reduces per capita consumption (Cook and George Tauchen, 1982; Christopher J. Ruhm, 1995; Douglas J. Young and Agnieszka Bielinska-Kwapisz, 2003). In principle, a tax-induced reduction in per capita consumption of alcohol may be the result of both a reduction in the prevalence of alcohol abuse and the prevalence of moderate drinking, with opposite effects on mortality rates. The net effect on mortality could be either positive or negative and has not been established empirically.

Some specific mechanisms by which drinking creates health risks and benefits are well documented. For all age groups, episodes of alcohol intoxication cause death from overdose or from injury resulting from accident or intentional violence (Ralph Hingson and Michael Winter, 2003). Chronic heavy drinking may cause death due to organ damage, including liver cirrhosis (Jürgen Rehm et al., 2003). On the other hand, chronic drinking confers some health benefits on middle-aged people, defined here as persons aged 35–69. Alcohol acts as an anti-cholesterol drug, and epidemiological evidence suggests that moderate drinking is associated with reduced mortality from heart disease and stroke (Giovanni Corrao et al., 2000).

Thus an increase in alcohol excise taxes may reduce mortality rates to the extent that it induces a lower incidence of risky drinking and lower prevalence of chronic heavy drinking. But if older people drink *too little* in response to higher prices, then the result may be increased cardiovascular death rates.

In what follows, we combine new estimates of the effect of per capita alcohol consumption on drinking patterns with a summary estimate from the epidemiology literature of relative risks associated with different levels of drinking. We calculate that a permanent reduction of 1 percent in alcohol consumption per capita, induced by a tax increase or some other mechanism, would have little net effect on mortality in middle age. Our sensitivity experiments suggest that the effect may be positive or negative but is always close to zero. Since there is no health benefit from drinking for younger people, and considerable risks, we conclude that the public-health case for increased alcohol taxation is strong.

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I. Drinking and Mortality Rates

Risks and benefits of a drinking career are age-related. A meta-analysis of all-cause mortality found that for men under age 45, death rates increase with alcohol consumption nearly linearly (due to injury risks), but for middle-aged cohorts, the relationship follows a J-shaped curve (Rehm et al., 2001): for those in middle age, mortality rates are lower for those who drink moderately than for abstainers, but at some point the mortality rate increases with alcohol consumption and eventually exceeds the rate for abstainers (Annie Britton and Michael Marmot, 2004). Over the entire age range, typical estimates find a similar number of lives saved and lost from drinking in the United States and Canada, but with an important difference: the victims tend to be quite young, whereas it is older people whose lives are extended by drinking. If the calculation of gains and losses is based on life-years gained and lost, or life years adjusted for disability, then the losses greatly exceed the gains (Christopher J. L. Murray and Alan D. Lopez, 1997; Eric Single et al., 1999).

The implicit thought experiment underlying these estimates is to compare the current mortality rate to a hypothetical mortality rate associated with permanent population-wide abstinence. What is missing from this literature consideration of the effect of a small long-term reduction in per capita

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consumption of the sort that could be accomplished through a modest, but politically feasible, increase in the excise tax rate.

II. Simulation Results

Our empirical approach is to link estimates of the all-cause relative mortality risks from different levels of drinking, using estimates from a meta-analysis of the literature with alternative estimates of how middle-aged drinking patterns are changed by a small change in per capita consumption of the sort associated with a tax increase.

The curve relating all-cause mortality risk to drinking has been estimated in a large number of epidemiological studies utilizing a variety of data sets. A recent meta-analysis of the results for samples of older people (average age of 45 at baseline) documents the J-curve for both males and females (Gerhard Gmel et al., 2003). The summary statistics on relative risks after adjusting for other personal characteristics and behaviors are given in column (i) of Table 1. For females, the lowest relative risk is for drinkers who consume no more than 10 grams of ethanol per day on average (less than that contained in one standard drink, e.g., 12 ounces of beer or 4 ounces of wine). For males the lowest relative risk occurs in the 10–20 gram range, which is the equivalent of about one standard drink per day.

We acknowledge that these results are based on observational data and are subject to a variety of problems of measurement and causal inference. They represent the state of the art, given the impossibility of controlled experiments.

The current distribution of the United States population aged 35–69 across drinking categories is given in column (ii) of Table 1. The estimates come from a recent survey, the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), conducted by National Institute on Alcohol Abuse and Alcoholism, fielded in 2001–2002 with a representative sample of 43,093 noninstitutionalized Americans aged 18 and over (National Institute on Alcohol Abuse and Alcoholism, 2003).[1] The remaining columns present the population distributions that would have resulted from a 1-percent reduction in per capita consumption under different assumptions on how the change is distributed. Simulation III in column (iv) assumes that there is no change at the extensive margin, and that the reduction in per capita consumption is accomplished by a uniform downward shift in consumption by drinkers. In effect, each drinker consumes 99 percent as much as in reality. Simulation II adopts the intermediate assumption, generally guided by regression results, that impacts occur at both the extensive and intensive margin.[2] Simulation I

TABLE 1—THE EFFECT OF REDUCED PER CAPITA CONSUMPTION ON RISK EXPOSURE: DRINKERS AGED 35–69

	(i) Relative risk of mortality*	(ii) Population distribution, 2000	(iii) Sim II	(iv) Sim III
A. *Females:*				
Ex-drinkers	1.44	0.196008	0.196008	0.196008
Lifetime abstainers	1.00	0.447048	0.450072	0.447048
>0–10 g	0.87	0.231526	0.229696	0.232531
>10–30 g	1.01	0.084845	0.083994	0.084083
>30–50 g	1.40	0.022772	0.022829	0.023107
>50 g	1.43	0.017802	0.017402	0.017223
B. *Males:*				
Ex-drinkers	1.21	0.187786	0.187786	0.187786
Lifetime abstainers	1.00	0.266528	0.268933	0.266528
>0–10 g	0.85	0.249303	0.248972	0.250581
>10–20 g	0.80	0.098276	0.097794	0.09816
>20–30 g	0.91	0.058864	0.058471	0.058803
>30–40 g	0.96	0.037739	0.03773	0.038305
>40–70 g	1.04	0.050816	0.04997	0.049394
>70–110 g	1.27	0.022036	0.021818	0.022112
>110 g	1.46	0.028652	0.028525	0.028331

Sources: Relative risk is taken from Table 2 of Gmel et al. (2003). The population estimate is from NESARC survey data for adults aged 35–69 in 2000–2001. Simulations ("Sim II" and "Sim III") are described in the text.

[1] Like other such surveys, the NESARC-based estimate of average consumption for the U.S. population has a large negative bias, capturing only about half of per capita sales (authors' calculations). Note, however, that the epidemiological evidence is also based on self-reported drinking and is subject to the same bias.

[2] The regression results are presented in the longer version of this paper (Cook et al., 2005). We utilized NESARC data together with state-level per capita sales data to determine how average drinking related to drinking patterns at the extensive and intensive margins.

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TABLE 2—CHANGES RESULTING FROM A 1-PERCENT REDUCTION IN PER CAPITA ALCOHOL CONSUMPTION: DEATHS AND LIFE-YEARS, AGES 35–69

Simulation	Deaths	Life-years lost
Simulation I		
Male	176	4,061
Female	32	813
Simulation II		
Male	13	294
Female	20	520
Simulation III		
Male	−152	−3,514
Female	−64	−1,646

(not shown) assumes that the effect of the tax increase and resulting 1-percent reduction in per capita consumption is accomplished entirely at the extensive margin. One percent of the drinkers become abstainers, and the proportional distribution of drinkers over quantities is unaffected. That is, each category of drinking quantity loses 1 percent of its members.

We assume that the increase in abstainers in Simulations I and II occurs only in the "lifetime" category, and not in the "previous drinker" category—an important assumption because the relative mortality risk is substantially higher in the latter. The "previous drinker" category is likely to include a large group who quit because of health problems (Gmel et al., 2003). Since we simulate the effect of an increase in taxes, the proximate cause of the switch would (by assumption) be higher prices rather than illness.

The first two simulations (for which there is some movement from drinker to abstainer) result in an increase in the population-weighted average in relative risk, while the third results in a decrease.[3] Table 2 summarizes the results translated into estimates of deaths in a single year, together with the associated loss of life years. A striking finding is that the numbers are small to the point of triviality in comparison with the 700,000 annual deaths in this age group. Thus a permanent 1-percent reduction in drinking by the population aged 35–69 would have a negligible effect on the death rate. While it is not possible to be sure whether the effect would be positive or negative, fewer than 200 lives are at stake. Our best estimate (from Simulation II) is that 33 lives would be lost per year in middle age.

[3] For Simulation 1, the increase is 31 and 74.5 per million for males and females respectively. For Simulation 2 the corresponding numbers are 428.3 and 30.8. For Simulation 3, the decline is 370.6 and 235.7 per million.

III. Concluding Thoughts

How do these results affect the case for higher alcohol excise taxes? The public-health argument (as opposed to the economic argument) for a higher tax rate is that it would reduce morbidity and save lives (Michael Grossman et al., 1993; Cook and Michael J. Moore, 2002). That argument is less obvious than the corresponding argument for tobacco taxes. An increase in tax penalizes healthy as well as unhealthy drinking, whereas smoking in any amount is detrimental to health. Perhaps that distinction is part of the explanation for why tobacco-tax bills have fared so much better in state legislatures in recent years than alcohol-tax bills (Sloan and Justin Trogdon, 2004).

The results presented here strongly suggest that an alcohol tax increase will save lives. We find that the net effect on mortality rates among older people is nil, while the epidemiological evidence suggests that the relative risk increases monotonically with drinking for younger people.

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