Is there a link between per capita alcohol consumption and youth drinking? A time–series analysis for Sweden in 1972–2012

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ABSTRACT

Aims   To estimate the relationship between per capita alcohol consumption and youth drinking in Sweden during the last 40 years and to estimate the relationship between female and male youth drinking during the 40-year study period. **Design, setting, participants and measurements**   Per capita alcohol consumption was proxied by official sales data, supplemented by data on unrecorded consumption. Youth consumption was measured by a question on heavy episodic drinking (HED) included in an annual school survey of alcohol and drug habits among Swedish 9th -grade students (15–16 years of age). The annual samples comprise approximately 5000 individuals (with roughly equal numbers of boys and girls) with response rates in the range 80–93%. The study spans the period 1972–2012. Autoregressive integrated moving average (ARIMA) time–series analysis was used to estimate the relation between per-capita alcohol consumption and youth drinking. Ocular inspection of the time–series data suggested a stronger synchronization between the two series in the early period, before the mid-1990s, than in the later period, indicating a structural shift in the relation at issue. We therefore conducted period specific time–series analyses with 1995 as the year of division. **Results**   There was a statistically significant relation between per capita alcohol consumption and HED among youth for 1972–94. A 1% increase in per capita alcohol consumption was associated with an increase in HED of 1.52% ($P = 0.008$). The estimate for 1995–2012 (0.12) was well below statistical significance ($P = 0.580$). The estimated elasticity of the association between boys' and girls' HED during 1972–94 was close to unity (0.98, $P < 0.001$), suggesting proportional changes in boys' and girls' drinking. When controlling for per capita consumption, the association was halved (to 0.55) but still significant in table 3 ($P = 0.045$). **Conclusions**   Adult and youth drinking in Sweden were synchronized closely during the two last decades of the 20th century, but youth drinking developed an independent trajectory shortly before 2000.

Keywords   Alcohol, collectivity of drinking cultures, population drinking, Sweden, time–series analysis, youth.

INTRODUCTION

Alcohol use among adolescents, and heavy episodic drinking in particular, is associated with several short-term negative consequences (such as injuries and violence) as well as long-term effects, including greater risk of alcohol dependency and psychopathology in adulthood [1]. Against this backdrop, the fairly extensive research that aims at uncovering causal factors behind adolescent drinking seems highly justified. Almost all this research addresses individual-level factors, such as impulsivity, parental monitoring, peer influences, etc. It is, of course, urgent to

identify characteristics that put certain individuals at an elevated risk of problem drinking in adolescence, but it seems equally important to identify societal factors that affect the *prevalence* of youth drinking. In this paper we will focus upon the influence of total consumption in society. More specifically, we will use Swedish time–series data to assess the association between per-capita alcohol consumption and drinking among 9th-grade boys and girls during the last four decades. In addition, we will address the relation between trends in male and female youth drinking.

Two alternative hypotheses may be advanced with regard to the association between per-capita consumption

and youth drinking. The first takes its point of departure in various mechanisms that have a synchronizing effect on drinking behaviour. An obvious set of such mechanisms comprises societal and policy-related environmental factors, including alcohol prices and availability, which affect youth drinking as well as adult consumption. Another kind of synchronizing mechanism is portrayed in the theory of the collectivity of drinking cultures, as developed by Skog [2]. This theory proposes that drinking is a social behaviour where each individual's drinking is influenced by the drinking habits of his/her network. Because each drinker is connected to large segments of society indirectly through friends of friends, Skog's theory predicts that changes in alcohol consumption is synchronized across all consumption categories, from light to heavy drinkers. The consequence would be that the whole population moves up and down the consumption scale when per-capita consumption changes [2]. We may therefore expect that adolescent drinking also moves in concert with drinking of the adult population. Plausible mechanisms behind this include adults as role models [3–5]. The alternative hypothesis departs from the notion that youth culture is a genuinely independent subculture which develops more or less independently of prevailing norms and customs of the society [6]. Following this line of thought, we would not expect any association between adult consumption and youth drinking. The findings reported by Fuhr & Gmel [7] are consistent with the first hypothesis: using data for 68 countries they found a positive and strongly significant cross-cultural correlation between recorded adult alcohol per-capita consumption and adolescent drinking. Similarly, on the basis of data for 11 countries, Bjarnason *et al.* found that national beer sales were associated with adolescent alcohol use [8]. Further, drawing upon data for Ireland, Smyth *et al.* [9] reported a negative correlation between per-capita alcohol consumption and the median age at which each birth cohort made their drinking debut. A recent study based on aggregate analyses of US state-level data [10] found a positive and statistically significant association between adult and youth binge drinking. The evidence for Sweden is scattered and contradictory. Svensson & Landberg [11] found a positive association between per-capita alcohol consumption and youth drinking during the three-decade period prior to 2000, whereas Norström & Svensson [12] report a marked decrease in youth drinking during a period (2000–12) when per-capita consumption increased. Similar findings have been reported for Norway since 1995 [13]. It seems clear that the literature addressing the link between per-capita consumption and youth drinking is scarce and inconclusive, and often relies upon cross-sectional data with well-known limitations for drawing causal inferences. The main aim of this paper is to assess the relationship at issue by employing adequate statistical tools on unique Swedish time–series data on youth drinking collected annually in a consistent manner during the last 40 years.

A second aim of our paper is to assess to what degree trends in female and male youth drinking are synchronized during the 40-year study period. This will provide an additional test of the collectivity of drinking theory. The synchronizing mechanism of social interaction is not obvious in this context, however; adolescent friendships are predominantly gender homophilic [14,15], and thus most of the peer influence on drinking is within-sex [16]. However, dating and romantic relationships provide a bridge for cross-gender influences that may be enhanced by network effects through mutual influences between a person's and his/her partner's friends' drinking [17]. Other mechanisms that should synchronize trends in female and male youth drinking are, of course, societal factors that affect drinking in both genders, such as availability of alcohol. While some studies explore trends in female and male youth drinking in a descriptive way (e.g. [18,19]), no investigations have analysed the relation between the two more systematically.

METHODS

Youth heavy episodic drinking

The data on youth drinking stem from national surveys on youth alcohol consumption conducted by the Swedish Council for Information on Alcohol and other Drugs (CAN) on an annual basis since 1972. The survey is an anonymous paper-and-pen questionnaire completed in the classroom during March–April each year. The annual samples comprise approximately 5000 individuals (with roughly equal numbers of boys and girls) representative of Swedish 9th-grade students (aged 15–16 years). The sampling was accomplished by Statistics Sweden and includes two steps. In the first step, a random sample of 300 schools is selected. In order to avoid oversampling of small schools, a probability proportional-to-size sampling design (PPS) is applied where a school's inclusion probability is proportional to its number of 9th-grade students. A new cluster of schools is sampled each year. In the second step, one 9th-grade class is selected randomly in each of the sampled schools, using a PPS sampling procedure with class size as argument. The response rates are in the range 80–93% [20,21].

Heavy episodic drinking (HED) was measured by the question: 'How often do you drink alcohol corresponding to at least half a bottle of spirits or one bottle of wine or four large bottles of strong cider or four cans of strong beer during one drinking session?'. The response categories were 'some times per week', 'some times per month', 'about once

a month', 'a few times per year', 'more seldom' and 'never' (source: [20,21]). Our outcome measure was the percentage who responded 'about once a month' or more often.

Per-capita alcohol consumption

In population-level research, sales data are used typically as proxy for per-capita alcohol consumption. An obvious complication of this approach is the presence of unrecorded consumption, in particular if the latter varies greatly over time. According to Leifman's analyses, unrecorded consumption was fairly stable in Sweden during our study period until the mid-1990s [22]. However, this does not hold true after Sweden's entrance into the European Union (EU) (1995), because this implied that the quotas for private import of alcoholic beverages were gradually dismantled. Available data [23,24] thus indicate that after 1994 the fraction of total consumption that is unrecorded has varied considerably. For the period 1972–94 we thus used sales data from the Swedish alcohol monopoly (source: [25]) as proxy for per-capita alcohol consumption (litres 100% alcohol per inhabitant aged 15 years and above). However, for the period 1995–2012 we used a consumption proxy that is based on sales data as well as survey estimates of unrecorded consumption (source: [23,24]; missing data for unrecorded consumption for 1999 was imputed through linear interpolation). The estimate of unrecorded consumption was derived from survey questions of private import of spirits, wine and beer and home production of wine and beer. The quantities imported or home-produced during the last 30 days were aggregated into an annual measure. Previous research suggests that this is a reliable indicator of changes in population drinking [26], and outperforms sales data when accounting for trends in harm rates [27].

Although our main focus is on the impact of total alcohol consumption on youth drinking, we also analysed beverage-specific models where the effects of per-capita beer, wine and spirits consumption on youth drinking were estimated.

Statistical analysis

We estimated the association between per-capita alcohol consumption and youth drinking by using autoregressive integrated moving average (ARIMA) modelling [28]. As can be seen in Fig. 1, the time–series trend strongly. This requires some form of filtering or detrending to achieve the stationarity required for ARIMA modelling. As shown in Fig. 2 a simple differencing was sufficient to remove non-stationary trends; that is, rather than using raw series, we analysed the yearly changes. [Autocorrelations, partial autocorrelations, and Box–Ljung *Q*-statistics, pertaining to the differenced series, are shown in Table 1; these statistics indicate that all series are white noise after differencing.]
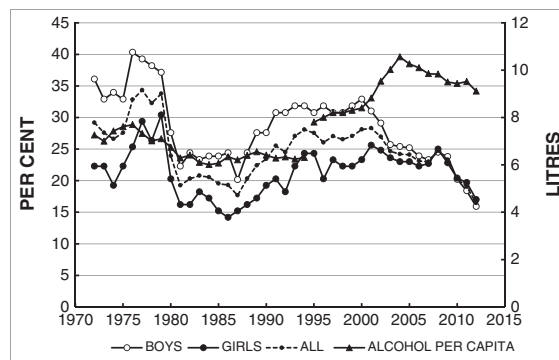

Figure 1 Trends in per-capita alcohol consumption (sales data 1972–94 and sales + unrecorded 1995–2012) and adolescent heavy episodic drinking among boys, girls and all participants

Figure 2 Annual changes in per-capita alcohol consumption (sales data 1972–94 and sales + unrecorded 1995–2012) and adolescent heavy episodic drinking among boys, girls and all participants. Differenced data
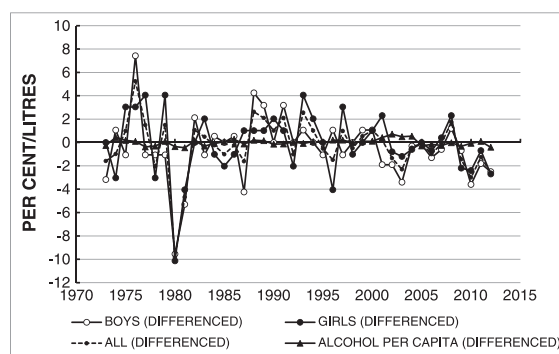
Differencing greatly reduces the risk of obtaining spurious correlations, because an omitted variable is more likely to be correlated with the explanatory variable as a result of common trends rather than as a result of synchronization in the yearly changes. Further, the noise (error) term, which includes explanatory variables not considered in the model, is allowed to have a temporal structure that is modelled and estimated in terms of autoregressive (AR) or moving average (MA) parameters. The model specification is indicated by: (order of autoregressive parameters, order of differencing, order of moving average parameters). That is, a model based on first-order differencing and including an MA-parameter of order 1 is indicated as: (0,1,1).The error term structure was specified on the basis of the autocorrelation function of the residuals from a model including no AR- or MA-parameters. Typically, the residuals from these models had a spike at lag 1, which suggested (0,1,1). This applies to models 1A,B, D–F (in Table 1) and 2A,B (in Table 2). The residuals from model 1C also displayed a spike at lag 3 when no noise parameters were included, which made us specify (0,1,3). The residuals from model 2C were already white noise when no

Table 1 Time–series statistics for alcohol consumption per capita (ACP) and adolescent heavy episodic drinking (HED).

Series	Lag	AC	PAC	Q	P
ACP	1	0.25	0.26	2.65	0.10
	2	0.14	0.07	3.46	0.18
	3	0.07	0.02	3.66	0.30
	4	−0.03	−0.06	3.70	0.45
	5	−0.10	−0.09	4.16	0.53
HED, boys	1	0.12	0.12	0.62	0.43
	2	0.04	0.02	0.68	0.71
	3	0.00	−0.01	0.68	0.88
	4	−0.27	−0.29	3.98	0.41
	5	−0.14	−0.05	4.88	0.43
HED, girls	1	−0.06	−0.06	0.14	0.71
	2	0.01	0.00	0.14	0.93
	3	−0.19	−0.20	1.81	0.61
	4	0.07	0.05	2.04	0.73
	5	−0.24	−0.27	4.89	0.43
HED, all	1	0.21	0.22	1.95	0.16
	2	−0.04	−0.09	2.02	0.36
	3	−0.04	−0.01	2.11	0.55
	4	−0.27	−0.29	5.43	0.25
	5	−0.12	−0.02	6.07	0.30

All series are differenced. AC = autocorrelation; PAC = partial autocorrelation; Q = Box–Ljung statistics. P = P-value for Q.

noise parameters were included. The model residuals from the final model should not differ from white noise; this was tested with the Box–Ljung Q-statistics. For further methodological assumptions regarding this type of analysis, see Norström & Skog [29].

The functional form of the relation between youth drinking and per-capita consumption is not obvious. We thus chose a log–log specification that can accommodate linear, as well as accelerating and decelerating functions; the ensuing effect parameter is also easy to interpret. The general form of the model is:

$$\nabla LnY_t = a + e\nabla LnA_t + \nabla N_t, \qquad (1)$$

where Y is youth drinking, A denotes per-capita alcohol consumption and e is the effect parameter (the elasticity) to be estimated. The elasticity expresses the expected

percentage change in Y, given a 1% increase in A. N is the noise term that includes other causes of Y not included in the model. The operator ∇ denotes that the series are differenced.

We also assessed to what degree trends and shifts in youth drinking can be accounted for. This was accomplished by comparing the observed rate of youth drinking with that predicted according to:

$$PredY_t = cA_t^{\hat{e}}, \qquad (2)$$

where *PredY* is predicted youth drinking, A is per-capita alcohol consumption, $\hat{e}$ is the estimated elasticity and c is a constant to equalize the levels of observed and predicted youth drinking.

Ocular inspection of the data suggested a structural shift in the association between per-capita alcohol consumption and youth drinking. The fairly close synchronization between the two phenomena visible at the beginning of the study period was not present after the mid-1990s. On this premise, we estimated period-specific models, one for 1972–94 and another for 1995–2012. There were two additional rationales for choosing 1995 as a cutting point: (i) this is when Sweden joined the EU, which implied a liberalization of Swedish alcohol policies with the potential effect of an increased availability of alcohol for young people; (ii) as noted above, we used two different (and not directly comparable) consumption proxies for the two subperiods.

With regard to the association between trends in female and male drinking, its direction cannot be assessed from the time–series data proper, but must be determined on the basis of external information. Available evidence suggests that the cross-gender influence on drinking appears to be non-mutual: boys influence girls, while girls do not influence boys [16,30]. The relation between boys' and girls' HED was estimated by the log–log model:

$$\nabla LnHEDG_t = a + e\nabla LnHEDB_t + \nabla N_t, \qquad (3)$$

where *HEDG* is heavy drinking among girls and *HEDB* signifies boys' heavy drinking. However, the elasticity estimate from this model will, in all probability, also be influenced by common factors affecting boys' and girls' drinking. One

Table 2 Estimated effect [autoregressive integrated moving average (ARIMA) models] of per capita alcohol consumption on adolescent heavy episodic drinking. Log–log models estimated on differenced time–series data 1972–94 and 1995–2012 (statistics of residuals shown in Table 4).

	All					Boys					Girls				
	Model*	No.	Est	SE	P	Model*		Est	SE	P	Model*		Est	SE	p
1972–94	(0,1,1)	1A	1.52	0.57	0.008	(0,1,1)	1B	2.31	0.60	<.001	(0,1,3)	1C	1.25	0.59	0.034
1995–2012	(0,1,1)	1D	0.12	0.22	0.580	(0,1,1)	1E	−0.33	0.62	0.590	(0,1,1)	1F	0.84	0.90	0.349

*Model specification indicated by (order of autoregressive parameters, order of differencing, order of moving average parameters). SE = standard error.

way to mitigate this problem is to use the residuals from gender-specific estimations of model 1. These series will indicate boys' and girls' drinking purged of the influence of a supposedly major common factor; that is, the general level of drinking in society.

All statistical analyses were performed with Stata, version 13 (StataCorp, College Station, TX, USA).

RESULTS

Fig. 1 shows the trends in adolescent heavy episodic drinking (HED) and per-capita alcohol consumption during the study period. Between 1974 and 1978 HED increased markedly, both for boys and girls. This was followed by a period lasting until the mid-1980s with declining youth drinking. HED increased during the 1990s, but then started to decline again. For boys the decline started in 2002, while for girls there was a small decline between 2000 and 2006, followed by an increase and then again a sharp decline. The lowest rate for 9th-grade boys was recorded in 2012, when only 16% reported HED once a month or more often.

Per-capita alcohol consumption increased in the mid-1970s, peaked in 1976, and then gradually declined until 1984, followed by a somewhat stable period that ended in the mid-1990s. During this period the recorded per-capita alcohol consumption was approximately 6 litres of pure alcohol. This period was followed by a fairly steep increase in consumption; between 1995 and 2004 per-capita consumption increased by roughly 30%. Since 2005 per-capita alcohol consumption has declined steadily and in 2012 was approximately 14% lower than in 2004.

As hinted above, and as appears from Fig. 1, there was a fairly close match between trends in per-capita consumption and youth drinking during the first part of the study period, but by the mid-1990s the trends began to diverge.

The results from the ARIMA modelling are presented in Table 2. The estimated relationships between per-capita alcohol consumption and adolescent heavy episodic drinking were statistically significant for 1972–94, suggesting that a 1% increase in population drinking was associated with an overall increase in HED of 1.52% ($P = 0.008$). The difference between the gender-specific estimates [2.31% ($P < 0.001$) for boys and 1.25% ($P = 0.034$) for girls] is not statistically significant (*t*-value = 1.26, $P > 0.05$). The estimates for 1995–2012 were well below statistical significance. We also estimated beverage-specific effects on youth drinking. Although none of the individual estimates were statistically significant for any of the two time-periods, a combined measure of beer and spirits was significant for the early period, but not the latter. For all (boys and girls), we obtained an estimated elasticity of 1.94 [standard error (SE) = 0.42, $P < 0.001$]. The corresponding numbers for

boys were 1.79 (SE = 0.73, $P = 0.015$) and for girls 1.29 (SE = 0.65, $P = 0.048$). This outcome is compatible with the fact that beer and spirits are the most (and wine the least) preferred alcoholic beverages in this age group according to the school surveys [21].

On the basis of the elasticity estimate from model 1A displayed in Table 2 ($e = 1.52$), we computed the trajectory in youth drinking expected from the development in population drinking (applying formula 2). The outcome (Fig. 3) suggests that population drinking had a strong explanatory power during the first half of the study period, but not during the latter; the correlation between predicted and observed youth drinking was 0.76 ($P < 0.001$) during the first subperiod and −0.41 ($P = 0.09$) during the latter.

The estimated elasticity of the association between female and male HED during 1972–94 (Table 3, model 2A) was close to unity (0.98), suggesting proportional changes in boys' and girls' drinking. However, when we controlled for a common determinant (per-capita consumption) by using the residuals from the gender-specific models for 1972–94 in Table 2, the magnitude of the association was halved (Table 3, model 2C), but still remained statistically significant. For 1995–2012 (Table 3, model 2B) the elasticity was markedly lower (0.65), although not significantly different from the estimate for 1972–94 (*t*-value for difference = 1.22, $P > 0.05$). As per-capita consumption was not associated with youth drinking after 1994, it was not meaningful to control for this factor.

Autocorrelations, partial autocorrelations and Box–Ljung *Q*-statistics, pertaining to the model residuals, are shown in Table 4. These statistics indicate that the residuals from all models were satisfactory; that is, not different than white noise.

DISCUSSION

The outcome from the model estimations as well as the increasing divergence between observed and predicted youth
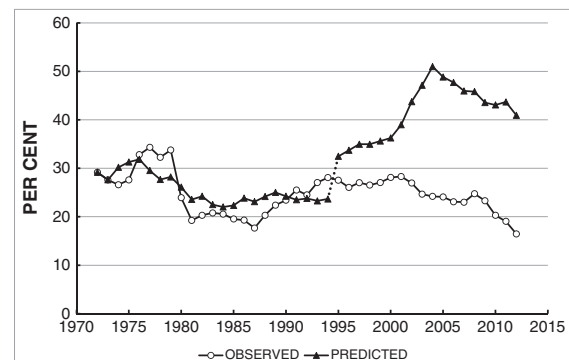
Figure 3 Observed and predicted trends in adolescent heavy episodic drinking

Table 3 Estimated effect [autoregressive integrated moving average (ARIMA) models] of boys' heavy episodic drinking on girls' heavy episodic drinking; log–log models estimated on differenced time–series data 1972–94 and 1995–2012. In model 2C the series are purged of the effect of per capita alcohol consumption (statistics of residuals shown in Table 4).

	No.	Model*	Elasticity	SE	P
1972–94	2A	(0,1,1)	0.98	0.13	<0.001
1995–2012	2B	(0,1,1)	0.65	0.24	0.006
1972–94	2C	(0,0,0)	0.55	0.27	0.045

*Model specification indicated by (order of autoregressive parameters, order of differencing, order of moving average parameters). SE = standard error.

drinking strongly suggest a structural shift in the association between total alcohol consumption and youth drinking in Sweden. After being tightly synchronized with trends and shifts in adult alcohol consumption during the first part of the study period, youth drinking took its own trajectory some years before the millennium shift. The findings thus give some support to both of the two alternative hypotheses that we suggested concerning the relation between total alcohol consumption and youth drinking. It is interesting that more detailed analyses of youth drinking (Swedish 15-year-olds) between 2000 and 2012 suggest a collectivity of drinking within this segment of the population. That is, during this period both alcohol consumption (volume) and heavy episodic drinking decreased in all drinking groups, from light to heavy (top 5%) young drinkers. Some previous Swedish studies imply departures from what should be expected from the collectivity of drinking theory. Thus the findings reported by Hallgren *et al.* [31] suggest a pattern of polarized drinking among Stockholm youths during 2000–10. While drinking among the great majority decreased, it increased among the heaviest drinkers. Although this observation does not seem unconceivable—it could comprise increased drinking in at-risk groups, for example, triggered by alcohol's increased accessibility—the outcome was not sustained in subsequent studies relying on a more robust analytical strategy [12,32]. Another study suggests that alcohol consumption increased more among Swedish manual labourers than among non-manual employees during the last three decades of the 20th century. A plausible explanation of this shift was a great equalization in real income among social classes during the study period [33]. Yet another study addressed the abolition of the rationing system in Sweden in 1955. Accompanied by markedly increased alcohol prices, this reform implied an increased cost of drinking for light consumers and a lowered cost for heavy drinkers, who had previously had to resort to the expensive black market to obtain alcohol in excess of the moderate rations. The reform thus resulted in a substantial redistribution of consumption [34]. All these exceptions from collectivity in

Table 4 Time–series statistics for residuals from models shown in Tables 2 and 3.

Model no.	Lag	AC	PAC	Q	P
1A	1	0.01	0.01	0.00	0.97
	2	−0.07	−0.08	0.14	0.93
	3	−0.28	−0.32	2.29	0.52
	4	−0.27	−0.33	4.43	0.35
	5	0.08	0.06	4.65	0.46
1B	1	−0.01	−0.01	0.00	0.98
	2	−0.11	−0.12	0.34	0.84
	3	−0.28	−0.32	2.58	0.46
	4	−0.43	−0.58	7.98	0.09
	5	0.20	0.18	9.18	0.10
1C	1	−0.07	−0.07	0.13	0.71
	2	0.07	0.10	0.27	0.87
	3	−0.05	−0.06	0.33	0.96
	4	0.11	0.14	0.71	0.95
	5	−0.28	−0.44	3.13	0.68
1D	1	−0.21	−0.26	0.86	0.35
	2	0.07	0.04	0.98	0.61
	3	0.14	0.25	1.43	0.70
	4	−0.05	0.21	1.49	0.83
	5	−0.23	−0.53	2.89	0.72
1E	1	0.04	0.07	0.04	0.84
	2	0.10	0.13	0.25	0.88
	3	−0.03	0.02	0.28	0.96
	4	−0.15	−0.20	0.80	0.94
	5	−0.22	−0.48	2.12	0.83
1 F	1	0.01	−0.01	0.00	0.98
	2	−0.11	−0.11	0.25	0.88
	3	0.24	0.59	1.54	0.67
	4	0.01	0.28	1.54	0.82
	5	−0.26	−0.38	3.39	0.64
2A	1	0.21	0.22	1.95	0.16
	2	−0.04	−0.09	2.02	0.36
	3	−0.04	−0.01	2.11	0.55
	4	−0.27	−0.29	5.43	0.25
	5	−0.12	−0.02	6.07	0.30
2B	1	0.12	0.12	0.62	0.43
	2	0.04	0.02	0.68	0.71
	3	0.00	−0.01	0.68	0.88
	4	−0.27	−0.29	3.98	0.41
	5	−0.14	−0.05	4.88	0.43
2C	1	−0.06	−0.06	0.14	0.71
	2	0.01	0.00	0.14	0.93
	3	−0.19	−0.20	1.81	0.61
	4	0.07	0.05	2.04	0.73
	5	−0.24	−0.27	4.89	0.43

AC = autocorrelation; PAC = partial autocorrelation; Q = Box–Ljung statistics. P = P-value for Q.

drinking are thus explainable, typically by other mechanisms being at work.

The declining trend of alcohol consumption since the turn of the millennium among Swedish youths may seem unexpected, in view of the fact that policy changes have generally been in a liberal direction [35]; for instance,

since Sweden joined the EU in 1995, all state monopolies but one, the retail sales system, have been abolished [36]. However, to counter this weakening of the Swedish alcohol control system the Swedish government allocated more than 900 million SEK for 2001–05 and more than 1.8 billion SEK for 2006–10 to strengthen prevention and treatment of alcohol-related problems at all levels in society [37]. This has spurred several prevention programmes aiming at reducing alcohol consumption primarily among youth that have proved to be efficient. Examples of these efforts include limiting alcohol availability through encouraging parents not to supply alcohol to adolescents [38], and strengthening age controls and servicing policies at on-premise outlets [39] and graduation parties [40]. Another possible explanation is the increase in internet use and computer gaming. It may be hypothesized that the alertness required by such activities makes them incompatible with drinking. However, the empirical support for this hypothesis is fragile. Although a Swedish study [41] has reported a negative association between game-playing and adolescent drinking, there are also findings that point in the opposite direction, suggesting that internet use would be a risk factor for drinking [42,43].

STRENGTHS AND LIMITATIONS

An obvious strength of our study is the access to the long data series on youth drinking based on large nationally representative samples with high response rates. Nevertheless, data on self-reported drinking have their limitations, including under-reporting [44] and over-representation of heavy consumers among non-responders [45]. However, two reviews [44,46] conclude that such data are reliable enough for most research purposes, provided that the interview situation has been organized to minimize bias. This was indeed the case; our surveys were conducted in the classroom, with a strong emphasis on the anonymity of the respondent. Further, our focus on change over time in drinking should make the issue of under-reporting less salient.

CONCLUSION

Our findings suggest that there was a close link between adult and youth drinking in Sweden during the two last decades of the 20th century, but not after the millennium shift. An obvious challenge for future research is to determine what might have caused this disconnection, and to identify factors which could explain the decline in youth drinking that has also been witnessed in several countries during the recent decade.

Declaration of interests

None.

Acknowledgements

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