

Effects of Alcohol Retail Privatization on Excessive Alcohol Consumption and Related Harms

A Community Guide Systematic Review

Robert A. Hahn, PhD, MPH, Jennifer Cook Middleton, PhD, Randy Elder, PhD, Robert Brewer, MD, MSPH, Jonathan Fielding, MD, MPH, MBA, Timothy S. Naimi, MD, MPH, Traci L. Toomey, PhD, Sajal Chattopadhyay, PhD, Briana Lawrence, MPH, Carla Alexia Campbell, MHSc, and the Community Preventive Services Task Force

Context: Excessive alcohol consumption is the third-leading cause of preventable death in the U.S. This systematic review is one in a series exploring effectiveness of interventions to reduce alcohol-related harms.

Evidence acquisition: The focus of this review was on studies evaluating the effects of the privatization of alcohol retail sales on excessive alcohol consumption and related harms. Using *Community Guide* methods for conducting systematic reviews, a systematic search was conducted in multiple databases up to December 2010. Reference lists of acquired articles and review papers were also scanned for additional studies.

Evidence synthesis: A total of 17 studies assessed the impact of privatizing retail alcohol sales on the per capita alcohol consumption, a well-established proxy for excessive alcohol consumption; 9 of these studies also examined the effects of privatization on the per capita consumption of alcoholic beverages that were not privatized. One cohort study in Finland assessed the impact of privatizing the sales of medium-strength beer (MSB) on self-reported alcohol consumption. One study in Sweden assessed the impact of re-monopolizing the sale of MSB on alcohol-related harms. Across the 17 studies, there was a 44.4% median increase in the per capita sales of privatized beverages in locations that privatized retail alcohol sales (interquartile interval: 4.5% to 122.5%). During the same time period, sales of nonprivatized alcoholic beverages decreased by a median of 2.2% (interquartile interval: -6.6% to -0.1%). Privatizing the sale of MSB in Finland was associated with a mean increase in alcohol consumption of 1.7 liters of pure alcohol per person per year. Re-monopolization of the sale of MSB in Sweden was associated with a general reduction in alcohol-related harms.

Conclusions: According to *Community Guide* rules of evidence, there is strong evidence that privatization of retail alcohol sales leads to increases in excessive alcohol consumption.

(Am J Prev Med 2012;42(4):418–427) Published by Elsevier Inc. on behalf of American Journal of Preventive Medicine

From the Community Guide Branch, Epidemiology and Analysis Program Office (Hahn, Middleton, Elder, Chattopadhyay, Lawrence, Campbell), National Center for Chronic Disease Prevention and Health Promotion (Brewer), CDC, Atlanta, Georgia; Los Angeles County Department of Health Services (Fielding); University of Minnesota School of Public Health (Toomey), Minneapolis, Minnesota; and the Schools of Medicine and Public Health (Naimi), Boston University, Boston, Massachusetts

Author affiliations are shown at the time the research was conducted.

Names and affiliations of the Task Force members can be found at www.thecommunityguide.org/about/task-force-members.html.

Address correspondence to: Robert A. Hahn, PhD, MPH, Community Guide Branch, Epidemiology and Analysis Program Office, CDC, 1600 Clifton Road, Mailstop E-69, Atlanta GA 30333. E-mail: rhahn@cdc.gov.

0749-3797/\$36.00

doi: 10.1016/j.amepre.2012.01.002

Context

Excessive alcohol consumption, including both binge drinking and underage drinking, is responsible for approximately 79,000 deaths per year in the U.S., making it the third-leading cause of preventable death in the nation.¹ In 2009, approximately 23% of adult drinkers (aged ≥ 18 years) in the U.S. reported binge drinking (consuming five or more drinks per occasion for men and four or more drinks per occasion for women) in the past 30 days, as did 25.2% of high school students.^{2,3} Among full-time college students in 2008, 48.6% of men and 34.4% of women reported binge drinking.⁴ In 2006,

the estimated economic cost of excessive drinking in the U.S. was \$223.5 billion.⁵ The reduction of excessive alcohol consumption is thus a matter of major public health and economic interest.

Following the end of Prohibition in the U.S. in 1933, some states continued prohibition at the state level. “Control” states allowed alcohol to be sold, but only through government-run retail stores; “license” states allowed retail sales by commercial interests.⁶ In all states, wholesale of alcoholic beverages is under state control. Currently, no states prohibit alcohol sales, and the number of states that have retained control over retail sales has been reduced through privatization. However, in all states with government control over certain beverage types, government control is restricted to *off-premises* sales outlets (i.e., outlets where alcohol is sold for consumption elsewhere); government control does not affect the *on-premises* sale of alcohol in any state.

In the U.S. and Canada, privatization most often affects wine and spirits (e.g., vodka and whiskey). In the U.S., all states and counties that permit the sale of alcohol allow privatized retail sales of beer, and most allow privatized retail sale of all alcoholic beverages. In contrast, in the Scandinavian countries where most other studies of privatization have been conducted, privatization and re-monopolization generally affect beer sales. The National Alcohol Beverage Control Association (NABCA; www.nabca.org) classifies state retail alcohol sales control policies as shown in Table 1.

The predominant trend in the U.S. and elsewhere is toward relaxing government control over the sale of alcoholic beverages, including by privatizing alcohol sales. The formation of the European Union has also led to a loosening of national control and increased privatization in some member nations.^{7,8} However, because privatization could plausibly lead to increases in excessive alcohol consumption and related harms, a public health intervention of possible interest to some jurisdictions and decision makers may be the reversal of privatization (*re-monopolization*) or the maintenance of government control where it exists currently.

This review addresses three research questions related to the effect of privatizing retail sales of alcoholic beverages. (1) Does retail privatization of a specific type of alcoholic beverage increase its excessive consumption and associated harms (e.g., alcohol-impaired driving, assaults, and cirrhosis of the liver)? (2) Does privatization of sales of one type of alcoholic beverage also reduce excessive consumption of alcoholic beverages for which sales are not privatized (e.g., does the retail privatization of wine sales lead consumers to reduce their consumption of liquor, if liquor sales are still subject to government control)? (3) Does the re-establishment of state control over the retail sales of an

Table 1. The National Alcohol Beverage Control Association (NABCA; www.nabca.org/) classification of state retail alcohol sales control policies

State	Wine	Spirits
Alabama	Private	Government
Idaho	Private	Government and agents
Iowa	Private	Private
Maine	Private	Agents
Maryland (Montgomery County only)	Government	Government
Michigan	Private	Private
Mississippi	Private	Private
Montana	Private	Agents
New Hampshire	Private	Government
North Carolina	Private	Government
Ohio	Private	Agents
Oregon	Private	Agents
Pennsylvania	Government	Government
Utah	Government and agents	Government and agents
Vermont	Private	Agents
Virginia	Private	Government
Washington	Private and government	Government and agents
West Virginia	Private	Private
Wyoming	Private	Private

alcoholic beverage (re-monopolization) reduce the excessive consumption of that beverage and the harms related to excessive consumption?

Findings, Recommendations, and Directives from Other Reviews and Advisory Groups

The 2010 WHO-sponsored review *Alcohol: No Ordinary Commodity*,⁸ a consensus narrative review of a broad array of alcohol interventions, assessed government control of the retail sale of alcohol, and rated it 3+ (the highest rating) for effectiveness in reducing excessive alcohol consumption and related harms and for the extent of research supporting the finding and 2+ on cross-cultural testing, suggesting generalizability across settings. The cost of implementing government control was rated as low. The reviewers concluded that “the evidence is quite strong that off-premise government control systems limit alcohol consumption and alcohol-related problems,

and that elimination of government off-premise monopolies can increase total alcohol consumption.”⁸ The present analysis adds more recent evidence on effects of privatization and applies a more formal protocol to the evaluation and synthesis of available scientific evidence on this topic. The intervention reviewed here may be helpful in addressing several national health objectives related to substance abuse prevention, as specified in *Healthy People 2020*.⁹

Evidence Acquisition

The *Guide to Community Preventive Services (Community Guide)* systematic review process was used to assess whether privatization leads to increases in excessive alcohol consumption and related harms. More details on the *Community Guide* review process are presented elsewhere.^{10,11} In brief, this process involves forming a systematic review development team; developing a conceptual approach to organizing, grouping, and selecting interventions; prioritizing these interventions; searching for and retrieving the existing research evidence on the effects of the interventions; assessing the quality of each study; abstracting information from each study that meets qualifying criteria; drawing conclusions about the body of evidence on intervention effectiveness; and translating the evidence on effectiveness into recommendations. To help ensure objectivity, the systematic review development team consists of systematic review methodologists and subject matter experts from a range of agencies, organizations, and academic institutions. The review team works under the oversight of the non-federal, independent Community Preventive Services Task Force (Task Force), which directs the work of the *Community Guide*.

The systematic review development team collects and summarizes evidence on (1) the effectiveness of interventions in altering the health-related outcomes of interest; and (2) benefits and harms of the intervention on other health and nonhealth outcomes. When an intervention is shown to be effective, information is also included about (3) the applicability (or generalizability) of the evidence to diverse population segments and settings; (4) the economic impact of the intervention; and (5) barriers to implementation. The systematic review development team then presents the results of this review process to the Task Force, which considers all of the evidence presented and determines whether it is sufficient to warrant a recommendation for practice or policy.¹⁰ The rules of evidence under which the Task Force makes its determination require consideration of several aspects of the body of evidence, including the number of studies of different levels of design suitability and execution, as well as judgments regarding the consistency of the findings, the public health importance of the overall effect size, and the balance of the outcome of interest with other consequences of the intervention.

Conceptual Approach and Analytic Framework

Six intermediate consequences of privatization are hypothesized to affect alcohol consumption (Figure 1). First, privatization generally leads to increases in the density of off-premise alcohol outlets.¹² Second, privatization may increase the availability of alcohol by increasing the days and hours during which it is sold.^{13,14} Third, privatization may increase the availability of specific types and brands of alcoholic beverages.

Fourth, privatization may affect the retail price of alcohol because of various factors that may either increase or decrease prices;

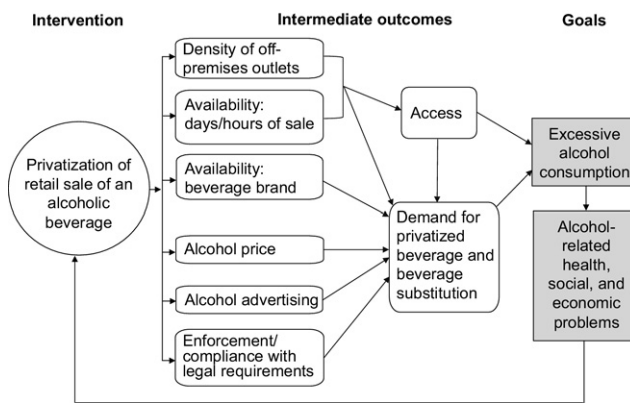


Figure 1. Analytic framework

Note: Privatization of retail sales of alcoholic beverages: Oval indicates intervention; rectangles with rounded corners indicate mediators or intermediate outcomes; rectangles indicate health outcomes.

overall, prices tend to increase with privatization.^{13,14} However, the wider range of alcohol products typically available in privatized systems may result in more low-priced products that would appeal to high-volume or high-risk drinkers, even if the average price for all alcohol products were similar in state-owned and privatized systems. Fifth, because it introduces competition among alcohol outlets, privatization may lead to increased alcohol advertising in various venues, including TV, radio, billboards, and at the point of purchase.¹³ Sixth, because of increased numbers of outlets and less direct governmental control, privatization may lead to decreased enforcement of and compliance with sales regulations (e.g., minimum-drinking-age laws).¹⁵

Many of these consequences of privatization may increase the demand for the privatized beverage, substitution to or from other beverages, and access to alcoholic beverages. In turn, these consequences may affect excessive consumption and related harms. In contrast, re-monopolization is expected to have effects opposite to those of privatization.

Inclusion and Exclusion Criteria

To qualify as a source of primary evidence for this review, a study had to meet several criteria. It had to evaluate retail privatization or renewed government control; be conducted in a country with a high-income economy¹⁶; be primary research (rather than a review of other research); be published in English; and have a comparison group and/or compare conditions before and after privatization. Optimally, alcohol consumption in locations that experienced changes in government control (e.g., privatization) would be compared with alcohol consumption in similar locations that did not experience this change.

A study also had to report outcomes related to excessive alcohol consumption or related harms. Some specific harms of interest included alcohol-related medical conditions (e.g., liver cirrhosis), alcohol-impaired driving and alcohol-related crashes, unintentional injuries, intentional injuries, and crime. Government reports were included, but unpublished papers were not, as they may be difficult for others to access and are not peer-reviewed.

When studies assessed multiple outcomes of interest, those with the strongest known association with excessive alcohol consumption were given more weight. Outcome measures in the studies that had the strongest association with excessive alcohol consumption included binge drinking, heavy drinking, liver cirrho-

sis mortality, alcohol-related hospital admissions, and alcohol-related motor vehicle crashes (or strong proxies for such crashes, e.g., single-vehicle nighttime crashes for alcohol-related motor vehicle crashes).¹⁷ Less-direct measures included per capita ethanol consumption, a well-recognized proxy for estimating the number of excessive drinkers in a population^{8,18,19}; unintentional injuries; suicide; and crime (e.g., homicide and aggravated assault).

Cross-sectional and panel studies in which the sequence of events was not taken into account (e.g., counting year as an ordinal variable) were considered secondary evidence in this review. Secondary evidence was regarded as useful for generating hypotheses and for strengthening or weakening conclusions based on primary evidence, but was insufficient alone for assessing intervention effectiveness. Many of the studies qualifying for this review used per capita alcohol sales as a proxy for excessive drinking. In assessing the quality of study execution, a penalty (described below) was assigned to studies that assessed changes in population-level consumption rather than changes in excessive drinking by individuals. This was a conservative approach because excessive drinking and per capita alcohol consumption are strongly related both theoretically and empirically.^{18–20}

This empirical relationship is conceptualized in the “single distribution theory,” which asserts that excessive drinkers, including binge and heavy drinkers, account for a consistent proportion of the drinking population in a given setting,¹⁹ such that the prevalence of excessive alcohol consumption is directly related to per capita alcohol sales. Further, the theory proposes that the relationship between per capita sales and “heavy” or excessive drinking is quadratic, meaning that, “If population A has twice the average consumption of population B, then A has about four times (i.e., 2²) the prevalence of heavy drinking.” Cook and Skog¹⁹ report evidence from multiple countries supporting this proposition. Thus, changes in per capita alcohol consumption would be expected to have a greater effect on excessive alcohol consumption, including binge drinking, than on non-excessive alcohol consumption. This evidence supports the Task Force’s use of per capita alcohol consumption based on sales as an outcome measure for assessing the impact of privatization on excessive alcohol consumption.

Search for Evidence

The following databases were searched for this review: Econlit, PsycINFO, Sociology Abstracts, MEDLINE, Embase, and EtOH. All years were searched up to October 2007. (Details of the search strategy are available at www.thecommunityguide.org/alcohol/supportingmaterials/SSalcoholuse.html.) This search was updated in the ISI Web of Knowledge through December 2010 by the Alcohol Epidemiology Program at the University of Minnesota. Reference lists of articles reviewed as well as lists in review articles were searched, and subject matter experts were consulted.

Assessing the Quality and Summarizing the Body of Evidence on Effectiveness

Each study that met the criteria for candidate studies was read by two reviewers, who used standardized criteria (available at www.thecommunityguide.org/about/methods.html) to assess suitability of study design and threats to validity. Uncertainties and disagreements between reviewers were reconciled by consensus among the team members. The team’s classification of the designs of studies reviewed corresponds with the research questions of the review and the standards of the *Community Guide* review process¹¹ and may differ from the classification reported in the original studies.

The quality of studies that were candidates as primary evidence for this review was evaluated both in terms of design and execution. Studies with greatest design suitability were those in which data on exposed and comparison populations were collected prospectively; studies with moderate design suitability were those in which data on exposed and comparison populations were collected retrospectively or in which there were multiple pre- or post-intervention measurements, but no concurrent comparison population; and studies with least-suitable designs were cross-sectional studies or those in which there was no comparison population or only a single pre- and post-measurement in the intervention population. On the basis of the number of threats to validity—such as poor measurement of exposure or outcome, lack of control of potential confounders, or high attrition—studies were characterized as having good (at most one threat to validity), fair (two to four threats), or limited (five or more threats) quality of execution. Studies with good or fair quality of execution and any level of design suitability (greatest, moderate, or least) qualified for the body of evidence.

Effect estimates were calculated as relative percentage change using the following formulas:

- For studies with before–after measurements and concurrent comparison groups:

$$\text{Effect estimate} = \left[\frac{(I_{\text{post}}/C_{\text{post}})}{(I_{\text{pre}}/C_{\text{pre}})} - 1 \right] \times 100\%$$

where:

I_{post} = last reported outcome rate or count in the intervention group after the intervention;

I_{pre} = last reported outcome rate in the intervention group before the intervention;

C_{post} = last reported outcome rate in the comparison group after the intervention;

C_{pre} = last reported outcome rate in the comparison group before the intervention.

- For studies with before–after measurements but no concurrent comparison:

$$\text{Effect estimate} = \left[\frac{(I_{\text{post}} - I_{\text{pre}})}{I_{\text{pre}}} \right] \times 100\%.$$

Several events of privatization (e.g., the privatization of wine in Iowa in 1985) were assessed by more than one team of researchers, thus resulting in multiple studies of the same event. Effect estimates are reported for each research group, noting which were associated with a single event. Median effect sizes are calculated using the means of privatization events with differing findings from different researchers.

Evidence Synthesis

Intervention Effectiveness

The effects of 12 distinct privatization events were assessed in 17 studies and reported in 13 publications.^{14,21–32} In addition, there was one study of re-monopolization, described separately below.³³ The privatization events assessed were in seven U.S. states (Alabama, Idaho, Iowa [two events], Maine, Montana,

New Hampshire, West Virginia); two Canadian provinces (Quebec [two events] and Alberta); and Finland. Several publications described a single privatization event, and several publications each assessed more than one privatization event.

All studies used alcohol sales data as an index of population-level alcohol consumption except one²⁵ that assessed changes in individual-level consumption (in Finland). Fitzgerald and Mulford^{14,22} also assessed changes in self-reported consumption in addition to sales data (in Iowa). However, as they note, their measures of alcohol consumption were problematic (e.g., separate cross-sectional studies collected under different sampling procedures with different interview procedures), and thus only the assessments of changes in alcohol sales from their study are included in this review.

In the U.S., privatized beverages were limited to wine and spirits, as beer was already privatized. In Canada, sale of beer was privatized in addition to sales of wine and spirits, and in Scandinavia, privatization (and re-monopolization) focused on beer sales. The privatization events assessed in these studies occurred between 1950 and 2000. Three studies used autoregressive integrated moving average (ARIMA) time series.^{27–29} Fourteen studies (presented in eight publications)^{14,23,26–30,32} were of greatest design suitability; three studies (presented in two publications)^{24,25} were of moderate design suitability. All studies were of fair quality of execution.

The qualifying studies provided information on several of the intermediate consequences of privatization discussed above (Figure 1). These consequences include increased numbers of alcoholic beverage outlets, increased hours and days of sale, advertising, greater brand selection, and acceptance of alternate forms of payment (e.g., credit card).^{13,14,23,26–30,32,34} All of these intermediate outcomes would be expected to result in increased consumption.

Most studies reviewed reported generally higher prices for alcoholic beverages in the privatized than in the state control setting. The higher prices may be the conse-

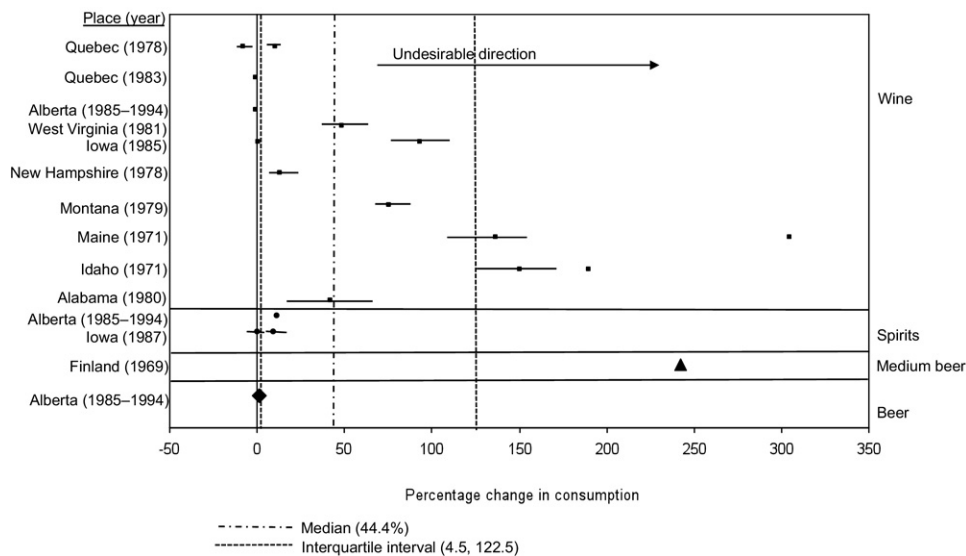


Figure 2. Percentage change by location of privatization event in consumption of privatized alcoholic beverages attributable to privatization

Note: Bars on the point estimate represent 95% CIs when reported or calculated.

quence of relative inefficiencies of scale (e.g., multiple smaller outlets and increased overhead expenses).³⁵ In contrast to other intermediate outcomes, higher prices would be expected to result in decreased consumption. However, Fitzgerald and Mulford²¹ assessed whether the increase in the price of spirits following privatization of retail sales in Iowa had affected consumers’ purchasing behavior, and found that only 37.4% of those surveyed who purchased liquor in the past month recognized that prices had increased, and <2% of Iowa consumers reported increasing their purchase of liquor from adjacent states.

Effects of privatization on consumption of privatized beverages.

Overall, the median increase in per capita sales of privatized beverages was 44.4%, with an interquartile interval of 4.5% to 122.5% (Figure 2). Some differences, however, were observed across studies in the impact of privatization on retail sales of privatized beverages and in the relationship between privatization and other public health outcomes, described below.

Studies assessing the effects of the privatization of wine (1985) and spirits (1987) sales in Iowa had inconsistent findings. Wagenaar and Holder³¹ reported that wine consumption increased 93.0% (95% CI=69.3%, 120.2%) from baseline to 44 months after privatization of wine sales in Iowa, with no decrease in spirits or beer consumption. Following the subsequent privatization of spirits sales in Iowa 2 years later, these researchers²³ reported a 9.5% (95% CI=3.5%, 15.9%) increase in spirits consumption, along with a 12.1% (95% CI= -20.6%, -2.7%) decrease in wine consumption and no change in

beer consumption. They^{23,31} also found no evidence that privatization affected alcohol purchasing across state lines (effect estimate 0.1%, 95% CI= −3.1%, 6.2%).

In contrast, Mulford and Fitzgerald²⁷ found that wine privatization was associated with a nonsignificant long-term increase of only 0.5% (95% CI= −6.8%, 8.3%) in wine sales, and that spirits privatization was associated with a nonsignificant long-term increase of 0.7% (95% CI= −1.9%, 3.4%) in spirits sales. For both beverages, the nonsignificant long-term effects were preceded by 3-year spikes in sales. The differences between the conclusions of these two research teams about the effects of the privatization of wine and spirits in Iowa may be the consequence of different modeling strategies, different time periods covered, and different forms of alcoholic beverages included—particularly the inclusion of “wine coolers” in measures of wine sales by Wagenaar and Holder.^{31,32}

Finally, Makela²⁵ assessed the impact on alcohol consumption of a law in Finland that allowed the sale of medium-strength beer (MSB) in grocery stores. This was the only study included in the review that assessed changes in self-reported alcohol consumption by individuals over time. Survey participants were specifically asked about their levels of consumption before implementation of the new law and then again in the year following its implementation. The researchers stratified their findings based on drinking patterns of respondents before and after privatization. Consumption of all alcoholic beverages (not just the privatized beverage) increased by a mean of 1.7 L of pure alcohol per year per person interviewed (approximately 137 ounces of 80° proof liquor). Makela reports that 86% of the increase in overall alcohol consumption was attributable to increases in the privatized beverage (MSB). The greatest increase in alcohol consumption after privatization was observed among those who reported drinking between 17 and 68 ounces of pure alcohol per year at first interview. However, there was also an increase in consumption in the population that reported no alcohol consumption within the past 30 days when first interviewed.

Effects of privatization on alcohol-related harms. Two studies assessed the association between retail privatization and motor vehicle crashes. One study estimated that incremental privatization over a 20-year period was associated with a nonsignificant 11.3% (95% CI= −33.9%, 19.0%) decrease in traffic fatalities in Alberta, Canada.²⁹ This study estimated the degree of privatization over a long period preceding final privatization in 1994, had only 1 year of follow-up, and used a proxy outcome measure.

A second study assessed changes in alcohol-related harms associated with the Iowa privatization of wine in 1985 and spirits in 1987.^{14,26} The researchers compared the period before 1985 with the period after 1989, when

both wine and spirits sales were privatized. Despite increased per capita sales of both wine and spirits, there was a reported 1.6% decline in nighttime motor vehicle crashes and a 5.5% decline in liver cirrhosis. However, initial mortality data were for 1985—the same year in which the privatization of wine occurred; thus these data included deaths both prior to and following privatization, weakening the analysis. Moreover, no comparison data were provided to adjust for national or regional trends in these outcomes over the time period evaluated.

Effects of privatization on the consumption of non-privatized alcoholic beverages. Many of the studies^{14,25,26,31,32,36} reviewed also assessed the effect of privatizing the sale of one type of alcoholic beverage on the sale of other nonprivatized beverages. In the seven settings assessed, the sales of nonprivatized alcoholic beverages decreased a median of 2.2%, with an interquartile interval ranging from a decrease of 6.6% in sales to a decrease of 0.1% (Figure 3). These decreases are not of sufficient magnitude to offset the overall increase in per capita sales of privatized beverages.

Effects of re-monopolization on alcohol-related outcomes. One study in Sweden³³ directly assessed effects of a 1977 re-monopolization of the sale of MSB (2.26%–3.50% alcohol by volume; beer in the U.S. is generally 4%–6% alcohol by volume). The study was of moderate design suitability and fair execution. Re-monopolization resulted in a substantial decline in the number of outlets for MSB, from 11,550 to 300. The effects of this policy change on hospitalization for several alcohol-related outcomes (alcoholism, alcohol intoxication, alcoholic psychosis, hospitalizations for acute alcohol intoxication, suicides, falls, motor vehicle crashes, and assaults) were assessed using time-series design, comparing the 4 years before and after re-monopolization. The results were stratified by four age categories (10–19 years, 20–39 years, 40–59 years, and ≥60 years), and the study did not provide data to allow aggregation across age groups.

The researchers identified a number of positive changes in health outcomes following re-monopolization. Hospital admissions for the treatment of alcoholism, alcohol intoxication, and alcohol psychosis decreased across all age groups ($p>0.05$), and there was a 20% decline ($p<0.05$) in these outcomes among people aged 10–19 years. Hospitalizations for acute alcohol intoxication decreased across all ages from 3.5% to 14.7% ($p>0.05$). Suicides decreased from 1.7% to 11.8% ($p>0.05$). Falls decreased from 3.6% to 4.9% ($p>0.05$). Motor vehicle crashes decreased 14% ($p<0.05$) for three age categories (10–19 years, 40–59 years, and ≥60 years) and by 4.4% for those aged 20–39 years ($p>0.05$). In contrast, assaults *increased* from 6.9% to 14.8% ($p>0.05$)

in three of four age categories, and decreased by 1.4% among those aged 20–39 years ($p>0.05$). In summary, the re-monopolization of MSB in Sweden was associated with reductions in most of the alcohol-related harms assessed across all age groups; however, many of these effects were not significant.

Cross-sectional studies, panel studies, and summarized studies in translation. The team found 20 cross-sectional and panel studies^{29,35,37–54} assessing the association of privatization with alcohol consumption and related harms; five studies^{35,38,43,47,48} had multiple outcomes. (Panel studies were included in this section if they did not include time as an ordinal covariate or compare alcohol-related outcomes before and after events of privatization.) Seventeen studies^{29,35,37,38,40,42–48,50–54} found that privatization was associated with greater consumption (nine were significant,^{37,40,42–44,46,48,52,53} seven were not,^{29,35,38,45,47,50,54} and one⁵¹ did not report significance). Four studies found decreased consumption (three were significant,^{40,43,44} one not³⁸). Three studies^{37,41,50} assessed the association of privatization with cirrhosis mortality; all were positive and two^{37,41} were significant. Finally, two studies assessed the association of privatization with motor vehicle fatalities,^{39,46} and both found a positive, but nonsignificant association; one study found a negative, significant association of privatization and drunk driving. Overall, this evidence is consistent with evidence from primary studies indicating positive associations between privatization and increased population-level consumption and between privatization and alcohol-related harms.

Makela, Rossow, and Tryggvesson³⁶ published (in English) a review of studies conducted in Finland, Sweden, and Norway that were not published in English translation and thus were not included in this review. These studies examined the effect of either privatizing or re-monopolization of the sales of medium or strong beer between the mid-1960s and the early 1990s on various kinds of alcohol-related harms (e.g., arrests for drunkenness and alcohol-related illnesses).

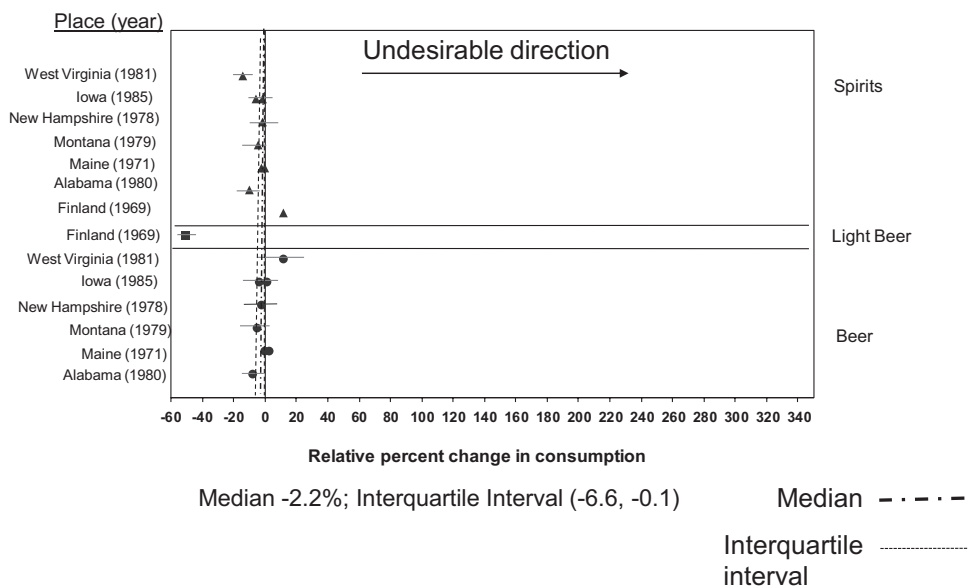


Figure 3. Percentage change in consumption of nonprivatized alcoholic beverages attributable to privatization of other alcoholic beverages

Note: Bars on the point estimate represent 95% CIs when reported or calculated.

The researchers found that when beer sales were privatized, there were increases in alcohol consumption and alcohol-related harms such as arrests for drunkenness and alcohol-related illnesses. They also found that re-monopolization generally resulted in decreased population-level consumption of the affected alcoholic beverage, decreases in excessive alcohol consumption, and decreases in alcohol-related harms. In addition, they found that when a particular strength of beer became more or less accessible, consumers tended to purchase the beverage type that was more readily accessible. This beverage substitution effect appeared to be stronger among different strengths of beer than among different types of alcoholic beverages.

Summary of Intervention Effectiveness

Across the studies qualifying for this review, the privatization of off-premises retail sales of an alcoholic beverage was associated with a median 44.4% increase (interquartile interval 4.5%, 122.5%) in the per capita sales of the beverage and with a 2.2% decline (interquartile interval -6.6%, -0.1%) in the per capita sales of beverages for which sales were not privatized. One study (in Finland)²⁵ found that the increases in consumption occurred among drinkers at all consumption levels. A single study³³ evaluating the effects of re-monopolization of alcohol sales found that this change was associated with a subsequent decrease in several alcohol-related harms (e.g., hospitalizations for acute alcohol intoxication).

Other Harms and Benefits

Government control over retail alcohol sales generally results in lower alcohol outlet density. In addition to potential public health benefits, lower outlet density may improve quality of life by reducing property damage and public disturbance (e.g., public intoxication). However, the studies reviewed did not assess these effects. The review team did not postulate any serious harms associated with the maintenance of government control over retail alcohol sales.

Applicability

Consistent evidence of the association between privatization and increased per capita alcohol sales comes from studies done in multiple settings in the U.S., Canada, and Europe. Most of these studies evaluated the effects of privatizing the sales of wine and spirits. Only one Swedish study³³ specifically assessed the impact of re-monopolization (of MSB). The findings from the current review apply most directly to the impact of privatizing the sale of wine and spirits in high-income nations such as the U.S.

Economic Efficiency

The present systematic economic review identified one study⁵⁵ in Canada that used simulation modeling to estimate healthcare and law enforcement costs and costs of lost productivity due to disability and premature mortality in the event all Canadian provinces and territories were to privatize alcohol sales. The study was judged to be satisfactory by *Community Guide* economics criteria (www.thecommunityguide.org/about/EconAbstraction_v5.pdf). Study authors concluded that these costs were substantially greater than the tax and mark-up revenue gained from increased sales associated with privatization; however, benefit data were not documented.

Research Gaps

Although the studies reviewed have demonstrated an association between privatization and increases in the per capita consumption of the privatized beverages without substantial reductions in consumption of other alcoholic beverages, additional research is needed to clarify the relationship between privatization and various patterns of excessive alcohol consumption (e.g., binge drinking) as well as harms related to it. Most useful would be cohort studies in the U.S. similar to the one conducted by Makela et al.²⁵ in Finland, assessing the effects of privatization on patterns of excessive alcohol consumption (e.g., binge drinking) and alcohol-related harms. It would also be useful to evaluate the impact of increased government control over alcohol sales (e.g., re-monopolization) on excessive alcohol consumption and related harms, were

such events to occur in the U.S. or other high-income nations.

Privatization has assumed different forms in different states and localities. Thus, it would be useful to determine how the effects of privatization observed in this review vary by the degree of government regulation and other specific parameters of the privatization. Although, in general, government control establishes a greater degree of regulation over retail alcohol sales than systems in which sales have been privatized, Her et al.¹³ have noted that “privatization might involve a change from a very restrictive alcohol management system to a loosely regulated private one; it would also potentially involve a change from a commercially orientated public system to a private sector operation that is heavily regulated.”

No peer-reviewed studies were found that evaluated economic effects of privatizing the sale of alcoholic beverages in the U.S. The anticipated effects of privatization include a large, but short-term, source of revenue to states; a potential increase in healthcare and criminal justice costs; and productivity losses from expected increases in excessive alcohol consumption owing to greater availability and/or lower prices. Studies assessing these economic impacts would be useful for informing future discussions of this issue. It would be useful to assess the effects of different specific approaches to privatization on state revenues associated with sales and taxes on alcoholic beverages.

Conclusion

The evidence consistently showed that privatization of retail alcohol sales was associated with a substantial increase in per capita sales of the privatized beverages, a well-established proxy for excessive alcohol consumption. There was also evidence that re-monopolization is associated with a decrease in alcohol-related harms. Therefore, according to *Community Guide* rules of evidence, there was strong evidence that retail privatization of alcohol sales leads to increases in excessive alcohol consumption.

In the U.S., many states have privatized the retail sales of alcoholic beverages. Currently, three states control the off-premises consumption retail sales of both wine and spirits, and an additional ten states maintain control over the retail sale of spirits alone. In addition, one county in the state of Maryland has county-level control over the retail sale of spirits and wine. The findings of the present report are based solely on evidence related to the public health consequences of privatization, which may be one of several factors considered in making decisions on whether to privatize retail alcohol sales. The maintenance of government control of off-premises sale of alcoholic

beverages is one of many effective strategies to prevent or reduce excessive consumption, which is one of the leading causes of preventable death and disability.

We would like to thank Steve Wing (SAMHSA) and Ralph Hingson, ScD, MPH, National Institute of Alcohol Abuse and Alcoholism, for participation in this review. We also thank our team of consultants for their comments: Edward Bernstein, MD, Boston University School of Public Health; Richard J. Bonnie, LLB, University of Virginia; Raul Caetano, MD, MPH, PhD, University of Texas at Dallas; Frank Chaloupka, PhD, University of Illinois at Chicago; Norm Giesbrecht, PhD, Centre for Addiction and Mental Health, Canada; Thomas Greenfield, PhD, National Alcohol Research Center/Alcohol Research Group, California; Joel Grube, PhD, and Harold Holder, PhD, Pacific Institute for Research and Evaluation (PIRE), California; Mel Kohn, MD, Oregon Department of Human Services; Jurgen Rehm, PhD, Centre for Addiction and Mental Health, Canada; Robin Room, PhD, Stockholm University; Henry Saffer, PhD, National Bureau of Economic Research; Leslie Snyder, PhD, University of Connecticut; Tim Stockwell, PhD, University of Victoria; Alex Wagenaar, PhD, University of Florida College of Medicine.

No financial disclosures were reported by the authors of this paper.

References

1. CDC. Alcohol-attributable deaths and years of potential life lost—U.S., 2001. *MMWR Morb Mortal Wkly Rep* 2004;53(37):866–70.
2. Miller JW, Naimi TS, Brewer RD, Jones SE. Binge drinking and associated health risk behaviors among high school students. *Pediatrics* 2007;119(1):76–85.
3. National Center for Health Statistics. Health, U.S., 2010, with special feature on death and dying. www.cdc.gov/nchs/data/abus/abus10.pdf.
4. Johnston LD, O'Malley PM, Bachman JG, Schulenberg JE. Monitoring the future: National survey results on drug use, 1975–2008. Volume II, College students and adults ages 19–50. Bethesda MD: National Institute on Drug Abuse, 11-1-2009. NIH Publication No. 09-7403.
5. Bouchery EE, Harwood HJ, Sacks JJ, Simon CJ, Brewer RD. Economic costs of excessive alcohol consumption in the U.S., 2006. *Am J Prev Med* 2011;41(5):516–24.
6. Aaron P, Musto D. Temperance and probibility in America: an historical overview. In: Moore MH, Gerstein DR, editors. *Alcohol and public policy: beyond the shadow of prohibition*. Washington DC: National Academy Press, 1981:127–81.
7. Holder HD, Giesbrecht N, Horverak O, et al. Potential consequences from possible changes to Nordic retail alcohol monopolies resulting from European Union membership. *Addiction* 1995;90(12):1603–18.
8. Babor TF. *Alcohol: no ordinary commodity. Research and public policy*. 2nd ed. New York: Oxford University Press, 2010.
9. DHHS. *Healthy People 2020*. www.healthypeople.gov/2020/default.aspx.
10. Briss PA, Zaza S, Pappaioanou M, et al. Developing an evidence-based Guide to Community Preventive Service—methods. *Am J Prev Med* 2000;18(1S):35–43.
11. Zaza S, Wright-De Agüero LK, Briss PA, et al. Data collection instrument and procedure for systematic reviews in the Guide to Community Preventive Services. *Am J Prev Med* 2000;18(1S):44–74.
12. Campbell AC, Hahn RA, Elder RA, et al.; Task Force on Community Preventive Services. The effectiveness of limiting alcohol outlet density as a means of reducing excessive alcohol consumption and alcohol-related harms. *Am J Prev Med* 2009;37(6):556–69.
13. Her M, Giesbrecht N, Room R, Rehm J. Privatizing alcohol sales and alcohol consumption: evidence and implications. *Addiction* 1999;94(8):1125–39.
14. Fitzgerald JL, Mulford HA. Consequences of increasing alcohol availability: the Iowa experience revisited. *Br J Addict* 1992;87(2):267–74.
15. Rossow I, Karlsson K, Raitasalo K. Old enough for a beer? Compliance with minimum legal age for alcohol purchases in monopoly and other off-premise outlets in Finland and Norway. *Addiction* 2008;103:1468–73.
16. World Bank. *World Development Indicators 2006*. devdata.worldbank.org/wdi2006/contents/cover.htm.
17. Gruenewald PJ, Millar AB, Treño AJ, Yang Z, Ponicki WR, Roepel P. The geography of availability and driving after drinking. *Addiction* 1996;91(7):967–83.
18. Nelson D, Naimi TS, Brewer RD, Roepel J. U.S. State alcohol sales compared to survey data, 1993–2006. *Addiction* 2010;105:1589–96.
19. Cook PJ, Skog OJ. Alcohol, alcoholism, alcoholisation—comment. *Alcohol Health Res World* 1995;19(1):30–1.
20. Greenfield TK, Rogers JD. Who drinks most of the alcohol in the U.S.? The policy implications. *J Stud Alcohol* 1999;60(1):78–89.
21. Fitzgerald JL, Mulford HA. Privatization, price and cross-border liquor purchases. *J Stud Alcohol* 1993;54(4):462–4.
22. Fitzgerald JL, Mulford HA. Alcohol availability, drinking contexts and drinking problems: the Iowa experience. *J Stud Alcohol* 1993;54(3):320–5.
23. Holder HD, Wagenaar AC. Effects of the elimination of a state monopoly on distilled spirits' retail sales: a time-series analysis of Iowa. *Br J Addict* 1990;85(12):1615–25.
24. Macdonald S. The impact of increased availability of wine in grocery stores on consumption: four case histories. *Br J Addict* 1986;81:381–7.
25. Makela P. Whose drinking does the liberalization of alcohol policy increase? Change in alcohol consumption by the initial level in the Finnish panel survey in 1968 and 1969. *Addiction* 2002;97(6):701–6.
26. Mulford HA, Fitzgerald JL. Consequences of increasing off-premise wine outlets in Iowa. *Br J Addict* 1988;83(11):1271–9.
27. Mulford HA, Ledolter J, Fitzgerald JL. Alcohol availability and consumption: Iowa sales data revisited. *J Stud Alcohol* 1992;53(5):487–94.
28. Smart RG. The impact on consumption of selling wine in grocery stores. *Alcohol Alcohol* 1986;21(3):233–6.
29. Trollid B. An investigation of the effect of privatization of retail sales of alcohol on consumption and traffic accidents in Alberta, Canada. *Addiction* 2005;100(5):662–71.
30. Trollid B. The privatization of wine sales in Quebec in 1978 and 1983 to 1984. *Alcohol Clin Exp Res* 2005;29(3):410–6.
31. Wagenaar AC, Holder HD. A change from public to private sale of wine: results from natural experiments in Iowa and West Virginia. *J Stud Alcohol* 1991;52(2):162–73.
32. Wagenaar AC, Holder HD. Changes in alcohol consumption resulting from the elimination of retail wine monopolies: results from five U.S. states. *J Stud Alcohol* 1995;56(5):566–72.
33. Ramstedt M. The repeal of medium-strength beer in grocery stores in Sweden: the impact on alcohol-related hospitalizations in different age groups. In: Room R, ed. *The effects of Nordic alcohol policies: what happens to drinking and harm when alcohol controls change? Finland: Nordic Council for Alcohol and Drug Research (NAD), 2002:69–78*.
34. Mustonen H, Sund R. Changes in the characteristics of drinking occasions resulting from liberalization of alcohol availability: A reanalysis of the 1968 and 1969 Finnish panel survey data. In: Room R, ed. *The effects of Nordic alcohol policies: what happens to drinking and harm when alcohol controls change? Nordic Council for Alcohol and Drug Research, 2002:49–55*.

35. Simon JL. The economic effects of state monopoly of packaged-liquor retailing. *J Polit Econ* 1966;74:188–94.
36. Makela P, Rossow I, Tryggvesson K. Who drinks more and less when policies change? The evidence from 50 years of Nordic studies. In: Room R, editor. *The effects of Nordic alcohol policies: what happens to drinking and harm when alcohol controls change? Finland: Nordic Council for Alcohol and Drug Research*, 2002:42–55.
37. Andreano RL, Li JY. Death rates from liver cirrhosis in alcohol monopoly and free-market states. *Q J Stud Alcohol* 1974;35(Pt A):649–54.
38. Beard TR, Gant PA, Saba RP. Border-crossing sales, tax avoidance, and state tax policies: an application to alcohol. *South Econ J* 1997; 64(1):293–306.
39. Colon I. The influence of state monopoly of alcohol distribution and the frequency of package stores on single motor vehicle fatalities. *Am J Drug Alcohol Abuse* 1982;9(3):325–31.
40. Goel RK, Morey MJ. The interdependence of cigarette and liquor demand. *South Econ J* 1995;62(2):451–9.
41. Heien D, Pompelli G. Stress, ethnic and distribution factors in a dichotomous response model of alcohol abuse. *J Stud Alcohol* 1987; 48(5):450–5.
42. Hoadley JF, Fuchs BC, Holder HD. The effect of alcohol beverage restrictions on consumption: a 25-year longitudinal analysis. *Am J Drug Alcohol Abuse* 1984;10(3):375–401.
43. Kenkel DS. Drinking, driving, and deterrence: The effectiveness and social costs of alternative policies. *J Law Econ* 1993;36(2):877–913.
44. Kenkel DS. New estimates of the optimal tax on alcohol. *Economic Inquiry* 1996;34(2):296–319.
45. McCornac DC, Filante RW. The demand for distilled spirits: an empirical investigation. *J Stud Alcohol* 1984;45(2):176–8.
46. Miller T, Snowden C, Birckmayer J, Hendrie D. Retail alcohol monopolies, underage drinking, and youth impaired driving deaths. *Accid Anal Prev* 2006;38(6):1162–7.
47. Nelson JP. State monopolies and alcoholic beverage consumption. *J Regulatory Econ* 1990;2(1):83–98.
48. Nelson JP. Advertising bans, monopoly, and alcohol demand: testing for substitution effects using state panel data. *Rev Industrial Org* 2003;22(1):1–25.
49. Ornstein S, Hanssens D. Alcohol control laws and the consumption of distilled spirits and beer. *J Consum Res* 1985;12(2):200–13.
50. Popham RE, Schmidt W, de Lint J. Government control measures to prevent hazardous drinking. In: Ewing JA, Rouse BA, editors. *Drinking: alcohol in American society: issues and current research*. Chicago: Nelson-Hall, 1978:239–66.
51. Spellman WE, Jorgenson MR. Liquor control and consumption. *J Stud Alcohol* 1983;44(1):194–7.
52. Stockwell T, Zhang J, Macdonald S, Pakula B, Gruenewald P, Holder H. Changes in per capita alcohol sales during the partial privatization of British Columbia's retail alcohol monopoly 2003–2008: a multi-level local area analysis. *Addiction* 2009;104:1827–36.
53. Trollid B. Alcohol price elasticities in control and license states in the U.S., 1982–99. *Addiction* 2005;100(8):1158–65.
54. Zardkoohi A, Sheer A. Public versus private liquor retailing: an investigation into the behavior of the state governments. *South Econ J* 1984;50(4):1058–76.
55. Popova S, Patra J, Sarnocinska-Hart A, Gnam WH, Giesbrecht N, Rehm J. Cost of privatization versus government alcohol retailing systems: Canadian example. *Drug Alcohol Rev* 2011;Epub ahead of print.