CHANGES IN ACCESS TO ALCOHOL AND IMPACTS ON

ALCOHOL CONSUMPTION & DAMAGE

An overview of recent research studies focusing on alcohol price, hours and days of sale and density of alcohol outlets

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A. Background, Focus & Methods

The World Health Organization (2002) has indicated that in developed countries, including Canada, the damage from alcohol is ranked 3rd of 26 risk factors examined in terms of being a risk factor for disease, disability or mortality. The top two were tobacco and blood pressure. Alcohol was third and ahead of the following risk factors: cholesterol, body mass index, low intake of fruit and vegetables, physical inactivity and illicit drugs. However, as shown below, there have been intensive recent initiatives to promote alcohol, increase access to alcohol and stimulate alcohol sales. Concurrently, overall alcohol consumption and high-risk drinking have been increasing in Canada in recent years. It is expected that these initiatives to increase assess to alcohol and stimulate higher levels of overall consumption will contribute to increasing the risks from alcohol, damage from alcohol and attendant health, social and law enforcement costs.

However, it is feasible to curtail the rise in alcohol consumption and high-risk drinking, and thus reduce the damage from alcohol. This will require at a minimum three actions:

- there be no further initiatives to increase access to alcohol;
- the most effective interventions be implemented, reinforced and evaluated; and
- health and safety experts become central contributors to policy decisions that impact alcohol management in a jurisdiction.

This paper examines three interventions that have been shown to be particularly potent in controlling consumption and damage from alcohol consumption, namely, price and taxation, hours and days of sale, and density of alcohol outlets (Babor et al, 2003, chapter 16). However, first it provides some comments about recent changes in alcohol management in Canada.

In recent years all jurisdictions in Canada have undergone substantial changes in how alcoholic beverages are distributed and sold. These changes have for the most part been gradual and in some cases have taken place concurrently. They have included an increase in alcohol marketing and promotion, an increase in density in outlets, an extension of hours and days of sale, and use of discounts or sale prices in order to promote sales.

Provincial liquor boards and commissions include management of alcohol sales as part of their mandate. However, the control functions are currently primarily and narrowly restricted to social responsibility initiatives, interventions to control smuggling, concerns about the quality of products and some health promotion campaigns, such as prevention of drinking and driving. The primary current function of liquor boards and commissions appears to be the promotion of alcohol sales and marketing of alcoholic beverages.

In contrast, controlling overall per capita consumption of alcohol and reducing the size of the population that drinks in a high-risk manner do not appear to be part of the mandate, goals and activities of provincial liquor boards. This is a major and regrettable oversight since both the total volume of alcohol distributed in a society and proportion of high-risk drinkers have been shown to be associated with the levels of health and social order problems in a society (see Babor et al. 2003). In short, two of the most important dimensions (overall volume of alcohol sold and the proportion of high-risk drinkers in a jurisdiction) that contribute to a jurisdiction's alcohol-related damage are not part of the alcohol management process. Furthermore, health and safety considerations appear to have very little, if any, bearing on decisions to increase access to alcohol or to undertake extensive marketing campaigns – and both have been associated with high risk drinking. This is likely due to many factors, including the following:

- Decision-making protocols do not routinely include health and safety experts at the decision-making table (Giesbrecht et al., 2006).
- Second, in the current climate increased access to alcohol and an increase in overall consumption is expected as part of enhanced marketing, promotion and state-of-the art retailing (Giesbrecht & MacKenzie, 2000).
- Furthermore, an increase in the overall sales is conceptually and erroneously separated from an increase in the rate of alcohol-related problems. In other words it is falsely assumed in business and retailing circles that more alcohol can be sold without creating the potential for more alcohol-related problems in a society.

This perspective does not acknowledge an incongruity between greater commercial orientation and an emphasis on increasing alcohol sales and increase in damage and costs that this perspective might lead to (Giesbrecht and Őosterberg, 2008).

This skewed current emphasis on the market factors stands in sharp contrast to over 40 years of international research on the associations between access to alcohol, drinking patterns and damage from alcohol. This body of research has repeatedly shown that an increase in alcohol sales is strongly linked with an increase in drinking-related damage as shown by three international projects affiliated with WHO (Bruun, Edwards, Lumio et al., 1974; Edwards, Anderson, Babor et al.1994; Babor, Caetano, Casswell, et al. 2003).

Furthermore, a study of 14 European countries (Norström, 1999) demonstrated a strong association between 50 year trends in overall alcohol sales and mortality from alcohol-specific causes (Ramstedt, 2001), trauma (Rossow, 2001; Skog, 2001), chronic disease (Ramstedt, 2004a), as well as total mortality (Norström, 2001). Similar findings emerged from a study focusing Canada and its provinces for the period 1950 to 2000 (Norström, 2004; Ramstedt, 2003, 2004b, 2005; Rossow, 2004; Skog, 2003).

In Canada there has been an increase in the rate of alcohol consumption since about 1996 (Statistics Canada, 2002, 2005b), with some variation by province.[1,2] During this time the percentage of drinkers who reported drinking 5+ drinks per occasion at least monthly has also increased (Statistics Canada, 1997, 1999, 2003, 2005a).

These two developments are cause for concern from a public health and safety perspective. A cost study based on 2002 data found that the net costs of alcohol for Canada was just under $14 billion, with $418.9 million for Nova Scotia (Rehm et al. 2006). This estimate took into account potential health and other savings from moderate consumption and beneficial effects on health, and it was a conservative estimate in that the impacts of some social problems were difficult to quantify and therefore not included.

Therefore, it is possible that the damage and costs from alcohol will increase in Canada in the coming years. This projection is based on the following points:

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[1] In order to standardize the information so that it can be combined, beer, wine and spirits are converted to the equivalent in pure alcohol – i.e.100% ethanol, and this volume is divided by the population aged 15 and older. This is the international convention, since a substantial portion of the population has consumed some alcohol by age 15.

[2] This includes off-premise and on-premise sales combined. “Off-premise sales” refers to alcoholic beverages purchased in liquor stores and other package outlets for consumption in places other than where the beverage was purchased; “On-premise sales “ refers to alcoholic beverages purchased in bars, restaurants and other licensed premises for consumption at the place where it was purchased.

- Trends studies in Canada and Europe have shown that overall rates of consumption are positively related to both trauma and chronic disease – that is, as consumption increases damage from alcohol is expected to increase.
- In recent years both overall consumption and high-risk drinking have been on the increase in Canada.
- Recent alcohol management decisions have tended to be in the direction of stimulating consumption rather than controlling it – through such measures as increasing access and promoting alcohol sales.
- The policy decision processes tend to be skewed to favour a marketing perspective and do not give ample attention to health and safety perspectives, nor do they typically provide the opportunity extensive involvement of persons with health and safety expertise.

However, as noted at the outset, it is feasible to curtail the rise in alcohol consumption and high-risk drinking, and reduce the damage from alcohol. This will require at a minimum three actions: that there be no further initiatives to increase access to alcohol; that the most effective interventions be implemented, reinforced and evaluated; and that health and safety experts become central contributors to policy decisions that impact alcohol management.

All three dimensions have a bearing on the developments and on-going deliberations in Nova Scotia**,** including the following:

- provision of easy access to alcohol through long hours of sale, high density of outlets and promotion of consumption through happy hours;
- discount pricing of alcoholic beverages;
- advertising and promotion of access to alcohol and competitive pricing

In this context it is noteworthy that surveys have shown that alcohol consumption rates, such as heavy-frequent drinking and hazardous/harmful drinking are higher in Atlantic Canada in the Canadian Campus Survey (2004) than for the total sample (Adlaf, Demers, & Gliksman, 2004).

The main resources for this report were publications in English from developed countries that were published from 2000 onwards. As noted in Figures 1 and 2, several key words were

used to search for relevant abstracts, which were then reviewed and those most central to the themes of this report selected. Some studies were excluded for various reasons: because they did not evaluate the impact of an intervention or dependent variable – such as Paschall et al. (2007) which examined outlet characteristics and sales to youth; because they were not considered to be of good quality (e.g. Laranjeira and Hinkly, 2002); because they were duplicates of study already selected for review; or because they had insufficient information on the key variables, such as pricing and taxation. Overall 16 studies on taxation and pricing were selected, 8 on hours and days of sale and 17 on outlet density. These studies are summarized in Tables 1, 2 and 3, using the following organizing categories: authors and publication year; place of study; years of data collection; main variables; design and methods; impact of intervention; findings organized by alcohol consumption, drinking pattern and damage; population impacted; and policy implications.

As noted by Livingston and colleagues (2007) studies can be organized into three broad categories: cross-sectional studies, natural experiments and time-series analyses. These categories were used in their review of research on alcohol outlet density, but they can also apply to other dimensions of access to alcohol, such as price and hours/days of sale. Cross-sectional studies provide insights into the link between access to alcohol and overall consumption and damage, without providing firm conclusions about the causal direction. Time series studies typically involve long-term gradual changes in access to alcohol, are useful in determining whether, for example, "over a certain amount of time, changes in outlet rates are related to changes in problems" (Livingston et al. 2007, p. 558). The most robust method involves 'natural experiment'[3] studies that examine the impact of more dramatic changes in access to alcohol, whereas many changes are more gradual (Livingston et al. 2007).

[3] In this context a 'natural experiment' study refers to a situation where there is a policy or regulatory change and it is feasible to obtain data and statistics for before and after the change, and, ideally, similar trend data for a comparison or control area or jurisdiction that did not undergo a comparable change in policy or regulation. This way it is feasible to explore whether or not the change in policy had any impact over time on the dependent variable in the focus jurisdiction – that is where the policy change went into effect, and if this impact was similar to or different from that in a comparison area or jurisdiction that did not experience the change in policy or regulation.

B. Main Findings

The findings are organized in three main categories: alcohol prices and taxation; hours and days of sale; and density of alcohol outlets. In each case the impacts of a change are examined on the following dimensions: overall alcohol consumption, drinking patterns and damage from alcohol. Overall consumption refers to either the average volume of alcohol consumed by respondents, for example, if it is a survey-based study, or total sales of alcohol.

'Drinking patterns' refers to a combination of variables, for example, how alcohol consumption is distributed over time. How high-risk drinking (such as 5 + drinks per occasion) is distributed by age group or gender, and whether the percentage of persons at different levels of consumption increased or decreased as a result of the policy change that is under consideration.

Finally, damage from alcohol is widely defined, including both morbidity and mortality, and involving trauma (both intentional and unintentional causes), social problems and chronic disease. There are over 60 types of trauma and chronic disease associated with alcohol consumption.[4]

1. Alcohol Price and Taxation

Overall, 16 relevant studies were identified that were published from 2000 onward (see summary information in Table 1 and citations in the reference section). Considered together, these studies found that a change in price or taxes of alcohol had an impact on one or more of the three main outcome variables; overall consumption, drinking patterns or damage from

[4] Alcohol consumption has been associated with a number of different types of trauma, including the following: accidental poisoning; road and other transport injuries; fall, drowning and burning injuries, occupational and machine injuries; self-inflicted injuries and suicide; and assault injuries and violent deaths (Babor et al. 2003). There are many chronic diseases associated with alcohol consumption and they include, for example:

- Cancers: head and neck cancers as well as cancers of the gastrointestinal tract, liver cancer, and female breast cancer.
- Neuropsychiatric conditions: alcohol-dependence syndrom, alcohol abuse, depression, anxiety disorder, organic brain disease.
- Cardiovascular conditions: ischaemic heart disease, cerebrovascular disease.
- Gastrointestinal conditions: alcoholic liver cirrhosis, cholelithiasis, pancreatitis, and,
- Maternal and perinatal conditions: low birth weight, intrauterine growth retardation. (Babor et al. 2003).

alcohol. In other words as the 'real price'[5] of alcohol is increased the damage or potential damage from alcohol is reduced, or as the real price of alcohol is lowered, such as through discount pricing and sale pricing, the damage from alcohol or potential damage is elevated. While all of the studies did not necessarily focus exclusively on licensed premises, the economic principles that underlie these general findings apply to a wide range of type of outlets, including licensed premises.

The studies on price and taxation include both archival data, such as alcohol sales, drinking and driving statistics, mortality data, and self-report information based on survey methodology. They include a large number of cases, for example up to approximately 184,000 records as indicated by Gruenewald et al. (2006).

Also, while the topic of differential prices of specific alcoholic beverages is typically not discussed in these studies, it is feasible to encourage less hazardous consumption by having higher prices for stronger beverages within a group, such as beer. For example, having a unit price of 'X' for 3% beer, and a substantially higher price for stronger beer, with the price related to the ethanol content. The preferred approach from a public health perspective is to start with current typical price of 5% strength beer, and set this as the floor price for lowest strength beer (e.g., 3%), rather than discount the weaker strength beer. Furthermore, in licensed establishments, non-alcoholic beverages should have a significantly lower price than the cheapest alcoholic beverages in order to encourage those who choose to abstain or to switch to non-alcoholic drinks to be able to do so.

a. Impact on overall alcohol consumption

A number of reviews have concluded that price of alcohol, and taxations that impact prices have an impact on alcohol consumption – a reduction of prices is expected to stimulate alcohol consumption and an increase tends to curtail overall consumption. This was a conclusion drawn by Esa Österberg (1995), Griffith Edwards and colleagues (1994), and more recently by Frank Chaloupka and colleagues (2002), and also by Thomas Babor et al. (2003, chapter 6). Chaloupka et al. (2002) concluded that the majority of the research studies

[5] 'Real price' refers to the retail price of alcoholic beverages adjusted for consumer price index or typical prices of other goods and services.

clearly support a conclusion that an increase in monetary prices of alcoholic beverages through taxation significantly reduces alcohol consumption.

Several studies original studies have examined the impacts of tax or price changes of alcoholic beverages on alcohol consumption, including some that are based on 'natural experiment' opportunities. A study by Mäkelä and colleagues (2008) was based on surveys of a random sample of adults before and after policy changes in Denmark, Finland, southern Sweden and northern Sweden, with the last as the control site. The changes examined were large-scale decreases in alcohol taxes in Denmark and Finland and a large increase in travelers' allowances of alcohol importation into Finland and Sweden. The authors found that self-reported consumption decreased or remained the same among women and men in all three study sites, and relative changes were similar across subgroups. These findings, based on self-reports of respondents, are unexpected in that they are not in accordance with the expectations from the general economic literature (e.g. see Chaloupka et al. 2002), and in contrast to the sales data that showed an increase in consumption in Finland. In other words while there was an increase in overall alcohol sales with a decrease in alcohol taxes, the findings from self-reports did not match the financial and archival data.

Another survey-based study by Gerhard Gmel and colleagues (2008), focusing on Switzerland produced somewhat different findings. Their goal was to analyze the impacts of taxation-related decrease in spirits prices. After adjusting for regression to the mean effects (RTM), the authors found that higher volume drinkers increased their consumption more than lighter drinkers, but this was in the short-term, not a persistent effect. In the long term a reduction in taxation of spirits mainly affected light and moderate drinkers, in that it stimulates their alcohol consumption as indicated by the self-reports of respondents.

A long-term study by Paul Gruenewald and colleagues (2006) focused on Sweden during the years 1984-1994 and examined 184,385 records, 130 monthly observations and 3700 beverage brands. The main variables were alcohol beverage price, beverage quality and alcohol sales with primary focus variable being the impacts of increases in alcohol prices. Two main findings emerged with regard to alcohol prices:

- consumers respond to price increases by altering the reducing their total consumption and by varying their brand choices – e.g. switching to cheaper brands;

- significant reduction in sales was observed in response to price increases, but these were mitigated by a significant substitution between quality classes.

However, the authors note that those who currently consuming the brands at lowest cost were likely not to have the option of switching to lower-priced brands when prices go up and therefore might be expected to curtail their alcohol consumption to a greater extent than other consumers.

Hollingworth et al. (2006) focused on over 4 million young adults aged 20 in 2000 and sought to project the impacts over the next 10 years for this age cohort if there was a significant increase in excise taxes on alcoholic beverages. These researchers used price elasticities[6] and a hypothetical increase in excise tax the equivalent of $1 per six-pack of beer. It was projected that the proportion of 20-30 year olds engaged in medium and high habitual drinking or heavy episodic drinking would decrease from 26.7% to 24.4% in men and from 14.3% to 13.1% among women.

Studies have found that changes in price or taxation of alcoholic beverages have an impact on alcohol consumption, i.e. a reduction in price tends to *stimulate* consumption and an increase in price tends to *deflate* overall consumption. Since increases in alcohol consumption rates have been linked with increases in alcohol-related damage – including trauma, social problems and chronic disease - there are public health and safety benefits in maintaining the real price of alcohol and, alternatively, in not resorting to discount pricing as a way of stimulating consumption.

b. Impact on drinking patterns

Several studies also examined the impact of changes in price or taxation on drinking patterns. In the study by Gruenewald et al. (2006), mentioned above, the authors noted two findings with regard to drinking patterns. First, any saving from shifting from higher cost to lower cost alcoholic beverage alternatives tends to produce a type of induced income effect on consumers that operates similarly to the positive income effect typically associated with a price decrease. Second, if there is a rise in the price of high-quality beverages this could possibly lead to an increase in total alcohol consumption as consumers switch to higher quantities of lower-quality brands. Gmel and colleagues (2008) noted that in their survey of

[6] 'Price elasticity' refers to the "sensitivity of demand to price change…defined as a unit change in the demand caused by a unit change in price". In other words, a beverage is 'price elastic' if it is response to a change in price, and 'price inelastic' if it is not very response to a change in price (see Edwards et al.,1994, p. 110).

889 Swiss alcohol consumers that in the long run changes in taxation (in this case a reduction) affected mainly light and moderate drinkers and contributed to increased consumption in these sectors of the population.

Also, the review by Chaloupka and colleagues (2002) focused on an increase in monetary prices of alcoholic beverages through taxation. They reported that prevalence of drinking in the past year was highest among young adults aged 17-29 in the study by Grant et al. (1991) and was significantly reduced through an increase in alcohol taxation.

Studies that examined drinking patterns found the following: an increase in the price of alcoholic beverages can contribute to some consumers switching to lower priced beverages; an increase in price due to taxation significantly reduced the prevalence of drinking among young adults aged 17-29.

c. Impact on damage from alcohol

A number of recent studies have focused on changes in alcohol-related damage rates that occur in connection with changes in the prices or taxes on alcoholic beverages. As shown below, an increase in prices or taxes on alcohol tends to reduce damage, and a decrease tends to stimulate an increase in alcohol-related damage – trauma, social problems or chronic disease. The foci of these studies have included: alcohol-related problems, traffic crashes, crime, violence, sexually transmitted disease, and mortality from various causes. Both the range of trauma, social and chronic problems that have been examined and the repeated finding of a strong association between price and damage, clearly indicate that price and taxation can be powerful tools to reduce alcohol-related harm or conversely be significant stimuli for generating increased harm as the real price of alcoholic beverages is lowered.

A longitudinal study focusing on Switzerland between 1999 and 2001 examined the impact of decrease on tax on drinking related damage (Mohler-Kuo et al. 2004). The authors found a significant increase in alcohol-related problems as measured by items taken from the Alcohol Use Disorder Identification Test (AUDIT), but after controlling for distilled spirits consumption, the significance disappeared. The authors concluded that increase in problems associated

with the tax reform was mainly associated with the increased consumption of spirits. The increase in problems at follow-up was particularly evident among younger age groups who consumed more spirits.

Ponicki and colleagues (2007) examined beer taxes, minimum legal drinking age (MLDA) and traffic fatalities. They found that both interventions – namely raising beer taxes and raising the MLDA had the impact of reducing youth traffic fatalities among those aged 18-20. Similarly Dee and Evans (2001) found that an increase in the beer tax in the United States had deflating effect on motor vehicle mortality rates – both for night-time and day-time fatalities (the former more commonly associated with alcohol use).

Sexually transmitted disease (STD) rate was the focus of study by Chesson and colleagues (2000). They examined liquor tax, beer tax and STD rates for the period 1981-1995, focusing on all states of the United States, and examined the "impact of alcohol beverage taxes on risky sexual behavior, as reflected by sexually transmitted disease rates" (Chaloupka et al. 2002, p.585). Their models produced the following estimates: a $1 increase in the per-gallon liquor tax was expected to reduce gonorrhea rates by 2.1%, and a beer tax increase of 20 cents per six-pack can reduce gonorrhea rates by 8.9%. Similar or even larger effects were found for the syphilis rates.

At least five studies published from 2000 onwards focused on the associations between alcohol taxes/price and crime. Henry Saffer (2001) used data from the US. National Household Survey on Drug Abuse (NHSDA) and looked at the impact of an increase in beer price in 1991. He reported that increased beer taxes can reduce crime and the magnitude of these effects is larger for those under age 21 than for people over 21. This fits in with the general conclusion that because of the lower average disposable income among youth and young drinkers, changes in controlled access to alcohol through price or tax increases are expected to have an especially strong harm-reduction impact on this sector of the population. In other words, since younger drinkers are more responsive to an increase in the real price from alcohol than other drinkers, an increase in real price will have a beneficial impact by reducing high-risk drinking. Conversely, a reduction in the real price has the potential of stimulating overall alcohol consumption in this population, including high-risk drinking.

Several studies have focused on violence as it relates to alcohol consumption (Grossman and Markowitz, 2001a, 2001b, Markowitz, 2000; Markowitz and Grossman, 2000).
One study focused on the Core Alcohol and Drug Survey of college students (N=120,000) conducted in 200 U.S. colleges or universities in 1989-1991 (Grossman and Markowitz, 2001). The authors found an inverse relationship between an increase in beer prices and four types of violence: for example, a 10% increase in price elasticity would result in a decline from 12.3% to 11.7% trouble with police/authority, a decline from 7.5% to 7.1% property damage, a decline from 31.2% to 30.2% in verbal/physical fights, and decline from 14.3% to 13.8% in sexual misconduct.

Studies based on the U.S. National Family Violence survey (NFVS) focusing on 1986-1987, found consistent results that an increased in the price of alcohol reduced the likelihood of severe violence aimed at wives (kicking, biting, hitting with a fist, choking or threatening with a gun/knife). Markowitz (2000) concluded that a 1% increase in the price per once of pure alcohol would reduce the probability of being a victim of spousal abuse by 5.3% that could be translated into an avoidance of 104,660 cases of abuse in the US. A similar study focusing on the years 1976 and 1985 also using the NFVS surveys found that 1% increase in tax on beer would decrease the probability of violence by about 0.33%.[7]

Several studies have examined changes in mortality in connection with changes in prices or taxes of alcoholic beverages. Koski et al. (2007) reports on the impact of tax cuts in Finland during 1990 and 2004, using postmortem forensic toxicology data on 33,782 alcohol-positive cases and 37,617 alcohol negative cases. The impact of tax cuts was significant, resulting in eight additional alcohol-positive sudden deaths per week, namely a 17% increase, but there was no statistically significant change in the deaths where alcohol was not present.

Also the study by Hollingsworth et al. (2006), referred to above, focused on over 4 million young adults in the US aged 20. The authors projected that a tax increase equivalent of $1 per six pack of beer would lead to a reduction of 3.3% in all types of alcohol-attributable mortality throughout the life-span of this cohort, or 1,490 deaths attributable to alcohol.

[7] The focus of this study was family violence as indicated by the name of the survey. However, there is also alcohol-related violence in other contexts; for example, in bars and other licensed premises, associated with closing time, in public drinking locals. Also, alcohol is an important contributor to family violence, but generally speaking not the only factor. Violence in the family is also influenced by various cultural and personal factors, inter-personal dynamics, availability of weapons, absence of support systems, etc..

A study by Ponicki and Gruenewald (2006) examined 30 license states in the U.S. – those without government alcohol retailing systems during the period 1971 to1998. They found that cirrhosis mortality rates were significantly related to taxes on distilled spirits – for example, with an increase in taxes the cirrhosis mortality rate declined, but not to taxation of wine and beer. The authors indicated that the predominant impact of distilled-spirits taxes "makes sense given that heavy drinkers should prefer spirits as the lowest-cost form of ethanol in the United States (Treno et al., 1993) and those buying the lowest-cost beverages have been shown most responsive to price changes (Gruenewald et al. 2006)" (Ponicki & Gruenewald, 2006, p. 937).

Finally, the review by Chaloupka (2002) notes the following types of damage associated with changes in access to alcohol through price increases of alcoholic beverages:

- An increase in beer taxes had a significant negative effect (i.e. a decrease) on the fatality rate of drivers involved in nighttime single-vehicle crashes.
- An increase in beer taxes can reduce self-reported drinking and driving involvement in non-fatal crashes.
- Price increases on alcoholic beverages contribute to a reduction in liver cirrhosis mortality.
- Price increases on alcoholic beverages contribute to a reduced suicide rate.
- An increase in beer taxes would lead to significant reduction in rapes and robberies but would have a limited impact on homicides and assaults.

Studies have shown that an increase in alcohol prices or taxes tends to reduce alcohol-related damage, whereas a decrease in prices or taxes tends to stimulate an increase in alcohol-related damage. Change in the price of alcoholic beverages has been positively associated with the following:

- alcohol-related problems as measured by the AUDIT
- traffic-related fatalities among 18-20 year olds
- motor vehicle mortality rates
- rates of sexually-transmitted infections
- rapes and robberies, spousal abuse and crime involving youth and young adults
- alcohol-attributable mortality, suicide and cirrhosis mortality

2. Hours and Days of Sale

Several evaluations were located that were published from 2000 onward that examined the impact of hours and days of sale (see Table 2). Most focused on damage from alcohol, and two also include information on overall consumption. None provided information on drinking patterns. While all of the studies did not necessarily focus exclusively on licensed premises, the economic and availability principles that underlie these general findings apply to a wide range of types of outlets, including licensed premises.

a. Impact on overall alcohol consumption

An Australian study examined the impact of later trading hours for licensed hotels between 1991 and 1997 (Chikritzhs and Stockwell, 2002). The authors found that higher volumes of high alcohol content beer, wine and distilled spirits were purchased in the licensed hotels with late trading hours.

A study based in Sweden examined the impact of two changes in trading days, from an experimental area to the whole of Sweden between 1995 to 2002 (Norström and Skog, 2005). This involved Saturday opening of alcohol monopoly outlets. The authors found a statistically significant increase in alcohol sales in both phases 3.7% during phase I and 3.6% during phase II.

b. Impact on damage from alcohol

Several studies, based on natural experiments, have assessed the impacts of changes in either days of sale and hours of sale on drinking-related damage. Those focusing on days of sale are examined first.

An Ontario study examined the impact of the Liquor License Act to extend the hours of alcohol sales and service in licensed establishments from 1 am to 2 am, and focused on the period 1992 to 1999 (e.g, Vingilis et al. 2007). Their analyses include provincial to state and city-to-city comparisons, and several findings emerged from this study. The authors found

extension of closing hours had an impact on non-motor vehicle injuries presenting at Ontario trauma units, but road safety initiatives occurring at about the same time may have mediated the effects of the extension on motor vehicle collision injuries (Vingilis et al. 2007). Also, an analysis of several converging data sets suggested that there was little impact on BAC positive fatalities with the extension of closing hours, a finding that they found was consistent with other studies of small changes in alcohol availability (Vingilis et al. 2005). However, when they looked at the adjacent cities of Windsor and Detroit, they detected a cross-border impact. A significant increase in alcohol-related motor casualties was found in the Windsor region and concurrently, significant decreases in total and alcohol-related motor vehicle casualties were found in the Detroit region after the closing hours of licensed premises were extended). A significant decrease was found for injury collisions involving vehicles with Ontario license plates in the Detroit region (Vingilis et al. 2006). A reasonable explanation is that prior to the change in policy, some of the drinkers who would go to Detroit after the licensed premises closed in Windsor, were now staying in the Windsor area. It appears that for some parts of Ontario the increase in access to alcohol contributed to an increase in drinking-related problems.

The Australian study noted above found that following the introduction of extended trading hour permits, there was a significant increase in monthly assault rates for hotels with late trading hours (Chikritzhs and Stockwell, 2002). Furthermore, this relationship was largely accounted for by the higher volumes of alcohol sales, noted in the previous section.

In their study of the phased introduction of Saturday opening of government liquor stores in Sweden, Norström and Skog (2005) did not find significant changes in assault indicators during either phase. However, a significant increase in drunk driving (by 12%) was detected during phase I, with no change during the second phase.

A study based on the state of New Mexico examined the impact of allowing package sales (off-premise) on Sundays, focusing on 1990 to 2000 (McMillan and Lapham, 2006; McMillan et al. 2006). Several findings emerged from this analysis:

- There was an estimated excess of 543.1 alcohol-related crashes and 41.6 alcohol-related crash fatalities after the ban was lifted.

- There was marked variability in the impact of legalized Sunday packaged alcohol sales on alcohol-related crash rates – for example the relative risks vary across counties from 1.04 to 1.90.
- Counties and communities that quickly passed the local option to re-ban packaged sales on Sundays were able to mitigate most of the deleterious impact that was associated with increased alcohol availability that was observed across the state.

Results from recent 'natural experiment' studies provide the following key findings on the impacts of changing hours of sale or days of sale on alcohol consumption and damage from alcohol:

- In Australia, an increase in the hours of sale has been associated with an increase in the amount of alcohol purchased and an increase in monthly assault rates in those licensed premises with later hours of sale.
- In Ontario, there was an increase in alcohol-related motor vehicle casualties in an area affected by the increase in hours of on-premise sales (licensee), compared to a control area.
- In Sweden, introducing Saturday sales in government retail stores has been associated with an increase in overall alcohol sales, and a significant increase in drunk driving.
- In New Mexico, allowing off-premise sales on Sundays was linked with an increase in alcohol-related crashes, and conversely a reduction in crashes was found in those counties that reversed the decision and discontinued Sunday sales.

3. Density of Alcohol Outlets

A total of 17 research publications were located, published from 2000 onward that examined density of alcohol outlets (see Table 3). The majority considered impacts of changes on damage, with a few looking at consumption and drinking patterns.

a. Impact on alcohol consumption

A cross-sectional Swiss study by Kuntsche and Kuendig (2005) examined the associations between density and adolescent drinking during 2002, using archival information and survey data from 1,194 9th graders with a mean age of 15.3 years. They found positive main effects with higher drinking and drunkenness at the individual level in areas of high outlet density.

However, they found a greater perception of adolescent drinking in public in lower density areas.

A US-based study looked at density and several related variables and the associations with drinking levels, focusing on California from 1979 to 1990 (Pollack et al. 2005). The researchers found substantially higher levels of alcohol outlet density in the most economically deprived neighbourhoods, compared to the least deprived. However, the multilevel analysis showed that the least deprived neighbourhoods were associated with the heaviest alcohol consumption, even after adjusting for individual-level sociodemographic characteristics. They note further that alcohol availability was not associated with heavy drinking and did not mediate the relationship between neighbourhood deprivation and heavy alcohol consumption. In other words, there was a strong association between economic access to alcohol (i.e. not in a neighbourhood with high economic deprivation) and heavy alcohol consumption.

Scribner et al. (2008) considered 32 colleges and universities located in the USA, using several surveys and alcohol outlet density statistics. They found that higher densities of on-premise alcohol outlets were strongly related to drinking outcomes even after controlling for individual predictors of college drinking – such as attitudes to drinking, participation in campus associations, and others. The association indicated that the campus means for the average number of drinks when partying and the number of drinking occasions in the past 30 days was, respectively, 1.13 drinks and 1.32 occasions greater when the outlet density was substantially higher (i.e. by two standard deviations from the mean).

Findings from several studies demonstrate the dynamics between density of alcohol outlets and alcohol consumption. A Swiss study found higher drinking and drunkenness in areas of high outlet density in contrast to those with lower density outlets; however, perception of adolescents drinking in public was greater in the lower density areas. A US-based study of colleges and universities showed a correlation between higher density on-premise outlets and average number of drinks consumed and number of drinking occasions in the past 30 days.

b. Impact on drinking patterns and alcohol-related problems

Recent studies of alcohol density have examined a range of dependent variables, including high-risk drinking, problem drinking levels, drinking and driving incidents, pedestrian casualties, assaults and other types of violence, sexually transmitted disease and suicide.

One study focused on Boston, using 1999-2000 college survey data and density statistics (Weitzman et al. 2003). The researchers report that density was correlated with heavy drinking (i.e. consuming 5+ drinks at an off-campus party) and frequent drinking (drank on 10+ occasions in the past 30 days). They also note that women, underage students and students who took on binge drinking appear to be affected by higher outlet density. The authors state: “In fact, it appears that the ‘‘wettest’’ communities [i.e. high density of outlets] may be particularly risky for young people whose drinking does not reflect entrenched high-risk patterns” (Weitzman et al.2003, p 5). The authors found that outlet density in Boston was correlated with problem drinking among college students, defined as those reporting five or more drinking problems since the beginning of the school year. Students from areas with higher density reported more drinking problems.

An earlier study by Treno and colleagues (2001) examined a general population survey involving 13,440 California respondents, with data collected between 1992 and 1996. They found higher local outlet density – both on-premise establishments such as bars and restaurants and off-premise establishments such as liquor and grocery stores – was related to more self-reported injuries among respondents.

Several research projects report associations with drinking and driving incidents. A study by Grunewald et al. (2002) examined California jurisdictions between 1993 and 1996. Several findings emerged from their analyses:

- Restaurant densities were directly related to greater drinking frequencies and driving after drinking – in other words there was more frequent drinking and drinking and driving in areas with higher density of restaurants.
- Bar densities were inversely related to driving after drinking.- that is, driving after drinking was more common in areas where bar density was lower.

- Drinking and driving was strongly related to drinking location preference only when considered simultaneously with individual drinking patterns, particularly drinking frequency – in other words individuals who drank more frequently and drank in bars were more likely to drink and drive.
- Outlet density and preferred drinking location when considered together with individual drinking patterns support driving after drinking and thereby increase the potential for alcohol-related traffic crashes – that is, the potential for alcohol-related crashes was greater among frequent drinkers who were drinking in their favourite locals.

Treno and colleagues (2003) used two California-based surveys for the years 1998 and 2000 (N = 614) and outlet density at the city level. They found that density was positively associated with both drinking and driving (DAD) and riding with drinking drivers (RWDD) – in other words DAD and RWDD were more common in high density areas.. These main effects were moderated by a number of individual-level effects for both the DAD and RWDD variables, with younger respondents and females more likely to be affected by outlet densities.

Another study looked at number of alcohol outlets and hospital discharge data (HDD) for California 1995-2000 (Treno et al. 2007). The authors found that a change in outlet density over time were directly related to traffic injury rates requiring hospitalization which may or may not have involved alcohol (HDD data) and to crash rates reported by the police that were likely alcohol involved. For example, an increase in outlet density – particularly bars and off-premise outlets – as related to traffic injury rates noted above.

A “natural experiment” study based in New Mexico examined the relationship between driver-through liquor window locations and alcohol-related crashes for two years before and after New Mexico banned driver-through alcohol sales (Lapham et al. 2004) Cross-sectional analyses in Albuquerque revealed that the percentage of alcohol- involved crashes was not related to densities of on- or off-premise outlets per km of roadway, or to percentage of drive-up outlets. On a state-wide basis the percentage of drive-up outlets was not significantly related to the percentage of alcohol-related crashes within census tracts but was associated positively with the percentage of alcohol-related crashes in surrounding census tracts. And there was no statistically significant relationship between number of drive-ups and percentage

of alcohol-related crashes in either longitudinal model. However, they found that rate of non-pedestrian alcohol-related crashes relative to non-pedestrian total crashes showed an increasing trend prior to closure (the intervention) and a decreasing trend after closure.

LaScala et al. (2001) examined four California communities focusing on 1992 to 1996, and considered density of on-premise and off-premise outlets and drinking and sociodemographic measures. Pedestrian collisions not involving alcohol occurred more often in lower income areas with greater population and cross-street densities, and in areas having either younger or older age populations. They found that alcohol-involved pedestrian collisions occurred more often in areas with greater bar density and greater population, and where the local population reported drinking more alcohol per drinking occasion.

Violence was a central focus of four studies. Norström (2000) considered 30 years of data from Norway – 1960 to 1995, and used police data on crimes of violence and outlet density as number of public drinking places per 10,000 inhabitants aged 15 and older, and time series analysis techniques. He found a positive and statistically significant relationship between outlet density and crimes of violence investigated by the police, and thus replicated findings that were reported from cross-sectional studies.

Lipton and Gruenewald (2002) considered rates of violence and alcohol outlet density in California during 1990 and 1991. They concluded that the density of bars was found to be strongly associated with greater rates of assault, while density of restaurants was associated with less violence. Both appeared to have greatest effect in densely populated areas. Local and nearby population characteristics were also found to be related to greater rates of violence.

Another California-based trend study examined data for the period 1995 to 2000 using alcohol outlet and retail data, hospital discharge statistics and violent assault data (Gruenewald and Remer, 2006). They report that a 10% increase in the number of off-premise outlets and bars was related to 1.67 and 2.06% increases in violence rates across local and lagged spatial areas. Every six outlets accounted for one additional violent assault that resulted in at least one overnight stay at hospital. These effects increased with larger male populations, and were found to double with every 3% increase in the percent males.

A fourth study was based in Kansas City, Missouri, for 1995, using socio-demographic factors, alcohol outlet density and rates of assaults in 89 inner-city census tracts (Reid et al., 2003). The researchers found that alcohol-outlet density contributed significantly to the explained variance of the regression model that they used, and higher density was associated with higher rates of violent assaults in Kansas City.

A natural experiment study by Cohen and colleagues (2006) examined Los Angeles County for the period 1988 to 1996, using data on licensed premises and prevalence of gonorrhea cases. There was civil unrest in 1992 that included the destruction or closing of a number of licensed outlets. They found that after the civil unrest a unit decrease in the number of alcohol outlets per mile of roadway was associated with 21 fewer gonorrhea cases per 100,000 ($p < .01$) in census tracts affected by the unrest compared to those not affected.

Escobedo and Ortiz (2002) considered liquor outlets and a number of variables, including driving while intoxicated, alcohol-related crashes, and alcohol-related deaths, focusing on New Mexico, from 1990 to 1994. The following is a summary of their main findings:

- Suicide, alcohol-related crash, and alcohol-related crash fatality (adjusted for age, sex, and minority status) are significantly associated with liquor outlet density – in other words these problems were more common in the areas with a higher density of outlets.
- Data also show that, compared with the lowest level for outlet density, suicide and alcohol-related crash rates increase about 50% and the alcohol-related crash fatality rate two-fold with the higher level of liquor outlet density.
- Greater availability of liquor outlets is associated with higher rates of suicide, alcohol-related crash, and alcohol-related crash fatality. With one unit increase in the rate of liquor outlet density, the rate of suicide (deaths per 1000 population) increases by 0.23, the rate for alcohol-related crash (crashes per 1000 population) by 2.4, and the rate for alcohol-related crash fatality (deaths per 1000 population) by 0.22.

Finally, a recent review by Livingston et al. (2007) complements the main findings noted above, expands on some of the implications and offers topics for future research. They hypothesize that the effects of alcohol outlet density can be separated conceptually into: “(i) a proximity effect (how easily one can access alcohol); and (ii) an amenity effect (how outlets

influence the quality and characteristics of surrounds within the local community)" (Livingston et al. 2007, p. 561).

While both have implications for alcohol-related damage and prevention of the same, the authors point out that much of the outcome focus of the research on density has been on the first effect. They note that increased outlet density has been shown to increase consumption and alcohol-related problems, and may also have a second effect "each new outlet potentially increases the competitive pressures on existing outlets, which may result in price reductions which tend to lead to increased levels of consumption" (Livingston et al. 2007, p. 561) (see also Babor et al., 2003).

The amenity effects relates to the negative impacts of licensed premises on their neighbourhood. This can include violence, street disturbances and other social problems. Licensed premises may be seen as attractors of trouble, and a bunch of alcohol outlets in the same district "often results from crowds of young people, in various stages of intoxication, moving between outlets or spilling out onto the streets at closing time" (Livingston et al. 2007, p. 561).

Even if there is not a substantial increase in the density of outlets in an area, they can be linked to a high level or increase in alcohol-related problems. For example, this might be the case if the licensed premises are bunched together, encourage over-service or heavy consumption through lax server intervention practices and discount pricing, and are attractive those who wish to participate in violent and other disruptive behaviour.

A number of recent studies have found an association between higher outlet density and high-risk drinking and drinking-related problems and harm:

- In Boston, outlet density was correlated with heavy drinking and frequent drinking among college students, and more drinking problems. Women, underage students, and students who took on binge drinking were most affected by higher outlet density.
- In California, higher outlet density was associated with higher self-reported injuries, drinking and driving and riding with drinking drivers, traffic injury rates requiring hospitalization and crash rates reported to the police that likely involved alcohol.
- In California, higher restaurant density was associated with greater frequency of drinking and driving, and when combined with drinking-location preference also associated with alcohol-related accidents
- In New Mexico, higher outlet density was associated with alcohol-related motor vehicle crashes and crash fatalities, and suicides
- In California, alcohol-involved pedestrian collisions occurred more often in areas with greater bar density and greater population and where the local population reported drinking more alcohol per drinking occasion.
- A 10% increase in the number of off-premise outlets and bars was related to a 1.67 to 2.06% increase in rates of violence in a California-based study.
- Density of bars was found to be strongly associated with greater rates of assault in another study in California.
- Alcohol-outlet density was found to contribute significantly to the explained variance in rates of assaults in 89 inner-city areas of Kansas City.
- The destruction or closing of licensed outlets in Los Angeles county was related to a decrease in the prevalence of gonorrhea cases
- In Norway, higher outlet density was associated with more crimes of violence.

C. Interpretations and Policy Implications

The studies summarized in this report reflect a range of methods and data resources, including archival data on alcohol sales and outlet density, mortality and morbidity statistics, and survey data. In some studies a cross-sectional design is evident and others employ a longitudinal design. There are some that involve a quasi-experimental design, such as data collected before and after an intervention and using a comparison site or population.

Several caveats should be noted. Those with a cross-sectional design provide noteworthy findings with regard to associations between key variables, but they cannot provide a clear answer about the causal linkage or causal direction. For example, if in a cross-sectional study

alcohol consumption rates or prevalence of drinking-related problems are found to be higher in jurisdiction with a higher density of outlets, compared to those areas with lower density, it could be that higher density stimulated alcohol consumption, or that high consumption stimulated a receptivity to more alcohol outlets and growth in density, or that both alcohol consumption and density of outlets are influenced by other factors." However, as noted in the study by Weitzman et al. (2003) – summarized above, although it is difficult to determine the chronological order of supply and demand patterns, it is unlikely that supply, e.g. higher density of outlets, fully followed demand. In their case both high levels of heavy episodic or binge drinking and patterns of bar and alcohol outlet density had been in place for several years.

Second, most studies focus on one intervention or 'independent' variable. However, in reality modifications in how alcohol is managed may involve concurrent or partially overlapping changes – increased marketing, lower real prices, longer hours, and so on. This creates complications for undertaking the research and interpreting the results.

Although only one recent study was located that focused on Canada (e.g., Vingilis et al. 2007), it is noteworthy that the studies reported above are from Western countries with generally similar alcohol management systems to those found in Canada, including the control states in the US and alcohol management systems in Nordic countries. Furthermore, it is reasonable to assume that economic forces or access to alcohol dimensions that stimulate consumption or contribute to damage from alcohol, as shown in these studies, are not unique to the locales studied, but also are generically in line with the supply dimensions at play in Canadian contexts. If for example several studies demonstrated that lower prices stimulate alcohol sales in other jurisdictions, it seems reasonable to assume that lower prices would have a similar general impact in a Canadian context.

The studies from 2000 onward, summarized above, generally support the conclusions drawn by Babor and colleagues (2003, chapter 16) in a publication based on an international project affiliated with WHO. They classified price and taxation controls, controls on hours and days and sale, and controls on outlet density as being shown to be effective and involving more than a few studies and based on research in several cultural settings. These interventions

were among the ‘top 10’ interventions identified by Babor et al. (2003) and the findings summarized above would tend to support this conclusion.

It is clear that alcohol management has real consequences, and many problems can be reduced, or partially avoided through careful planning and a precautionary approach. If alcohol related problems are to be reduced and more effectively controlled, than any jurisdiction needs to undertake several interventions, based on the evidence summarized above:

- discontinue discount pricing and advertising promoting discounted alcohol prices;
- have prices of higher strength beverages set at a higher level than lower strength beverages within a group (e.g. beer);
- have prices of non-alcoholic beverages set substantially lower than the lowest prices alcoholic beverage in order to provide a financially attractive alternative to patrons who choose not to drink; and,
- have a moratorium on increasing the density of outlets and extending the hours of sale.

In conclusion, the evidence summarized above informs the current deliberations in Nova Scotia and points to several themes for further discussion and implementation.

- **Alcohol policies can increase damage or reduce harm:** As noted above, there are several key aspects of alcohol sales, distribution and retailing that can either lead to higher consumption and greater problems or controlling consumption and reduction of alcohol-related problems.
- **Not all alcohol policy interventions are of equal potency**.
    - Measures that increase access through lowering the price of alcohol, discount pricing, extensive happy hours, and general reduction in the real price of alcoholic beverages, are especially important because of they affect most purchasing occasions.
    - Price of alcohol is a particularly powerful ‘lever’. As repeatedly demonstrated in the research summarized above, on the one hand low prices can stimulate alcohol-related damage rates and on the other higher prices can contribute to preventing drinking-related problems.

  - Long hours of sale and high density of outlets have been associated with increased sales or alcohol-related damage.
  - They might also stimulate price reductions – for example in high density areas competition among drinking venues may lead to price cuts to attract more customers.

- **Consider the larger context.** While the local and regional context of an alcohol policy issue is an important consideration, the large and even global aspects need to be considered as well. In Canada the recent increase in overall consumption and high risk drinking clearly points to a precautionary perspective if the damage and high costs from alcohol are to be curtailed.
- **Health and safety experts at the decision-making table.** Alcohol policy and retailing decisions have implications for health, safety and social problems, therefore decision-making procedures need to include health and safety expertise, and not only fiscal, business and hospitality considerations.
- **A priori impact assessment.** Whatever alcohol policy changes are being considered it is advisable to have careful and wide-ranging a priori impact assessment.
- **A precautionary perspective.** Once a change in access has been introduced, vested interests set in and it is very difficult to reverse the decision, therefore a cautious approach is advised.
- **Pilot studies and evaluation.** Also, consider conducting pilot studies before moving forward. If a decision is made to change alcohol access or management, it is essential that there be sufficient time and resources to gather baseline data before the change so that ‘natural experiment’ evaluation is feasible.

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FIGURE 1

Flowchart for Literature Review on Taxation and Price

Keywords: alcohol consumption, pricing, taxation, consequences, licensed premises
Search year restriction: Year 2000 and afterwards

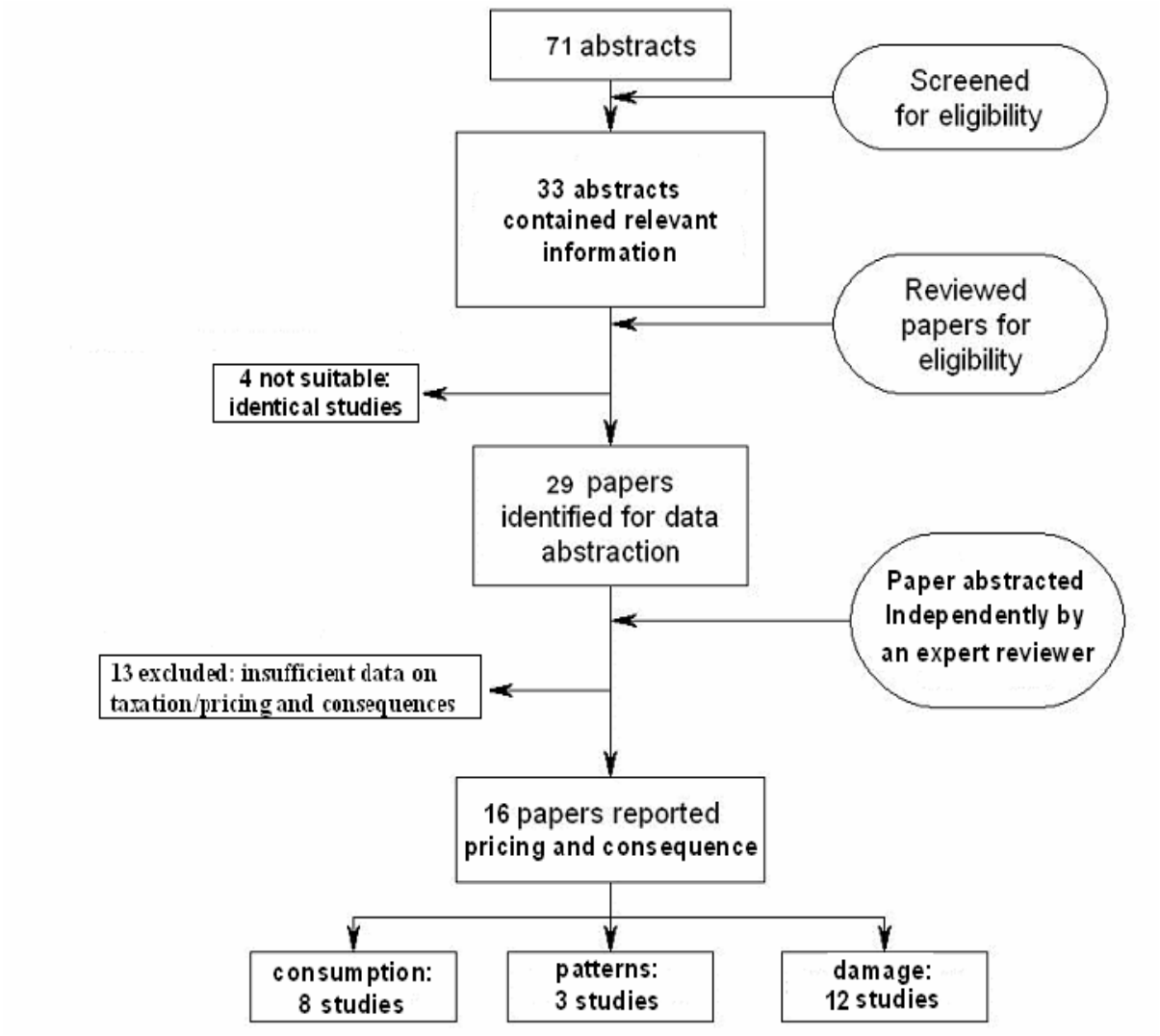
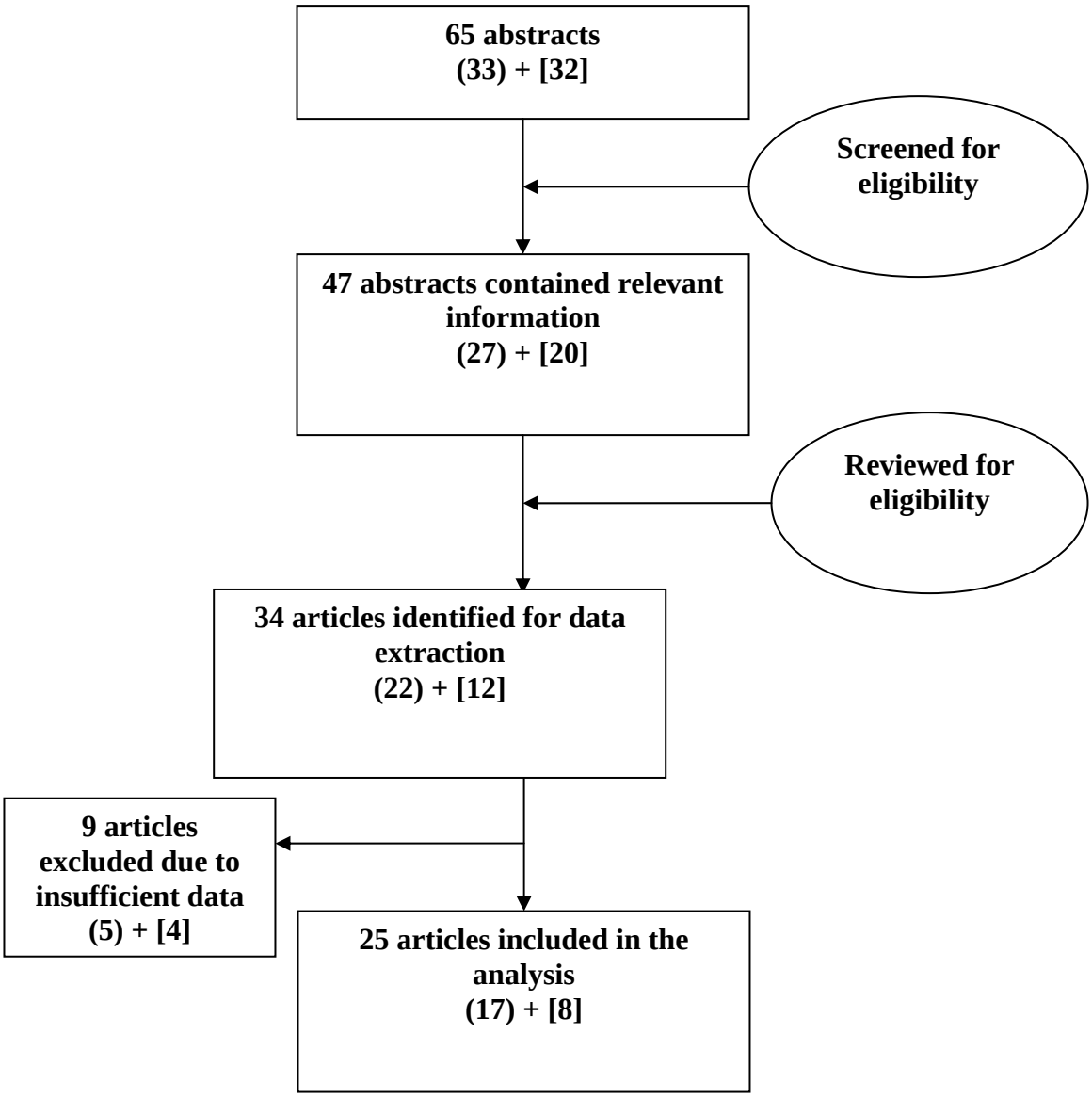


Figure 2
Flowchart for Literature Review on Outlets Density and Hours and Days of Alcohol Sales
Keywords: alcohol, availability, outlet density, sales
Search restrictions: 2000 – 2008;
Developed countries



In round brackets – articles related to outlets density
In square brackets – articles related to days and hours of alcohol sales