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Estimates of harm associated with changes in Swedish alcohol policy: results from past and present estimates

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ABSTRACT

Aims (i) To compare actual developments of alcohol-related harm in Sweden with estimates derived prior to major policy changes in 1995 and (ii) to estimate the effects on consumption and alcohol-related harm of reducing alcohol prices in Sweden. **Design** Alcohol effect parameters expressing the strength of the relationship between overall alcohol consumption and different alcohol-related harms were obtained from ARIMA (Auto Regressive Integrated Moving Average) time-series analyses. **Measurements** Measures of Swedish alcohol-related mortality (liver cirrhosis, alcoholic psychosis, alcoholism and alcohol poisoning), accident mortality, suicide, homicide, assaults and sickness absence from 1950 to 1995. **Findings** Previous estimates of alcohol-related harm based on changes in alcohol consumption for the period 1994–2002 for Sweden were, in some cases (e.g. violent assaults and accidents), relatively close to the actual harm levels, whereas in other cases (e.g. homicides, alcohol-related mortality and suicide) they diverged from observed harm levels. A tax cut by 40% on spirits and by 15% on wine is estimated to increase total per capita alcohol consumption by 0.35 litre. This increase is estimated to cause 289 additional deaths, 1627 additional assaults and 1.6 million additional sickness absence days. **Conclusions** The estimates of future changes in harm based upon even relatively modest increases in alcohol consumption produce considerable negative effects, with large economic consequences for the Swedish economy. The additional alcohol-related deaths, for instance, amount to more than half the number of yearly traffic fatalities in Sweden.

Keywords Alcohol, alcohol-related harm, mortality, policy, price.

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INTRODUCTION

National alcohol policies in the Nordic countries of Finland, Iceland, Norway and Sweden have historically had the goal of reducing alcohol problems by a combination of high alcohol prices and restrictive access to alcohol. This has been accomplished mainly by high alcohol taxes, a comprehensive state-owned alcohol retail monopoly and municipal control over licensed alcohol premises. These policies have proved to achieve their general purpose, i.e. countries with more restrictive alcohol policies do incur lower levels of alcohol-related problems. For summaries of evidence see [1–3].

Effective public decisions about changes in alcohol policies require the best available information about the probable consequences of various actions. This is especially true in current times when a number of international trade agreements, including policy developments within the European Union, have resulted in changes in many national policies concerning alcohol.

The report by Holder *et al.* [4] represented an effort to provide knowledge about the expected consequences of a major policy change in the three countries of Finland, Norway and Sweden. More specifically, the report projected potential levels in per capita alcohol consumption which might occur in each of these countries as a result of alternative changes in alcohol prices and changes in retail sales of alcohol caused by association with the European Union (EU). In addition, associated changes in the rate of alcohol-related harm were estimated for

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Sweden and Norway. These estimates were based on the historical relationship between per capita consumption and harm. However, a large number of changes have taken place since Sweden joined the EU: the production, wholesale, import and export monopolies were eliminated in 1995; next, the limits on private import of alcohol were practically removed in 2004. Therefore, the stable historical relationship between consumption and alcohol-related harm may well have altered. A follow-up of the Holder study thus seems warranted. It is also of interest to apply the model to a contemporary scenario.

The aim of the present paper is thus twofold. First, we evaluate the model used by Holder *et al*. [4] by comparing estimated and actual policy effects for Sweden. Secondly, we apply the Holder model to estimate effects of potential future changes in Swedish alcohol policy, particularly concerning alcohol prices.

METHODS

The predictions in Holder *et al*. [4] were based on established empirical relationships between per capita alcohol consumption and various forms of alcohol-related harm. Such a relationship is expressed in terms of an alcohol effect parameter which signifies the expected percentage change in the harm rate associated with a 1-litre increase in per capita alcohol consumption. The effect parameters had been estimated through ARIMA (Auto Regressive Integrated Moving Average) modelling [5] of aggregate time-series data covering a period of often more than 50 years prior to the projection period. Predictions about future alcohol-related harm thus rest on two basic assumptions: (i) that empirical historical relationships also hold into the future and (ii) that there are no major changes in causes other than alcohol consumption. In the following sections we test these assumptions by comparing observed alcohol-related harm levels from 1995 to 2002 with the harm levels that were predicted from the alcohol effect parameters used in the projections by Holder *et al*. [4]. The projections detailed changes in various forms of alcohol-related harm that were expected to result from certain increases in per capita consumption. For instance, for Sweden there was a projection that a l-litre increase in consumption would result in a 20% increase in alcohol-related mortality in men and 7% in women, with a corresponding increase in police reported assaults of 9%.

Predictions of alcohol-related harm are performed according to the formula:

$$\text{Predicted harm}_t = \exp(b \cdot Alc_t)$$

where *Alc* is observed alcohol consumption and *b* is the estimated effect of alcohol (Alc) on the harm rate at issue. As already noted, we use the same alcohol effect parameters as those applied by Holder *et al*. We use two alternative alcohol indicators: (i) alcohol sales and (ii) estimated total alcohol consumption (alcohol sales plus unregistered consumption as estimated from national surveys).

The following forms of alcohol-related harm were included in Holder *et al*. [4], and these are also focused in our evaluation:

- alcohol-related mortality (main causes of death include liver cirrhosis, alcoholic psychoses, alcoholism, alcohol abuse and alcohol poisoning);
- fatal accidents;
- suicide;
- homicide; and
- police-reported assaults.

When estimating effects of potential future changes in Swedish alcohol policy we include an additional outcome, namely sickness absence.

Estimates of the alcohol effect parameters for the chronic outcomes (alcohol-related mortality and sickness absence) include the lagged effects of alcohol consumption. This lag-structure is also incorporated into the projections by using a weighted alcohol measure. This implied a geometric lag-scheme truncated at lag 5, and with a lag-parameter equal to 0.8 for alcohol-related mortality [6] and 0.7 for sickness absence [7].

RESULTS

Part 1. Validation of model: estimated and actual policy effects for Sweden

First we look at the trajectories in the two alcohol indicators. Figure 1 plots alcohol sales as well as estimated total alcohol consumption (including unrecorded consump-

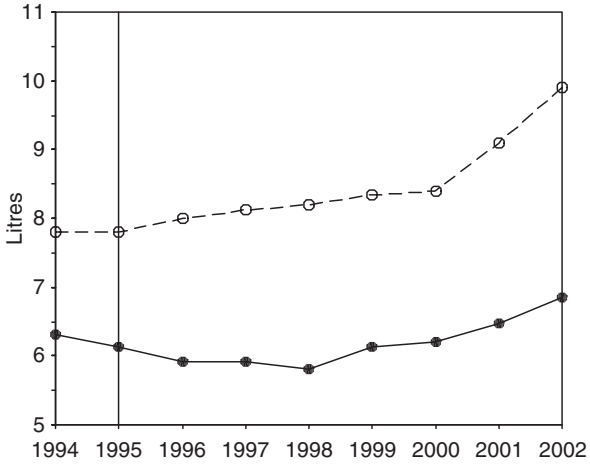

Figure 1 Swedish alcohol consumption, 1993–2002. Registered alcohol sales (closed circles), estimated total alcohol consumption, including unrecorded consumption (open circles). Litres 100% alcohol per capita 15 years and above

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tion) for the period 1994–2002. This figure shows that a major departure of estimated total alcohol consumption from alcohol sales occurred in 1995, the first year of the Swedish EU membership. While sales declined for 5 years (1994–98), estimated total consumption increased steadily over this same period.

The explanation for the increasing unrecorded consumption is lower alcohol prices in other EU member countries (Table 1) combined with increases in travellers' import quotas. When Sweden joined the EU in 1995, it was allowed to keep quantitative import quotas for all alcoholic beverages for the first 2 years of membership, which in 1996 were prolonged to July 2000. In new negotiations in 2000, Sweden agreed to abolish travellers' import quotas by the end of 2003. Partly because of the increase in border trade in beer, Sweden reduced its excise duty rate for beer in 1997 by 39%. In December 2001 Sweden reduced its excise duty rates for wine by 20%.

Table 2 provides a detailed picture of how various components of total alcohol consumption have changed between 1996 and 2003. Between 2000 and 2003, total alcohol consumption increased from 8.4 to 10.3 litres. Travellers' alcohol imports were 1.9 litres in 2002 and 2.2 litres in 2003. The sales of Systembolaget were 5.3 litres in 2000 and 6.6 litres in 2003. Thus, travellers' alcohol imports have increased relatively more than Systembolaget sales in the 2000–03 period.

In 2003 total unregistered alcohol consumption in Sweden was estimated at 3.2 litres, of which travellers' alcohol imports were 2.2 litres. Travellers' alcohol imports consisted of 1.0 litres of distilled spirits, 0.7 litres of wines and 0.5 litres of beer.

We turn now to the projection of harm rates based on the two alcohol indicators shown in Fig. 1, and utilizing the same alcohol effect parameters as Holder *et al.* [4]. Figures 2–9 show the predicted and observed rates for the

Table 1 Excise duty rates for alcoholic beverages in Denmark, Estonia, Finland, Germany and Sweden in May 2004, EUR per litre 100% alcohol.

	Estonia	*Finland*	*Sweden*	*Denmark*	*Germany*
Distilled spirits	9.27	28.25	55.19	20.20	13.03
Intermediate products (18% by volume)	5.68	23.56	27.62	7.89	8.50
Wines (12% by volume)	6.04	19.27	22.09	8.63	0.00
Beer	3.52	19.45	16.18	9.31	1.97

Table 2 Total alcohol consumption in Sweden 1996–2003, by beverage category and procurement method, litres 100% alcohol per inhabitants 15 years and older.

Beverage category and procurement method	*1996*	*1998*	*2000*	*2001*	*2002*	*2003*
Distilled spirits, total	2.7	2.6	2.3	2.5	2.6	2.6
Systembolaget	1.4	1.2	1.2	1.2	1.2	1.1
Restaurants	0.1	0.1	0.1	0.2	0.2	0.2
Travellers, imports	0.5	0.7	0.6	0.7	0.7	1.0
Smuggling	0.2	0.2	0.1	0.2	0.2	0.2
Moonshine	0.5	0.3	0.2	0.2	0.2	0.1
Wines, total	2.3	2.7	3.0	3.3	3.8	4.0
Systembolaget	1.7	1.9	2.0	2.2	2.4	2.6
Restaurants	0.2	0.2	0.2	0.3	0.3	0.3
Travellers import	0.3	0.4	0.6	0.7	0.7	0.7
Smuggling	–	–	0.0	0.0	0.0	0.1
Home-made	0.2	0.2	0.2	0.2	0.3	0.2
Beer, total	1.7	1.8	2.1	2.4	2.7	2.9
Systembolaget	0.8	0.8	1.1	1.2	1.3	1.4
Restaurants	0.6	0.6	0.6	0.6	0.6	0.6
Travellers' imports	0.3	0.4	0.4	0.5	0.5	0.5
Smuggling	–	–	0.1	0.2	0.3	0.4
Home-made	0.0	0.0	0.0	0.0	0.0	0.0
Folk beer (folköl), total*	1.3	1.2	1.0	0.9	0.8	0.8
Total alcohol consumption	8.0	8.2	8.4	9.1	9.9	10.3

*Beer with an alcohol content between 2.8 and 3.5% by volume. Source: Government of Sweden [14].

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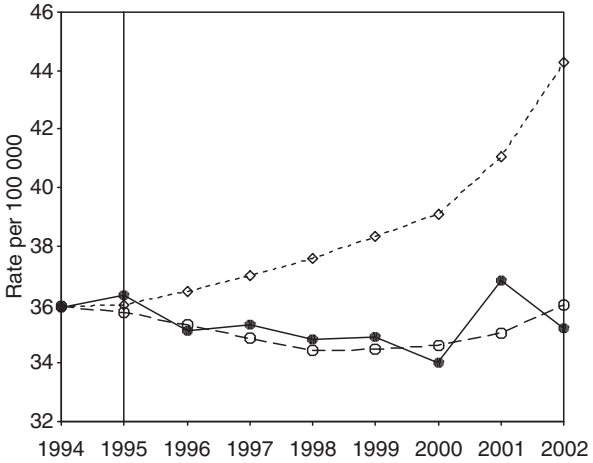

Figure 2 Alcohol-related mortality for men per 100 000. Observed (filled circles), predicted from alcohol sales (open circles), predicted from estimated total alcohol consumption, including unrecorded consumption (open squares)

Figure 4 Fatal accidents for men per 100 000. Observed (filled circles), predicted from alcohol sales (open circles), predicted from estimated total alcohol consumption, including unrecorded consumption (open squares)

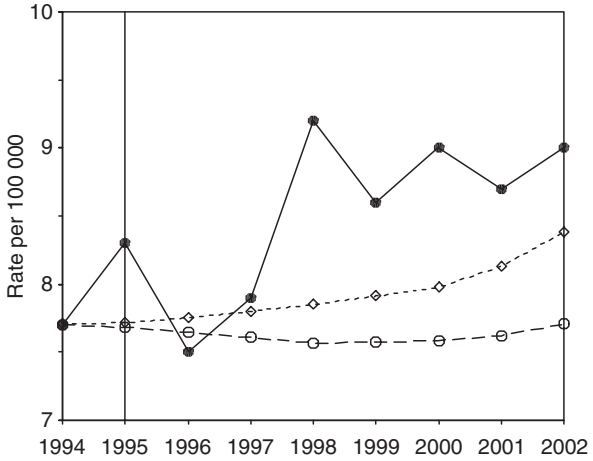

Figure 3 Alcohol-related mortality for women per 100 000. Observed (filled circles), predicted from alcohol sales (open circles), predicted from estimated total alcohol consumption, including unrecorded consumption (open squares)

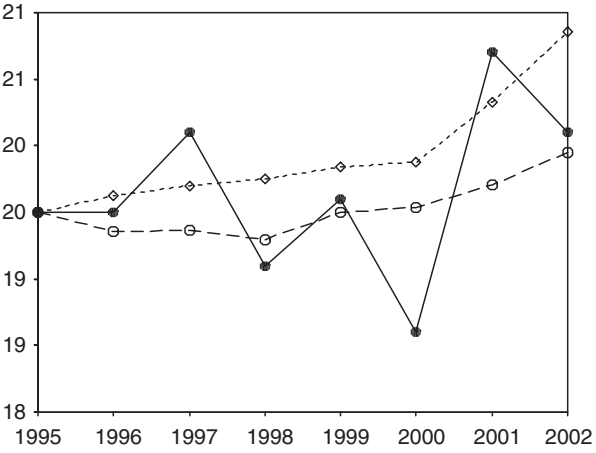

Figure 5 Fatal accidents for women per 100 000. Observed (filled circles), predicted from alcohol sales (open circles), predicted from estimated total alcohol consumption, including unrecorded consumption (open squares)

period 1994–2002. In each case, the predicted series is calibrated (by multiplying by a feasible constant) to equal the observed levels for the year 1994. [In the case of fatal accidents we begin the estimation with the base of 1995 (instead of 1994) due to an unusual event in 1994—the sinking of the ferry *Estonia* in the Baltic Sea in September 1994.]

In some cases the projected harm levels differ quite significantly when based on total consumption figures compared to sales figures. Generally, there is a poor match between observed and expected harm (we discuss possible explanations for this in the next section). Alcohol-related mortality in men has increased less than expected from total consumption; for women the opposite is true. Suicides (and homicide) show a decreasing trend, instead of the expected increase. However, the match is fairly good for two indicators: fatal accidents and assaults.

DISCUSSION

Part 1. Validation of model

The alcohol effect parameters applied in Holder *et al.* [4] were derived from historic Swedish data on registered alcohol sales and alcohol-related harm from the 1930s to 1995, during which time sales data and harm were well correlated. The projections presented above for the period

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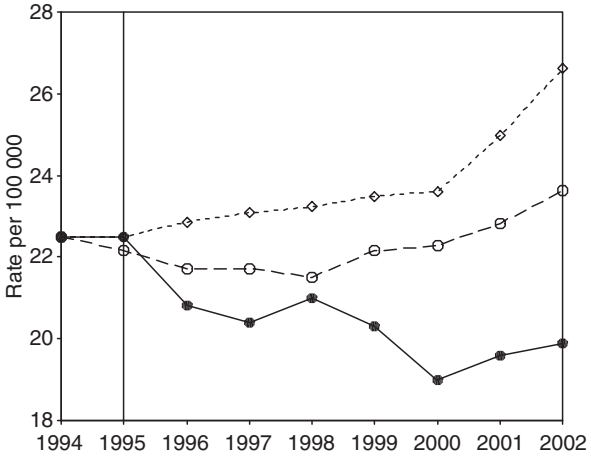

Figure 6 Suicides for men per 100 000. Observed (filled circles), predicted from alcohol sales (open circles), predicted from estimated total alcohol consumption, including unrecorded consumption (open squares)

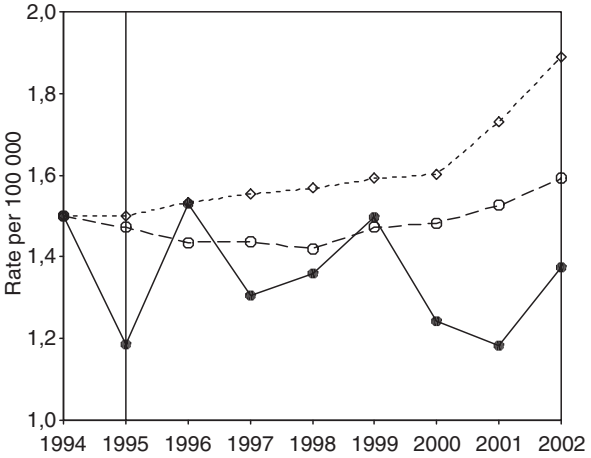

Figure 8 Homicides for men and women per 100 000. Observed (filled circles), predicted from alcohol sales (open circles), predicted from estimated total alcohol consumption, including unrecorded consumption (open squares)

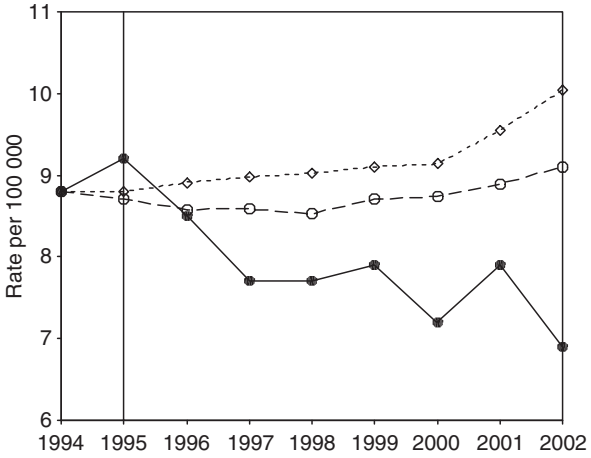

Figure 7 Suicides for women per 100 000. Observed (filled circles), predicted from alcohol sales (open circles), predicted from estimated total alcohol consumption, including unrecorded consumption (open squares)

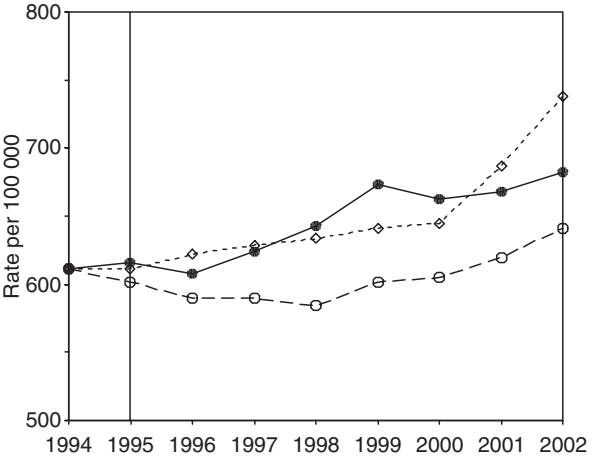

Figure 9 Police-reported assaults per 100 000. Observed (filled circles), predicted from alcohol sales (open circles), predicted from estimated total alcohol consumption, including unrecorded consumption (open squares)

1995–2002 suggest that these associations are not as uniform as could be expected from the earlier periods. This appears to be the case especially for alcohol-related mortality. There are a number of possible explanations for these divergences.

Increasing drinking among women

In the case of alcohol-related mortality, one reason may be that women's share of total alcohol consumption has increased significantly over the past decades, and hence we may assume that the parameter estimates may be too high for males and too low for females.

Heavy drinkers' share of total consumption

Another reason may be that while total consumption has increased, the heavy drinkers' share of total consumption may have decreased, which would dampen the impact of increasing consumption.

Multi-factorial harms

Another explanation is that factors other than alcohol consumption may have affected the trends in the harm indicators. This is likely to be the case particularly for multi-factorial harms such as accidents, homicide and suicide.

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Changes in diagnostic routines

There may also have been changes in diagnostic routines and criteria, e.g. autopsies being performed to a decreasing extent. The change from *International Classification of Diseases* version 9 (ICD-9) to ICD-10 in 1997 may possibly have reduced the likelihood of an alcohol-related diagnosis as the underlying cause of death; for instance, K70 is a specific alcohol-induced liver disease in ICD-10, whereas 571 was liver cirrhosis (whether alcohol-induced or not) in ICD-9.

Large confidence intervals

The estimates of the association between consumption and harm levels have relatively large confidence intervals, therefore the predictions are not precise.

Unrecorded alcohol consumption

There have been substantial changes in unrecorded alcohol consumption during this period. These changes have been estimated and factored into an estimate of total consumption. Unrecorded consumption has been estimated through survey studies. Representative population samples have been asked how much alcohol they have purchased during travels abroad during the past month and also to what extent they have bought alcohol from sources other than the retail monopoly shops, restaurants or grocery shops (in the case of beer with an alcohol content $<2.2\%$ by volume). Alternative sources included purchases of illegal, home-produced alcohol or purchases of privately imported alcohol. Surveys have been conducted since 1989 [8]. After 2001 they have been conducted on a monthly basis, where 1500 randomly chosen Swedes have been contacted, with a response rate of around 60% [9]. While refinements have been made in the methodology [10], these estimates are less reliable than sales data. It is possible that both over- and underestimates of unrecorded alcohol consumption have occurred at different periods.

Time-lag

Another source of uncertainty is the nature of the time-lag between changes in alcohol consumption and some types of alcohol-related harm. The medical conditions that are linked strongly to long-term heavy drinking take many years to develop and result in death. Although the individual drinker may experience chronic disease and death only after many years of heavy drinking, the relationship between consumption and alcohol-related mortality at the population level is assumed to be distributed over a shorter time period [11]. Thus, significant changes in total alcohol consumption have been followed by immediate changes in alcohol-related mortality as, for instance, in the former USSR in the mid-1980s [3]. On the other hand, changes in medical treatment including increases in frequency of utilization can alter the number of alcohol-related deaths in any one year.

Improvements in treatment

Improvements in treatment may have had a direct effect on specific types of alcohol-related mortality. One type of improvement involves the treatment of alcohol dependency, which would reduce the number of individuals with very high levels of consumption or reduce the peaks in consumption. This assumption is supported by the decreasing number of delirium tremens cases in Swedish hospitals, the increasing number of prescriptions for disulfiram, naltrexone and acamprosate and the increasing rates of attendance at Alcoholics Anonymous (AA) meetings. Another type of improvement involves the treatment of liver cirrhosis and other alcohol-related diseases [12]. The increase in the number of liver transplants supports this assumption.

Marginalized groups

After 1995, total alcohol-related mortality for men declines (interestingly, in a fashion which closely parallels registered alcohol sales), but diverges from the predicted mortality based upon estimated total consumption. This may relate partly to varying mobility among different groups of alcohol consumers. Alcohol-related mortality reflects, to a large extent, heavy drinking among marginalized groups. These individuals are not expected to travel and buy alcohol abroad to the same extent as others. Mortality changes in this group may therefore be expected to follow registered sales to a higher degree.

In the case of alcohol-related mortality, we found no increase in mortality for the period 1994–2002 as a whole. Most of the increase in alcohol consumption during this period occurred during the last 2 years, however. Between 1994 and 2000 consumption increased by 0.6 litres, whereas during 2001–02 it increased by 1.5 litres. During these last 2 years, an increasing trend in mortality can be seen.

Part 2. Results from analyses for the future for Sweden

In recent years, the increase in private imports caused much concern in Sweden, as these developments were thought to undermine the legitimacy of Swedish national alcohol policy. Among proposals to counteract the increase in private imports were reductions in excise duties on alcohol, by 40% for spirits and by 15% for wine [13].

How would the proposed decreases in alcohol excise duties affect per capita consumption and various forms of alcohol-related harm? To address this issue we apply the model used by Holder *et al.* [4]. The analyses were performed in two steps; the first step is to estimate the

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increase in consumption that is expected to result from decreases in price. The second step is to estimate the changes in harm rates that are expected to result from the consumption increase. In addition to the harm indicators that were used in the Holder study (see above) we include sickness absence (where available data only cover sickness absence periods in excess of 2 weeks).

Given the political debate in Sweden and the proposals for changes in tax policy that have been put forward, three possible scenarios were analysed:

1 Harmonization of wine taxes. A reduction in wine taxes of 15% is required to bring them into line with beer taxes. This would lead to a decrease in wine prices by 5.5%, which in turn is expected to increase wine consumption by 3.3%. This is equal to an increase in total alcohol consumption by about 1%, or of 0.1 litres per inhabitant aged 15 years and older.
2 A reduction in spirits taxes by 40%. This would lead to a decrease in spirits prices by 26%, which in turn is expected to increase total alcohol consumption by about 2% or 0.25 litres per inhabitant aged 15 years and older [14].
3 1 + 2 = increase in total consumption by 0.35 litres.

We confined the projection of alcohol-related harm to the third scenario.

Table 3 shows the price elasticities which were used to estimate changes in alcohol consumption. The elasticities were estimated on the basis of Swedish quarterly data for the period 1984–2004 [15].

In the Methods section we described the strategy for predicting how much a given change in overall alcohol consumption is expected to affect a specific harm indicator. However, rather than using the alcohol effect parameters that were utilized by Holder *et al.* [4], we chose parameter estimates that have been obtained more recently; generally these are of a similar magnitude to those used in the Holder study but have smaller standard errors. Most of the estimates were obtained from the results from ARIMA time-series analyses presented in the European Comparative Alcohol Study (ECAS) [16]. These analyses were performed on country-specific data for the period 1950–95 and covered 14 European countries, including Sweden. Generally, semilog models were used, and the resulting parameter estimates express the relative change in the harm indicator, given a 1-litre increase in per capita alcohol consumption. Because estimates with small standard errors are preferable in the projections, we chose pooled estimates (for Finland, Norway and Sweden) whenever feasible. A condition for a pooled estimate to be chosen was homogeneity; that is, it should not deviate greatly from the estimate specific to Sweden. As there was no estimate pertaining to the broader category of alcohol-related mortality, we took the estimate for cirrhosis mortality. In this case, the pooled estimate was chosen although it was much lower than that for Sweden. The rationale for this choice was that a more conservative estimate seemed to be warranted in view of the weak response in alcohol-related mortality to changes in population drinking during the last decade. In the case of suicide, the Swedish estimate was utilized because the pooled estimate was too heterogeneous. For assaults and sickness absence we utilized Swedish parameter estimates, as pooled estimates from northern Europe were not available. Sources and values of the selected parameter estimates are presented in Tables 4 and 5.

Applying these effect parameters for specific gender group (or total) for each type of alcohol-related harm yields an estimate of the expected number of additional cases given a 0.35-l increase in total alcohol consumption. Table 6 shows the results as percentage increase and

Table 3 Estimated price elasticities [15].

Beer	–0.55*
Wine	–0.57**
Spirits	–0.,96***

***$P < 0.001$; **$P < 0.01$; *$P < 0.05$.

Table 4 Sources of parameter estimates utilized to estimate alcohol-related harms.

Indicator	*Author*	*Outcome*	*Estimate pertains to*	*Comments*
Alcohol-related mortality	Ramstedt [18]	Cirrhosis mortality	Northern Europe (pooled estimate)	Estimate for Sweden higher
Accidents	Skog [19]	Fatal accidents	Northern Europe (pooled estimate)	Homogeneous within northern Europe Calculated from linear model
Suicide	Ramstedt [18]	Suicide	Sweden	Pooled estimate too heterogeneous Homogenous within northern Europe
Homicide	Rossow [20]	Homicide	Northern Europe (pooled estimate)	Homogeneous within northern Europe
Assaults	Norström [21]	Police-reported assaults	Sweden	
Sickness absence	Norström [7]	Sickness absence	Sweden	

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actual new cases (*n*) along with the upper and lower 95% confidence percentage intervals (UCI percentage and LCI percentage), which yields the specific upper and lower confidence intervals or limits associated (UCI *n* and LCI *n*).

DISCUSSION AND IMPLICATIONS

It is notoriously difficult to predict the future. This is especially the case in the field of alcohol and alcohol-related harms, where a large number of factors, known and unknown, can influence developments. Predictions are, nevertheless, essential to decision making, and in fact form the basis of many policy decisions. However, in practice scientifically based estimates of potential harm are rarely undertaken in conjunction with alcohol policy discussion. Holder *et al.* [4] was an interesting exception. To our knowledge this was the first systematic attempt, based on scientific methodology, to predict consequences of changes made to alcohol policy.

Table 5 Effect parameters from semilog models used in the projections.

	Effect parameter	*Standard error*	*Study population*	*Source*
Alcohol-related mortality				
Men	0.27	0.04	Northern Europe[1]	Ramstedt [18]
Women	0.15	0.04		
Fatal accidents				
Men	0.08	0.02	Northern Europe[2]	Skog [19]
Women	0.03	0.01		
Suicide				
Men	0.10	0.03	Sweden	Ramstedt [18]
Women	0.08	0.04		
Homicide				
Total	0.12	0.04	Northern Europe[1]	Rossow [20]
Police-reported assaults				
Total	0.07	0.03	Sweden	Norström [21]
Sickness absence				
Men	0.12	0.02	Sweden	Norström [7]

[1]Pooled estimate for Finland, Norway and Sweden. [2]Pooled estimate for Finland, Norway and Sweden. Calculated from linear models.

Table 6 Estimated increase in harm resulting from 0.35 litre increase in total consumption.

	Current number	*%*	*n*	*UCI (%)*	*LCI (%)*	*UCI (n)*	*LCI (n)*
Alcohol-related mortality							
Men	1 560	9.80	153	12.93	6.75	202	105
Women	410	5.28	22	7.99	2.64	33	11
Accidents							
Men	1 980	2.84	56	3.97	1.72	79	34
Women	1 220	1.13	14	1.82	0.43	22	5
Suicide							
Men	870	3.60	31	5.75	1.49	50	13
Women	320	2.80	9	5.30	0.36	17	1
Homicide							
Total	100	4.44	4	7.19	1.75	7	2
Total			289			410	171
Assaults							
Total	65 180	2.48	1 617	4.61	0.39	3 006	256
Sickness absence (days/year)							
Men	40 167 000	4.11	1 649 699	5.55	2.69	2 227 378	1 079 892

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The forecasts of harm based on changes in alcohol consumption for the period 1994–2002 were, in some cases (e.g. violent assaults and accidents), relatively close to the actual harm levels, whereas in other cases (e.g. homicides, alcohol-related mortality and suicide) they diverged from observed harm levels. Even so, the results of these analyses (predicted compared to actual) demonstrate that 1995 estimates of changes in alcohol problems provided reasonable results, i.e. the anticipated effects of Swedish policy changes would yield increases in such problems, even given the number of unknowns and unexpected changes in factors which would affect alcohol consumption: for example, elimination of private alcohol imports.

The present paper benefited from the results from a number of recent studies, especially the series of studies in the ECAS study. Even with a number of technical considerations, the results provided here represent our best estimates of future consequences of some proposed changes to alcohol policy in Sweden. A tax cut of 40% on spirits and of 15% on wine is estimated to lead to an increase in total per capita consumption by 0.35 litres. This may seem a modest increase, given that the present consumption is estimated to be 10.4 litres. Nevertheless, this increase is estimated to cause almost 300 additional deaths, more than 1500 additional assaults and 1.6 million additional sickness absence days. These are considerable negative effects, with large economic consequences for the Swedish economy. The additional alcohol-related deaths, for instance, amount to more than half the number of yearly traffic fatalities in Sweden. An additional 1.6 million sickness absence days translates into a considerable loss of productivity. Following the completion of the analyses presented in this paper, new proposals for tax reductions have been made by an official governmental review of alcohol policy [13]. In this review tax cuts of 40% for spirits, 30% for wine and 30% for beer were proposed. Were these tax cuts to be implemented the effects on consumption and harms would be considerably larger than suggested by the results of the analyses presented in this paper .

Given the challenge to Swedish alcohol policy resulting from increased travellers' imports, Sweden has basically two alternatives. The country can maintain its alcohol excise duties at the present level and accept the fact that travellers' imports are about 25% of total alcohol consumption. This alternative also includes taking the risk that travellers' alcohol imports will grow in the coming years.

The second alternative is to combat the level of travellers' alcohol imports and their possible growth by reducing Swedish alcohol excise duty rates. Basically, this is an effective way to reduce travellers' alcohol imports and also other unregistered activities, such as smuggling and home distilling. The negative side-effect is that reduced alcohol excise duty rates will lead to increases in total alcohol consumption and associated increases in alcohol-related harms. Following the theory of a collectivity of drinking culture, increases in average consumption are accompanied by increases in all parts of the drinking spectrum [17].

The findings from this study illustrate the heavy impact of alcohol on health and social problems in contemporary societies. They also illustrate the feasibility and the importance of estimating probable negative consequences of changes in alcohol policy prior to their implementation. The results from actual data and the estimated future consequences also illustrate significant weaknesses in national and international alcohol policy. While it is generally recognized that the proposed tax cuts in Sweden will result in increased drinking and increased alcohol-related harm, proponents of this course of action argue that this is the lesser of two evils. The problem with the present high level of alcohol taxation is that it leads to large private imports from neighbouring countries with considerably cheaper alcohol.

In the final analysis, the underlying problem confronting Swedish alcohol policy is the free flow of alcohol across borders in the European Union. Indirectly this forces down excise duties in member states that until now have used alcohol taxes as a public health measure to reduce the burden of alcohol-related harm. In this respect, alcohol is still basically viewed as an ordinary commodity.

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