

Changes in Alcohol-Related Problems After Alcohol Policy Changes in Denmark, Finland, and Sweden*

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ABSTRACT. Objective: European Union travelers' allowances for alcohol import to Denmark, Sweden, and Finland were abolished in 2004. In addition, excise taxes on alcohol were lowered in 2003 and 2005 in Denmark, and in 2004 in Finland. Using northern Sweden as a control site, this study examines whether levels of reported alcohol problems have changed in Denmark, Finland, and southern Sweden as a consequence of these policy changes. **Method:** Annual cross-sectional surveys were conducted in Denmark, Finland, and Sweden from 2003 to 2006. Five dependency items and seven extrinsic alcohol-related problems were examined. Changes were analyzed within each country/region with logistic regressions and tested for short- and long-term changes. Differential change was also tested between each country

and the control site, northern Sweden. **Results:** Prevalence of alcohol problems decreased over the study period. Only in selected subgroups did problems increase. This mainly occurred in the samples for northern Sweden and Finland, and mostly among older age groups and men. In relation to the control site, however, no increases in problem prevalence were found. **Conclusions:** Our findings on a decline in reported alcohol problems largely agree with published reports on alcohol consumption over the same period in the study countries. They do not agree, however, with findings on changes in health and social statistics in Finland and Denmark, where some significant increases in alcohol-related harm have been found. (*J. Stud. Alcohol Drugs*, 71, 32-40, 2010)

THAT THE PRICE OF ALCOHOL can influence consumption levels is well known (Babor et al., 2003; Edwards et al., 1994). This follows from a basic economic law of product price-demand: As the price of a product rises, the demand for that product falls (Chaloupka et al., 2002). This relationship is observed with alcoholic beverages but varies according to beverage type; the demand response to price changes in the most common beverage in a society (beer in the United States, for example) is not as sensitive as that for other beverages (Chaloupka et al., 2002). The relationship also varies according to the population in question. Research has documented that younger people tend to be more responsive to price changes than older people (Chaloupka et al., 2002; Kuo et al., 2003).

It is also well documented that alcohol consumption has adverse effects on many health conditions and that these effects increase with increasing consumption (Babor et al., 2003; Edwards et al., 1994; Flensburg-Madsen et al., 2007; Rehm et al., 2003; Room et al., 2005). Price regulation of alcoholic beverages, therefore, has been regarded as a major policy tool to control the incidence and prevalence of such problems (Babor et al., 2003; Bruun et al., 1975; Edwards et al., 1994).

A number of changes in alcohol policy affecting price and availability occurred in Denmark, Finland, and Sweden between 2003 and 2006. As of January 1, 2004, European Union travelers' allowances for alcohol import to Denmark, Sweden, and Finland for one's own use were effectively abolished. Table 1 provides an overview of the policy changes. In Denmark, the intent of the tax reduction on distilled spirits

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was to stem an anticipated influx of imports into the country after the change in travelers' import restrictions on January 1, 2004. In Finland, tax reductions were introduced with similar anticipation that in May 2004, Estonia would enter the European Union, at which time within-European Union travelers' import rules would come into effect for travel from Estonia. Estonia is located close to Finland and has substantially lower alcohol prices. Parts of Sweden are adjacent to Denmark and to Finland. It was anticipated that the reduction in Danish distilled-spirits taxes and the abolished travelers' allowances would affect southern Sweden; Denmark is one of the main countries from which Swedes import alcohol, and persons in this area were known to import large amounts (Boman et al., 2007). The policy changes in Finland were assumed to mainly affect areas in the north of Sweden closest to Finland.

According to the price-demand principle, it would be expected that a decrease in the price of alcohol would lead to increases in consumption and alcohol-related problems (Chaloupka et al., 2002; Edwards et al., 1994). The purpose of this article is to examine how decreases in alcohol taxation, as well as the abolition of European Union travelers' import restrictions, have affected the prevalence of self-reported alcohol-related problems in Denmark, Finland, and the part of Sweden close to Denmark (here called southern Sweden).

This research is part of the larger collaborative Nordic study, "Effects of Major Changes in Alcohol Availability," involving Denmark, Finland, and Sweden, that has investigated the effects on alcohol consumption and problems of these policy changes in all three countries. Researchers in the study surveyed adults in the three sites affected by the policy changes (Denmark, Finland, and southern Sweden) and in a control site largely unaffected (northern Sweden, excluding the area near the Finnish border). Previous analyses of these data have examined changes in reported alcohol consumption. Mäkelä et al. (2008) found no increases in reported consumption in any country from 2003 to 2004, which is surprising. Neither have increases in self-reported consumption been reported in the longer term (2003-2006), for Denmark (Grittner et al., 2009), southern Sweden (Gustafsson,

in press), or Finland (Mustonen et al., 2007a). Consumption in the control site of northern Sweden has increased, however (Gustafsson, in press).

Aggregate per capita figures (Table 2) indicate that total consumption declined during the study period in Denmark, although, immediately after the tax reduction, consumption of distilled spirits rose somewhat. In southern Sweden, total consumption, as well as distilled spirits consumption, rose after 2003 but declined again by 2006. In northern Sweden, total consumption rose; this apparently was more true of beer and wine than distilled spirits. In Finland, however, per capita consumption rose by almost a liter by 2006, reflecting increased consumption of all beverage types. The aggregate per capita trends thus clearly differ from the general survey findings for Finland (Mustonen et al., 2007b), although the differences are not so clear for Sweden and Denmark.

Previous research on price and alcohol-related problems

In a systematic review, Meier et al. (2008) found 24 studies that examined the direct link between changes in

TABLE 1. Overview of policy changes and dates of introduction

Country	Date	Policy change
Denmark	October 1, 2003	Excise tax (distilled spirits: -45%)
	January 1, 2004	Travelers' allowances from EU countries
	May 1, 2004	Travelers' allowances from Estonia
Finland	January 9, 2005	Excise tax (beer and wine: -13%)
	January 1, 2004	Travelers' allowances from EU countries
	March 1, 2004	Excise tax (distilled spirits: -44%; fortified wine: -40%; table wine: -10%; beer: -32%)
Sweden	May 1, 2004	Travelers' allowances from Estonia
	January 1, 2004	Travelers' allowances from EU countries
	May 1, 2004	Travelers' allowances from Estonia

Note: EU = European Union.

TABLE 2. Per capita (≥ 15 years) consumption of alcohol (pure alcohol in liters) for Denmark, Finland, and Sweden

Variable	Total	Beer	Wine	Distilled spirits
Denmark				
2000	13	6.4	5.0	1.8
2001	13	6.1	5.0	1.8
2002	13	6.1	5.0	1.8
2003	13.1	6.3	5.0	1.8
2004	12.7	5.8	4.5	2.0
2005	12.8	5.8	4.7	2.0
2006	12.1	5.6	4.5	1.8
Finland				
2000	8.6	4.3	1.3	2.2
2001	9.0	4.4	1.4	2.3
2002	9.2	4.4	1.5	2.4
2003	9.3	4.4	1.6	2.4
2004	9.9	4.6	1.6	2.8
2005	10.0	4.6	1.7	2.8
2006	10.1	4.6	1.7	2.9
Sweden				
south				
2000	— ^a	—	—	—
2001	—	—	—	—
2002	10.5	2.0	3.5	2.7
2003	10.8	2.6	3.6	2.9
2004	11.1	2.9	3.8	3.2
2005	10.5	2.6	3.6	3.0
2006	9.7	2.3	3.2	2.6
Sweden				
north				
2000	—	—	—	—
2001	—	—	—	—
2002	8.1	1.7	2.5	2.4
2003	8.4	2.1	2.8	2.0
2004	8.9	2.2	3.0	2.2
2005	8.5	2.2	2.6	2.3
2006	8.9	2.2	3.0	2.2

Notes: ^aNot available. Sources: Statistics Denmark, Finnish National Institute for Health and Welfare, Centre for Social Research on Alcohol and Drugs.

alcohol taxes and changes in alcohol-attributable harm, the latter primarily measured by health or police statistics. Cook (2007), who pioneered such studies, recently published a further analysis, in which he found a significant effect of alcohol-tax changes in U.S. states on motor vehicle fatalities and cirrhosis deaths. Earlier studies have found that increases in price of or tax on one or more alcoholic beverage types reduced youth drink-driving and alcohol-related traffic accidents (e.g., Chaloupka et al., 1993; Ponicki et al., 2007; Ruhm, 1996), liver cirrhosis mortality (Cook and Tauchen, 1982; Grossman, 1993), nonfatal workplace injuries (Ohsfeldt and Morrissey, 1997), violent crime (Cook and Moore, 1993), and family violence (Markowitz and Grossman, 1998, 2000). There is a classic example of the effects of taxes on consumption and health outcomes from Denmark, where distilled-spirits taxes were raised 12-fold during the First World War, resulting in a substantial decrease in per capita alcohol consumption and in health consequences of drinking (Bruun et al., 1975; Thorsen, 1990). These studies have focused on short-term effects; even for cirrhosis, the greatest effect of a reduction in consumption occurs in the first year (Skog, 1984). Studies of drink-driving interventions, however, have often found that the effects decay over several months or a few years, because motorists adjust and learn that the threat of arrest as a result of the intervention has been exaggerated (Ross, 1984). The literature then indicates that there is an immediate effect from a price intervention, but it is less clear whether this effect would be expected to persist or to decay in following years.

There is little population survey research on the relationship between decreasing alcohol prices and alcohol consumption and alcohol problems. One example, however, of a price decrease comes from Switzerland where, in 1999, taxes on foreign distilled spirits were lowered by 30% to 50%. This price reduction was associated with an increase in consumption among subgroups in the Swiss general population—with the exception of those older than age 60 (Kuo et al., 2003)—and an increase in alcohol-related problems, especially an increased distilled-spirits consumption among younger persons (Mohler-Kuo et al., 2004).

Within the framework of the current study, Bloomfield et al. (2009) examined trends in hospital admissions data for alcohol poisonings and violence in Denmark between 2003 and 2005 and found a significant 26% rise in alcohol poisoning admissions among those 15 years of age and younger. Another time-series analysis in Finland showed that the alcohol tax cuts in March 2004 were associated with a significant 17% increase in “alcohol-positive sudden deaths” (Koski et al., 2007). In Finland, liver disease deaths rose by 30% between 2003 and 2004, and again by 20% in 2005 (STAKES, 2006). Mäkelä et al. (2008) comment that the initial rise in mortality is likely the result of increased consumption among heavy drinkers who had already damaged their livers before the policy changes. These analyses involved aggregate

registry data that probably include individuals not captured by the general population surveys.

Method

Study design

To study changes in the prevalence of self-reported alcohol problems, we analyze repeated cross-sectional surveys conducted annually over 4 years. The sample for Sweden is divided into two subsamples, based on geography. The southern region of Sweden used in this analysis is the part close to Denmark, from Gothenburg eastward. The northern region of Sweden is used as a control site for examining alcohol policy changes and excludes the Stockholm region (which has ferry connections to Finland and Estonia) as well as the far-north area within 150 km of the Finnish border.

Samples

Cross-sectional samples of the adult population were drawn during the third and fourth quarters in 2003, 2004, 2005, and 2006 in Denmark, Finland, and the northern and southern regions of Sweden. This time of year was chosen for the first data collection wave because it was the earliest at which researchers could conduct the survey after learning of the policy changes. In the third quarter of 2003, the tax reduction on distilled spirits had not yet gone into effect in Denmark. By the fourth quarter the Danish taxes had changed, but the abolishment of the travelers' allowances had not. In the following years, data collection took place in September and early October in Denmark and in the third and fourth quarters in Sweden. Any further effort to distinguish effects of the two changes was abandoned, because there was no difference between the third and the fourth quarters in 2003-2004 in changes in alcohol consumption and problem rates (data available on request; detailed information in Mäkelä et al., 2007). In Finland, the survey took place on or about September 8 each year.

In Denmark and Sweden, telephone surveys were employed, and in Finland a self-administered postal survey was conducted. Sampling in Denmark and Sweden was done by random generation of plausible telephone numbers from which business and out-of-service numbers were eliminated. The last-birthday method was used to sample within households. In Finland, random sampling of persons 15-69 years was generated from a national population list.

Table 3 provides an overview of the sample sizes and response rates for the data collection waves. The variation in response rates is found mainly between Finland on the one hand and Sweden and Denmark on the other, representing differences between the postal and telephone surveys. Weights were calculated to make the samples representative of the adult population. The present analysis is based on

TABLE 3. Sample sizes and response rates

Year	Denmark		Finland		Southern Sweden		Northern Sweden	
	Sample size	Response rate	Sample size	Response rate	Sample size	Response rate	Sample size	Response rate
2003	1,770	43	2,049	60	1,292	52	1,190	48
2004	894	36	1,102	53	1,205	47	1,200	44
2005	954	43	1,073	53	780	49	763	46
2006	881	52	2,829	55	894	38	822	33

individuals ages 16-69 years, because that age range was available in all three countries. Permission to conduct survey research on human subjects was obtained in each country from the relevant national ethics authority.

Measures

A common core questionnaire was used for all four regions, although each country could add country-specific modules.

Drinking consequences. The present analysis uses the 12 items on alcohol-related problems that were included in the core questionnaire and asked of current drinkers in all three countries in all 4 years. A listing of these items may be found in Wicki et al. (2009). Five of these problem items, here called “dependence symptoms” and originating from the Alcohol Use Disorders Identification Test questionnaire (Saunders et al., 1993a, 1993b), were analyzed separately from the other problem items. They cover symptomatic behaviors associated with dependence (e.g., being unable to stop drinking). The other seven items, here called “extrinsic problems,” include harm from the respondent’s drinking in different life-areas and experiences with alcohol-related fights, injuries, and drink driving.

Summary measures of the two kinds of items were constructed. Items were first dichotomized to indicate whether the respondent did or did not experience the specific problem at least once within the last 12 months. These were then combined, separately for each problem type, into an additive score and then dichotomized into a 2+ measurement, coded as 1 if the respondent had experienced two or more alcohol related problems at least once within the 12 months before the interview, and 0 otherwise.

The prevalence rates of alcohol problems were based on the total sample in each country because we wanted to estimate *population* prevalences. These can be argued to be more relevant (than rates based only on drinkers in the denominator) for measuring the public health impact of policy changes and for estimating the burden of disease for the total population.

Sociodemographic characteristics. Respondent’s age was used as a continuous variable. For analyses of age-specific effects, three age groups were created: young (16-29 years),

middle (30-49 years), and old (50-69 years). Income was measured by gross personal income in Finland and Sweden and by gross household income in Denmark. Three levels of income (low, middle, and high) were created, each representing about a third of each country’s population. The income groups were dummy coded (“low income” as reference group) to model possible nonlinear effects of income.

Analytical strategy

We performed binary logistic regressions to assess short- and long-term effects of alcohol policy changes on alcohol-related problems by subsamples (e.g., young women in Finland). In a first step, we examined whether the prevalences of alcohol-related problems changed over the 4 years of observation within the four regions. In a second step, we tested whether differential change could be observed in the regions affected by the policy changes (Denmark, Finland, and southern Sweden) in comparison with the control site (northern Sweden) in order to attribute possible changes to the changes in the alcohol policies.

Dummy-coded variables were used in the models to examine short-term and long-term changes over the 4 years. The dummy variable for short-term effects was coded 1 for year 2004 and 0 for other years. The dummy variable for long-term effects compared the 2 later years (2005 and 2006) to the previous 2 years; it was coded 1 for years 2005 and 2006, and 0 for the earlier years. In the case of a steady increase over the 4 years, the odds ratios for short- and long-term effects in the logistic regression would be significantly greater than 1 for both. In the case of an increase only in the later years (2005 and 2006), odds ratios for short-term effects would not differ significantly from 1, and odds ratios for long-term effects would be significantly greater than 1.

To assess changes *within* the regions, the 2+ problem score of the region was regressed on sex, age, income, and dummy variables for short- and long-term effects. To assess differential change *in comparison with the control site* (northern Sweden), the model included all four regions. The 2+ problem score was regressed on sex, age, income, region (dummy coded, reference = northern Sweden), dummy variables for short- and long-term effects, and an interaction term between the regions and short- and long-term effects. A

significant positive interaction term would indicate a relative increase within a region in comparison with the control site, whereas a significant negative interaction term would indicate a relative decrease. We investigated sex- and age-specific effects by estimating the regression models separately for men and women, age groups, and sex-specific age groups (e.g., young women).

Results

Table 4 displays the prevalence of 2+ symptom items as well as 2+ extrinsic problem items for the first survey year (2003) for each region. It also indicates the extent of short- and long-term changes and whether these changes are significant. To ease interpretation of the table, details of the logistic regressions in which age, sex (where appropriate), and income were adjusted for are not shown (available on request).

In Denmark, the prevalence of 2+ dependence symptoms

decreased in the total sample and in nearly all subgroups. Statistically significant changes are seen in long-term decreases for the total sample, women, and the young—young women, in particular. Only among older respondents did the prevalence of dependence symptoms increase, but these changes are not significant. Decreases in the prevalence of extrinsic problems are also seen for Denmark; significant changes are mainly found as short-term decreases. These pertain again to the whole sample, as well as to the young and to women.

Changes in problem prevalence in Finland are also mainly dominated by decreases in dependence symptoms. All statistically significant changes are long term. They are found among the whole sample, women, and the young. Mixed changes are found for the extrinsic problems, with the young showing decreases in prevalence, and the older subsample, as well as older men, showing increases.

Southern Sweden experienced changes in the prevalence of 2+ dependence symptoms. However, in this case, declines

TABLE 4. Observed prevalence of 2+ dependency symptoms and extrinsic problems scores in 2003 and short- and long-term changes in Denmark, Finland, and southern and northern Sweden

Variable	Denmark			Finland			Southern Sweden			Northern Sweden		
	% 2003	Change		% 2003	Change		% 2003	Change		% 2003	Change	
		Short	Long		Short	Long		Short	Long		Short	Long
Dependency symptoms												
All	11.0	-1.2	-2.6*	32.7	-1.6	-3.7*	9.3	-0.7	-1.1	8.0	-0.9	1.3
Men	14.1	-0.6	-2.0	38.3	-1.8	-2.6	11.5	-1.0	0.4	9.5	0.5	3.1
Women	8.0	-1.8	-3.1**	26.7	-1.3	-4.4*	7.1	-0.6	-2.6*	6.3	-2.2	-0.4
Young, 16-29 yr.	28.7	-5.0	-6.6*	46.6	-3.9	-5.1*	17.7	-0.1	3.2	20.6	-5.5	2.9
Middle, 30-49 yr.	7.5	-1.4	-1.5	33.0	0.8	-3.7 ⁺	7.0	1.9	-1.5	8.1	-1.0	-0.9
Old, 50-69 yr.	2.8	1.7	-0.3	20.8	-1.2	-1.1	5.5	-3.4**	-4.0**	0.9	1.4 ⁺	1.8*
Young men	30.6	-3.1	-0.8	48.3	-1.3	-2.8	21.3	-3.7	9.1*	23.7	-3.1	5.6
Middle men	11.3	-1.2	-2.2	41.9	-1.0	-4.4	10.1	3.8	-2.4	9.6	0.3	1.2
Old men	5.0	1.5	-1.0	27.6	-1.7	-0.1	5.4	-3.4 ⁺	-3.1 ⁺	1.5	1.5	2.5 ⁺
Young women	26.7	-7.6	-12.3**	45.2	-5.8	-7.5*	14.0	3.5	-2.4	16.9	-8.2 ⁺	0.3
Middle women	3.7	-1.3	-0.8	24.2	2.1	-2.2	4.0	-0.6	-0.9	6.6	-2.4	-2.8
Old women	0.9	1.6	0.2	12.1	0.1	-1.2	5.5	-3.5 ⁺	-4.9**	0.2	1.4	1.3
Extrinsic problems												
All	8.9	-2.8*	-1.7	16.3	-1.0	-0.6	9.1	-3.1**	-1.9 ⁺	6.3	-0.4	1.3
Men	12.6	-2.7	-1.7	20.9	-2.0	0.2	10.8	-3.3 ⁺	-1.6	7.0	2.2	3.9*
Women	5.3	-3.2*	-1.6	11.5	-0.1	-1.2	7.4	-3.0*	-2.3 ⁺	5.6	-3.1*	-1.5
Young, 16-29 yr.	25.3	-6.4 ⁺	-3.6	34.4	-1.8	-4.6 ⁺	26.6	-9.9**	-5.0	20.5	-1.0	3.0
Middle, 30-49 yr.	5.5	-2.5	-1.6	12.8	0.1	0.2	3.6	0.6	-1.0	4.4	-2.1 ⁺	0.2
Old, 50-69 yr.	1.2	-0.3	0.6	6.0	-0.2	2.2*	1.7	-1.4 ⁺	-0.3	0.2	0.9	0.9
Young men	32.6	-4.6	-0.3	41.4	-5.6	-6.5 ⁺	30.2	-10.2 ⁺	-3.1	23.4	5.5	11.0*
Middle men	8.5	-3.3	-2.8	19.0	0.5	0.5	5.2	0.3	-2.0	4.4	-1.1	1.5
Old men	1.9	-0.1	0.5	8.8	0.0	4.3*	0.7	-0.4	1.3	0.3	1.4	1.4
Young women	17.4	-9.7*	-6.7*	28.2	1.9	-3.2	22.6	-9.6*	-6.9	17.1	-8.8 ⁺	-5.6
Middle women	2.5	-1.6	-0.4	6.6	-0.6	0.4	1.9	0.7	-0.1	4.4	-3.2 ⁺	-1.2
Old women	0.6	-0.6	0.6	2.5	-0.7	0.2	2.6	-2.3	-1.8	0.0	0.4	0.4

Notes: To test for significant changes, prevalence of 2+ problem scores are regressed on short- and long-term effects (adjusted for age, gender [if not separate model by gender], and income). Short = short-term change (prevalence 2004 – prevalence 2003); long = long-term change [(prevalence 2005 + prevalence 2006) / 2 – prevalence 2003]; yr. = year.

⁺ $p < .10$; * $p < .05$; ** $p < .01$.

TABLE 5. Relative short- and long-term changes in 2+ dependency symptoms and extrinsic problems scores in Denmark, Finland, and southern Sweden in comparison to northern Sweden

Variable	Denmark vs. northern Sweden				Finland vs. northern Sweden				Southern Sweden vs. northern Sweden			
	Dependency symptoms		Extrinsic problems		Dependency symptoms		Extrinsic problems		Dependency symptoms		Extrinsic problems	
	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long
All		↘		(↘)		↘						↘
Men		(↘)		↘		↘		↘				↘
Women							↗					
Young		↘				(↘)						↘
Middle												(↘)
Old		↘			(↘)	↘			↘	↘		↘
Young men								↘				↘
Middle men												(↘)
Old men		(↘)				(↘)			↘	↘		
Young women		↘					(↗)		(↗)	↘		
Middle women												(↗)
Old women									(↘)	↘		

Notes: To test differential short- and long-term changes for significance, the prevalence of 2+ problem scores are regressed on short- and long-term effects, regions (dummy coded, reference = northern Sweden), and the interaction terms between region and short-/long-term effect (adjusted for age, gender [if not separate model by gender, and income), a significant interaction term indicating a significant differential change. Symbol ↗ = relative increase in comparison with northern Sweden; symbol ↘ = relative decrease in comparison with northern Sweden; symbols ↗ ↘ = change at $p < .05$ (significance of interaction term between dummy coded regions and short- and long-term effects, respectively); symbols (↗) (↘) = change at $p < .10$.

are seen more among the older samples, especially among older women, whereas younger samples show increases in the long term, especially young men. Prevalence decreases are seen mainly for extrinsic problems, with more obvious changes among the young and young women.

Less decrease in problem prevalence is seen in northern Sweden than in the other regions. The main tendency is for increases in prevalence, with dependence symptoms increasing among the older samples and the prevalence of extrinsic problems increasing among the young and younger men.

Table 5 shows the direction of significant relative short- and long-term changes in problem scores for Denmark, Finland, and southern Sweden, in comparison with northern Sweden. The table is based on binary logistic analyses regressing the prevalence of 2+ problem scores on the region (dummy coded, reference = northern Sweden), short- and long-term effects, and the interaction between region and short- and long-term effects (adjusted for age, sex [if not separate model by sex], and income). Only the significance level of the interaction terms and its interpretation (as relative increase/decrease) are presented to ease interpretation (model estimates are available from the authors).

In comparison with the control region of northern Sweden, statistically significant long-term decreases in the prevalence of 2+ dependence symptoms are evident in Denmark for the total sample, the young and older subgroups, and younger women. The prevalence of extrinsic problems also decreased significantly among men. In Finland, mainly long-term decreases in dependence symptoms prevalence are seen for the total sample, men, and the older subgroups.

For extrinsic problems, men, as well as younger men, show decreases, but a short-term increase is detected for women. In relation to northern Sweden, southern Sweden shows a predominance of both short- and long-term decreases for the prevalence of dependence symptoms and extrinsic problems. These are significant among the older and older-male samples for dependence symptoms, as well as among older women for long-term changes. Men showed both short- and long-term decreases for extrinsic problems, whereas the young, the old, and younger men experienced short-term decreases.

Discussion

This article has reported the prevalence of self-reported alcohol-related problems in successive representative samples of the Danish, Finnish, and Swedish general population from 2003 through 2006. This research was conducted to examine possible prevalence changes relative to major alcohol policy changes implemented in late 2003 and early 2004. The main finding is that the prevalence of two alcohol-problems measures decreased in relation to the control site of northern Sweden over the study period, especially regarding long-term changes. Only in selected subgroups did the prevalence of problems increase. A statistically significant relative increase (short-term) was seen only among Finnish women for extrinsic problems.

The general finding of decreasing prevalence of self-reported problems in the total samples for these countries is in line with the findings on changes in self-reported consump-

tion in Denmark (Grittner et al., 2009), Finland (Mäkelä et al., 2008), and Sweden (Gustafsson, in press) where there were no increases in self-reported alcohol consumption after the main policy changes were found. The original hypothesis of this research was that the recent alcohol policy changes should have led to increases in consumption in Denmark, Finland, and the southern region of Sweden. We used northern Sweden as our control site, as did Mäkelä et al. (2008) and Gustafsson (in press). Contrary to alcohol availability theory, however, northern Sweden (control site) was the only area demonstrating increases in problem prevalence.

Our investigation examined all four waves of data collection, whereas Mäkelä et al. (2008) considered only short-term changes from 2003 to 2004. A new result that we find for Finland, in particular, is the emergence of increases in social and financial problems among older male respondents in the long-term. This finding is only evident as a within-country change, however, and does not hold when compared with our control site of northern Sweden.

Post hoc explanations can be put forward for these surprising findings on self-reported alcohol problems and alcohol consumption. One possibility is that the study is simply counterevidence for the economic model of the effects of taxes and “full price” on alcohol consumption and, thus, on alcohol problems. This possibility must be weighed against possible competing explanations. One such line of explanation focuses on concurrent secular changes in the societies studied. Northern Sweden has long had lower levels of alcohol consumption than the rest of Sweden, and the increases found there, coming after a general rise in Swedish consumption (Boman et al., 2007), can be interpreted in terms of “catching up” and convergence. On the other hand, economic theories on changes in availability have an implicit “*ceteris paribus*” clause—other factors also affect consumption and problem rates, and societies seem to have self-correcting tendencies when consumption and problems rise to certain levels (Room et al., 2009). The latter line of explanation, essentially that “*ceteris*” is not “*paribus*,” might apply particularly to southern Sweden and Denmark. Taken together, these explanatory lines might apply to the findings everywhere but in Finland, where the results from social and health statistics cannot easily be made to fit.

Another explanation is one of characteristics or deficiencies of the study data. A potential factor in the lack of significant results is that the sample sizes in this study are not very large for measuring changes in such relatively rare phenomena as alcohol problems, and the present study may be somewhat lacking in power. It must be noted, however, that where the findings are significant, they are primarily in the direction opposite to that hypothesized. A further limitation of our study is the low response rate in all countries, especially in Denmark and Sweden, where telephone surveys were employed. It has become well known that willingness to cooperate in general population surveys is declining and

telephone surveys have been especially affected (Curtin et al., 2005; Keeter et al., 2006). This could have led to an underrepresentation of those who might have suffered increased alcohol problems in response to the policy changes. We do not have sufficient information on survey nonresponders to determine which segments are underrepresented in our samples, unfortunately. The general findings from studies comparing problem rates in survey respondents to nonrespondents is that people who are harder to interview do have higher rates of heavy drinking and problems, although not very much higher (e.g., Armor et al., 1978; Gmel and Rehm, 2004).

This line of thinking leads to the closely related issue of lack of concordance between the findings from self-report survey data and findings from social and health registries. In Finland, in particular, it is clear that there is a divergence between the survey data on trends in alcohol consumption and the alcohol sales data, which clearly showed increases (Mustonen et al., 2007a). With regard to reported alcohol-related problems, there is also a divergence in the Finnish results. A series of analyses, referenced earlier in this article (e.g., Koski et al., 2007), has shown increases in drinking problems in the study period, as recorded in health or police registers. As with the consumption divergence, this may indicate problems in using self-report data to measure trends.

With respect to alcohol problems, however, there is another possibility. Comparisons of alcohol problems as measured in the general population and in “captured” populations—hospitalized, arrested, or in treatment—have shown strong divergences that have been discussed in terms of “two worlds of alcohol problems” (Storbjörk and Room, 2008, p. 68). The populations with alcohol problems known to social agencies are the substantially marginalized and socially excluded, whereas respondents in general populations surveys, even those who report alcohol problems, are usually quite integrated in the worlds of work, family, and living accommodations. This discrepancy can be a substantive finding in itself: the primary effect of these increases in availability, at least in the short and medium term in Finland, may have been on marginalized heavy drinkers (Herttua et al., 2008). There is indication that this may also be the case in a limited way in Denmark where, as mentioned earlier, underage youngsters have experienced an increase in alcohol poisoning hospitalizations (Bloomfield et al., 2009). Testing this hypothesis for the Swedish data and for other indicators in Denmark, as well as testing the plausibility of the other lines of explanation for all study countries, is the subject of further analyses.

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