



*The European Journal of Public Health*, Vol. 29, No. 4, 729–735

© The Author(s) 2019. Published by Oxford University Press on behalf of the European Public Health Association.

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs licence (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial reproduction and distribution of the work, in any medium, provided the original work is not altered or transformed in any way, and that the work is properly cited. For commercial re-use, please contact [journals.permissions@oup.com](mailto:journals.permissions@oup.com)

doi:10.1093/eurpub/ckz023 Advance Access published on 11 March 2019

# Towards explaining time trends in adolescents' alcohol use: a multilevel analysis of Swedish data from 1988 to 2011

Yunhwan Kim , Brittany E. Evans , Curt Hagquist

Centre for Research on Child and Adolescent Mental Health, Karlstad University, Karlstad, Sweden

**Correspondence:** Yunhwan Kim, Centre for Research on Child and Adolescent Mental Health, Karlstad University, 651 88 Karlstad, Sweden, Tel: +46 (54) 700 1459, Fax: +46 (54) 700 2523, e-mail: [yunhwan.kim@kau.se](mailto:yunhwan.kim@kau.se)

**Background:** Alcohol use has decreased among Swedish adolescents in the past few decades. We examined peer and parent factors (i.e. time spent with peers, time spent with parents and parental monitoring) that could contribute to explaining this trend by investigating their main effects and interaction effects with investigation years on alcohol use. We furthermore examined whether municipality-level socioeconomic conditions could contribute to explaining the trend. **Methods:** We used data from a repeated cross-sectional study that took place eight times between 1988 and 2011. The study targeted all ninth grade students (15–16 years old) in Värmland County, Sweden. Adolescents ( $N=22\ 257$ ) reported their monthly alcohol use, time spent with peers and parents and parental monitoring. Municipality-level socioeconomic conditions were based on parent education levels. **Results:** Logistic multilevel regression analyses showed that peer and parent factors and municipality-level socioeconomic conditions were associated with alcohol use among adolescents. The interaction effects between peer and parent factors and investigation years were not significant. The decreased trend in time spent with peers was associated with the decreased trend in frequency of alcohol use over time. **Conclusions:** The findings of the current study provide an indication that the decreased trend in alcohol use that has been observed in Swedish adolescents over the past few decades may be related to changes in adolescents' social interactions with peers.

## Introduction

Alcohol consumption among Swedish adolescents is currently at the lowest level since the 1970s.<sup>1</sup> Following an increase in the 1990s,<sup>2,3</sup> alcohol use has been declining, which is true for most of northern Europe<sup>4–6</sup> and the USA.<sup>7</sup> Possible explanations for this trend include changes in social relations, stricter parental attitudes, demographic changes and decreased accessibility of alcohol. This study sought to capitalize on findings from previous studies<sup>8–11</sup> and examine peer and parent factors (time spent with peers, time spent with parents and parental monitoring) and socioeconomic conditions that could be associated with the trend in alcohol use among Swedish adolescents from 1988 to 2011.

Achieving social independence is a major developmental task during adolescence. Interactions with peers gain particular significance<sup>12</sup> and adolescents begin spending more time with their peers than their parents.<sup>13</sup> During adolescence, alcohol use is often a social activity,<sup>14</sup> and involvement with peers who drink alcohol is one of the strongest predictors of alcohol use.<sup>15,16</sup> Moreover, spending more time with peers is associated with drinking more alcohol.<sup>17,18</sup>

As they spend more time with their peers, adolescents begin to spend less time with their parents.<sup>19,20</sup> Still, the parent–child relationship continues to be a key factor in their development: adolescents with supportive and involved parents are more likely to be well-adjusted.<sup>21</sup> Indeed, adolescents who spend more time with their parents may drink less alcohol.<sup>18,22</sup> Furthermore, adolescents whose parents monitor their activities more closely are less likely to drink alcohol.<sup>23</sup> Thus, parent factors such as spending time together

and monitoring seem to be associated with a lower likelihood of drinking alcohol among adolescents.

Peer and parent factors may be critical to adolescent alcohol use and were considered crucial factors driving the increase in adolescent alcohol use observed during the 1990s.<sup>2,24,25</sup> However, less is known about the more recent decrease in alcohol use. While one recent study reported that parental monitoring was not associated with this trend among Swedish adolescents,<sup>10</sup> research from Iceland and the Netherlands suggested that time spent with parents and parental monitoring were associated with the decrease in adolescent alcohol use.<sup>11,26,27</sup> A recent Australian study showed that fewer alcohol-drinking peers over time was related to the decreased trend in alcohol use among adolescents.<sup>9</sup> Overall, changes in peer and parent factors could explain the trends in adolescent alcohol use.

Previous research suggested that adolescent alcohol use might vary by socioeconomic conditions.<sup>28,29</sup> Some research showed that adolescents whose parents were more highly educated were less likely to drink alcohol.<sup>22</sup> Similarly, in addition to time spent with peers and parental monitoring, academic orientation (theoretical vs. non-theoretical) was associated with adolescent alcohol use.<sup>8</sup> The current study aimed to build upon and extend these previous findings into trend analyses.

In time trend analysis, a predictor may affect the trend by a change in its level or prevalence in the population over time, and/or a change in the strength of its association with the outcome over time.<sup>30</sup> We can assess these potential effects by observing how the trend (i.e. the change in substance use over time) is altered after including the predictor in comparison to before doing so, and by testing the interaction between the

predictor and time, respectively. In this study, we tested both main effects of our predictors and their interactions with time.

Using repeated cross-sectional data, we first illustrated adolescent alcohol use over time and for subgroups of adolescents according to gender, academic orientation, immigration background and peer and parent factors. Then, we examined whether peer and parent factors and municipality-level socioeconomic conditions were related to the trends in alcohol use among Swedish adolescents.

## Methods

### *Participants and procedure*

The study sample was obtained from the Young in Värmland study, which was conducted eight times between 1988 and 2011 among all students in the ninth grade of compulsory school (15–16 years old) in Värmland County ( $N = 23\ 167$ ). The response rates of each investigation year ranged from 83.4% to 93.7% ( $M = 88.2\%$ ). Students completed a questionnaire during regular school hours and returned it in a sealed envelope. In 1995, two of the 16 municipalities did not participate, therefore, data are missing from these municipalities for 1995. Adolescents were included in the sample for the current study if data were complete for all study variables ( $N = 22, 257$ ).

### *Measures*

#### **Alcohol use (1988–11)**

Participants first answered the question: ‘Have you ever in your life drunk beer, wine or spirits?’ If they answered ‘yes’, they answered the question: ‘During this school year, how often have you drunk strong beer (i.e. around 5% alcohol content), wine or spirits?’ We collapsed the response categories into infrequent/never-drinkers (those who answered ‘no’ to the first question or ‘never during this school year’ or ‘less than once a month’ to the second question) and frequent drinkers (those who answered that they drank ‘monthly, twice a month, once a week, twice a week, every other day or every day’).

#### **Time spent with peers (1988–2011)**

Adolescents were asked: ‘How often do you usually get together with your friends after school hours?’ We collapsed the answers into three categories: little (‘never’ and ‘less than once per week’), moderate (‘once or twice a week’ and ‘more than twice a week’) and much (‘almost every day’) time spent with peers.

#### **Time spent with parents (1988–2011)**

Adolescents were asked: ‘Do you do things outside the home with your parent(s), e.g. go to sporting events, visit relatives, take walks, etc.?’ We collapsed the answers into three categories: little (‘never’ and ‘not more than once per month’), moderate (‘one or more times per month’ and ‘about once a week’) and much (‘a few times a week or more’) time spent with parents.

#### **Parental monitoring (1988–2011)**

Adolescents were asked: ‘Do you tell your parent(s) where you are when you are away in the evenings?’ We collapsed the answers into high (‘always’ and ‘often’) and low (‘never, rarely and sometimes’) parental monitoring.

#### **Municipality-level socioeconomic conditions (1988–2011)**

The proportion of adolescents in each municipality with at least one parent who had completed at least 2 years of higher education was calculated yearly using data from Statistics Sweden. We used data for the study data collection years.

#### **Academic orientation (1995–2011)**

Students answered to which upper secondary school programme they intended to apply. We dichotomized the answers as theoretical (e.g. natural/social sciences) or non-theoretical (e.g. vocational programmes).

#### **Immigration background (1995–2011)**

Adolescents reported their parent(s)’ country of birth. They were considered to have an immigration background if one or both of their parents were born outside of Sweden.

### *Analysis*

We conducted descriptive analyses of alcohol use across the years of investigation according to gender and the peer and parent factors (1988–2011) and, for illustrative purposes, academic orientation and immigration background (1995–2011). In the main analyses, we only utilized variables with data for the entire time period (1988–2011). We conducted a series of logistic multilevel regression analyses with individuals nested in years of investigation nested in municipality, predicting the likelihood of being a frequent vs. infrequent/never-drinker. Beginning with the null model (Model I), we successively tested more complex models, comparing them using the likelihood ratio test. Model II included gender (as a covariate) and dummy variables for each year of investigation (reference: 1988). The coefficients for year of investigation in Model II served as the reference in examining whether including additional variables in subsequent models might be associated with the trend in alcohol use. In Models III–V, we included time spent with peers (III), time spent with parents (IV) and parental monitoring (V) separately and then included them simultaneously in one model to examine their combined effect (Model VI). Subsequently, we included municipality-level parent education levels (Model VII). We partitioned this factor into two components: variation between municipalities (regional component) and variation over time (longitudinal component).<sup>31</sup> For each of the Models III–V and VII, we additionally tested an interaction effect between the predictor and year of investigation. In the final model, we included all predictors together (Model VIII). We specified all models using maximum likelihood estimations in Stata v.14.<sup>32</sup> Since two municipalities did not participate in the 1995 data collection, we conducted a parallel analysis on the remaining 14 municipalities. We ran another parallel analysis in which we measured socioeconomic conditions at the school level. Results of these analyses showed the same patterns as those presented here (Supplementary appendix).

## Results

### *Descriptive analyses*

The trend in adolescent alcohol use showed that the proportion of frequent alcohol drinkers increased from 1988 until 1998 and subsequently decreased to lower levels in 2011 than in 1988 (figure 1a). This trend was similar for subgroups of adolescents based on gender, academic orientation, immigration background and the peer and parent factors (figure 1b–f). Figure 2a–c shows the proportion of adolescents in each collapsed response category across the years of investigation for each of the peer and parent factors. There was considerable variation between municipalities regarding socioeconomic conditions (figure 2d), and socioeconomic conditions improved slightly over time (figure 2e).

### *Peer and parent factors*

The results of all models are presented in table 1. The differences in odds ratios before and after including the peer and parent factors are illustrated in figure 3a–d. In order to facilitate the interpretability of

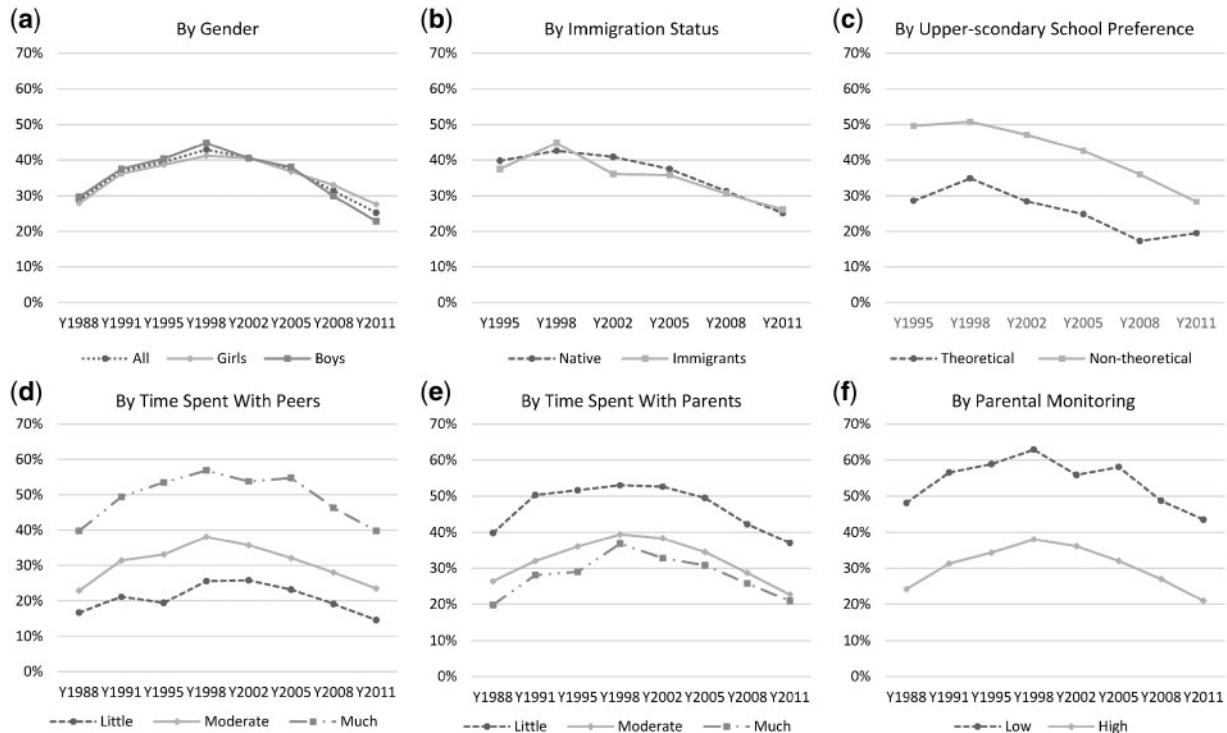


Figure 1 Time trends in the percentage of frequent alcohol users by various subgroups (a–f)

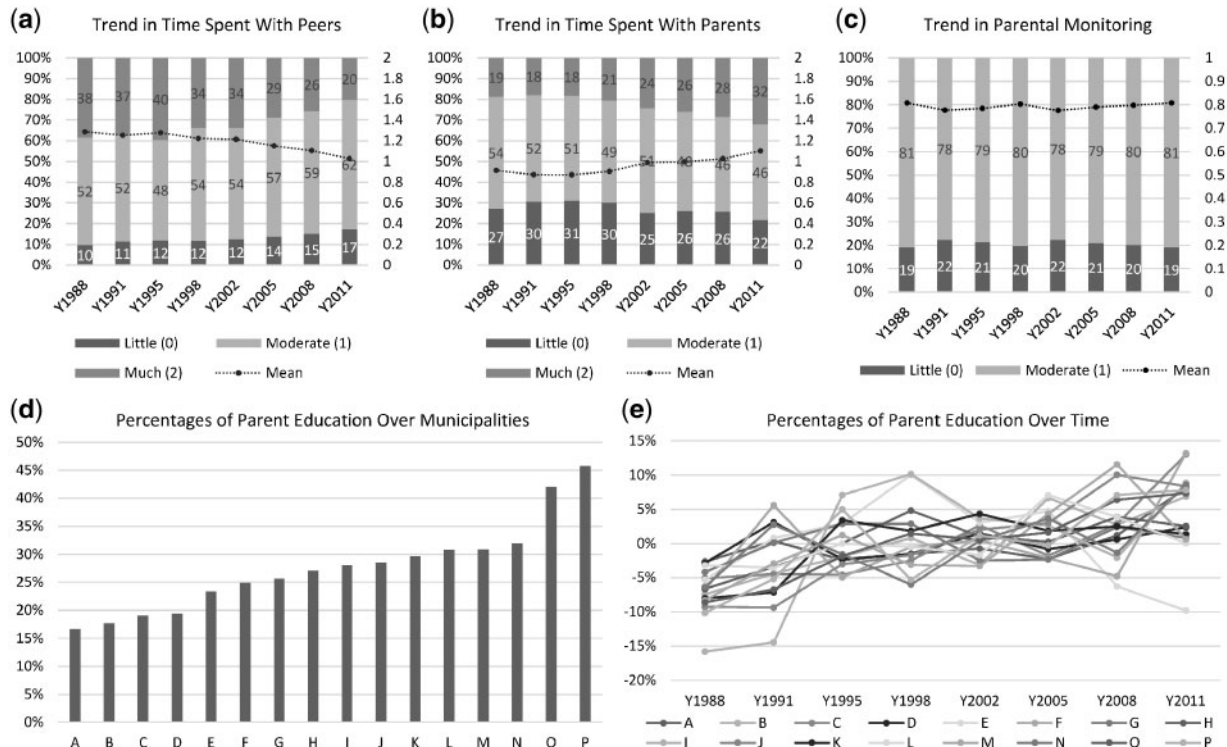


Figure 2 Descriptive statistics of all independent variables (a–e)

the findings, in figure 3e, we also converted the odds ratios into percentages of frequent alcohol users in the population (hereafter, projected percentages). Figure 3f depicts the differences in the projected percentages of frequent alcohol users before including the peer and parent factors (Model II) and after including them (Models III–VI). This illustrates the magnitude of the changes in

the alcohol use trend to which the peer and parent factors may have contributed.

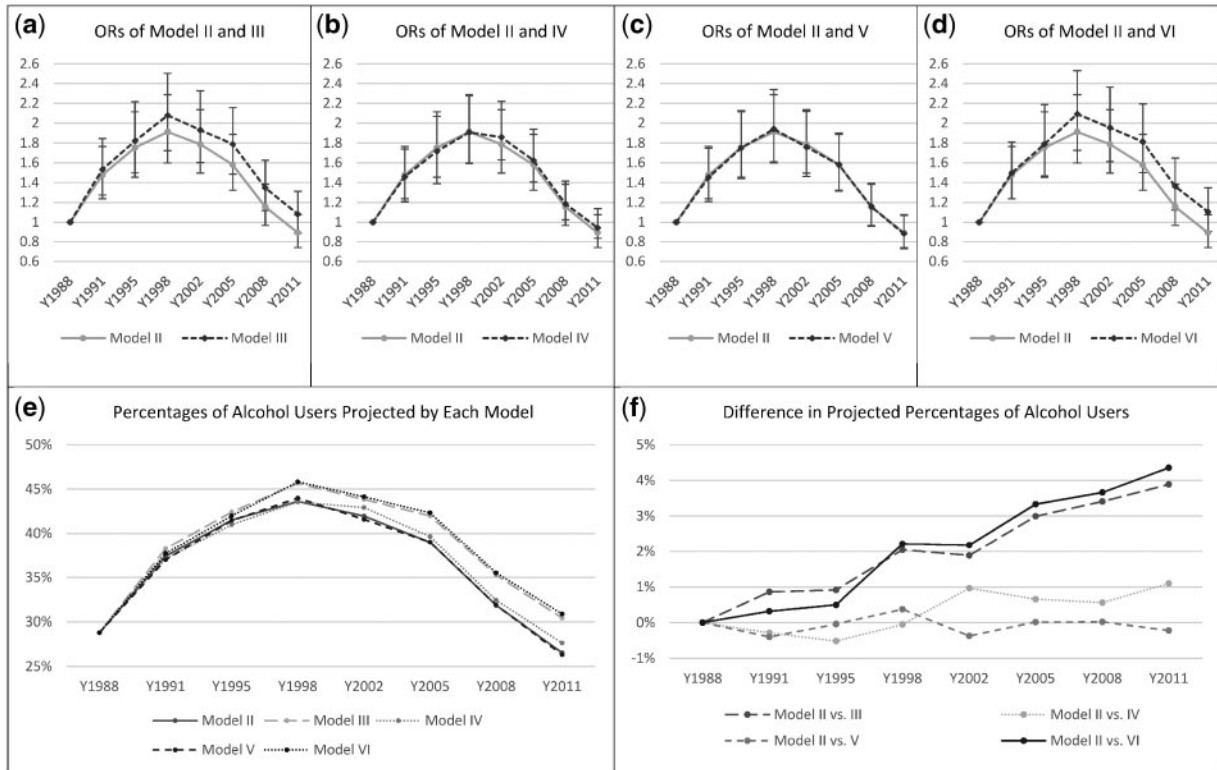
### Time spent with peers

Across the study period, adolescents who spent more time (i.e. once a week or more) compared to those who spent little time with their

Table 1 Odds ratios from logistic multilevel regression models predicting frequent alcohol use (vs. infrequent/never use)

	Model I	Model II	Model III	Model IV	Model V	Model VI	Model VII	Model VIII
Fixed effects								
Year								
1991 <sup>(Ref. 1988)</sup>		1.478 (1.237–1.764)	1.533 (1.274–1.845)	1.460 (1.225–1.740)	1.453 (1.208–1.747)	1.498 (1.239–1.811)	1.494 (1.246–1.792)	1.528 (1.258–1.855)
1995 <sup>(Ref. 1988)</sup>		1.754 (1.455–2.114)	1.821 (1.498–2.215)	1.717 (1.427–2.067)	1.751 (1.442–2.127)	1.790 (1.466–2.187)	1.790 (1.464–2.190)	1.855 (1.496–2.302)
1998 <sup>(Ref. 1988)</sup>		1.912 (1.599–2.287)	2.077 (1.722–2.505)	1.908 (1.598–2.278)	1.941 (1.611–2.338)	2.091 (1.726–2.532)	1.956 (1.608–2.380)	2.171 (1.761–2.678)
2002 <sup>(Ref. 1988)</sup>		1.787 (1.496–2.134)	1.930 (1.602–2.325)	1.859 (1.559–2.218)	1.760 (1.463–2.118)	1.953 (1.614–2.363)	1.830 (1.503–2.229)	2.034 (1.647–2.511)
2005 <sup>(Ref. 1988)</sup>		1.580 (1.323–1.887)	1.789 (1.486–2.155)	1.624 (1.363–1.937)	1.581 (1.315–1.902)	1.814 (1.500–2.193)	1.625 (1.327–1.991)	1.901 (1.530–2.361)
2008 <sup>(Ref. 1988)</sup>		1.156 (0.967–1.383)	1.347 (1.117–1.625)	1.186 (0.993–1.416)	1.157 (0.960–1.394)	1.362 (1.124–1.650)	1.197 (0.965–1.484)	1.441 (1.146–1.813)
2011 <sup>(Ref. 1988)</sup>		0.893 (0.741–1.075)	1.081 (0.890–1.312)	0.944 (0.785–1.136)	0.883 (0.728–1.070)	1.105 (0.906–1.348)	0.930 (0.737–1.175)	1.183 (0.922–1.517)
Gender								
Boy <sup>(Ref. Girl)</sup>		1.010 (0.955–1.068)	0.866 (0.807–0.907)	0.952 (0.899–1.008)	0.883 (0.834–0.936)	0.741 (0.697–0.787)	1.011 (0.956–1.069)	0.741 (0.697–0.788)
Time spent with peers								
Moderate <sup>(Ref. Little)</sup>			1.767 (1.599–1.954)			1.890 (1.706–2.094)		1.891 (1.707–2.095)
Much <sup>(Ref. Little)</sup>			4.184 (3.766–4.649)			4.110 (3.691–4.577)		4.111 (3.692–4.578)
Time spent with parents								
Moderate <sup>(Ref. Little)</sup>				0.531 (0.497–0.567)		0.635 (0.592–0.680)		0.634 (0.591–0.680)
Much <sup>(Ref. Little)</sup>				0.430 (0.397–0.467)		0.544 (0.499–0.592)		0.543 (0.499–0.592)
Parental monitoring								
High <sup>(Ref. Low)</sup>					0.355 (0.332–0.380)	0.418 (0.389–0.450)		0.418 (0.389–0.450)
Parent education								
Regional							0.979 (0.969–0.989)	0.976 (0.965–0.988)
Longitudinal							0.997 (0.985–1.009)	0.995 (0.982–1.007)
Random effects								
Intercept (municipality)	0.037 (0.012–0.107)	0.046 (0.020–0.1017)	0.062 (0.028–0.140)	0.047 (0.021–0.108)	0.045 (0.019–0.104)	0.061 (0.027–0.138)	0.018 (0.006–0.053)	0.025 (0.009–0.067)
Intercept (year)	0.118 (0.083–0.169)	0.034 (0.020–0.058)	0.039 (0.023–0.064)	0.032 (0.019–0.056)	0.038 (0.023–0.064)	0.040 (0.024–0.067)	0.034 (0.020–0.057)	0.039 (0.023–0.066)
ICC								
Municipality	0.011 (0.004–0.031)							
Year	0.045 (0.032–0.063)							
Likelihood ratio test comparison		To Model I	To Model II	To Model II	To Model II	To Model II, III, IV and V	To Model II	To Model VI and VII

**Note.** Frequent alcohol use indicates drinking one or more times per month. 95% CIs are in a parenthesis. All likelihood ratio test comparison comparisons were significant at either  $P < 0.01$  or  $P < 0.001$ . Differences between models pertain to the independent variable(s) included in each model (see Analysis section).



**Figure 3** Odds ratios of investigation years with 95% confidence intervals from Models II to VI (a–d), and percentages of frequent alcohol users converted from the odds ratios in Models II–VI (e and f)

peers were significantly more likely to drink alcohol frequently than to drink infrequently/never (Model III). The odds ratios for years of investigation in Model II (when time spent with peers was not accounted for) were lower than in Model III (when time spent with peers was accounted for). Likewise, figure 3f shows that the projected percentage of frequent alcohol users from Model II was lower than that from Model III. Thus, without accounting for the decreased time spent with peers over time, the percentage of frequent alcohol users would have been higher. In addition, throughout the entire investigation period, the difference between the projected percentages from Model II to III continuously increased over time up to about 4% in 2011, approaching the criterion of a small effect size of 7% difference in the population.<sup>33</sup>

### Time spent with parents

Across the study period, adolescents who spent moderate and much time compared with those who spent little time with their parents (i.e. less than once a month) were significantly less likely to drink alcohol frequently than to drink infrequently/never (Model IV). The odds ratios for years of investigation in Model II were slightly higher than in Model IV in 1991 and 1995, and slightly lower from 2002 to 2011. However, figure 3e and f shows that the effect of time spent with parents on the trend in alcohol use was at most 1% of difference in the projected percentage of frequent alcohol users, suggesting that the trend in time spent with parents was unrelated to that in alcohol use.

### Parental monitoring

Across the study period, adolescents who experienced high vs. low parental monitoring were significantly less likely to drink alcohol frequently than infrequently/never (Model V). The odds ratios for years of investigation in Model II were nearly the same as those in Model V (figure 3c), indicating that changes in parental monitoring

did not seem to be associated with the trend in alcohol use among adolescents. Figure 3e and f confirms this observation.

### Combined effects of peer and parent factors

The combined effects of the peer and parent factors on the trend in adolescent alcohol use (Model VI) were highly similar to that of time spent with peers (Model III). This indicates that the peer factor may have been more important for adolescent alcohol use than the parent factors.

### Municipality-level socioeconomic conditions

We observed a significant effect of the regional component of municipality-level socioeconomic conditions on adolescent alcohol use; adolescents who lived in areas with a higher proportion of higher-educated parents were less likely to drink alcohol frequently (compared with infrequently/never). The effect of the longitudinal component of municipality-level socioeconomic conditions on alcohol use was not significant (Model VII), indicating that changes in socioeconomic conditions were unrelated to the trend in adolescent alcohol use.

The final model (VIII) shows that the patterns from the previous models held when all factors were taken into account. In addition, the coefficients for years of investigation were largely the same as those in Model VI, indicating that the effects of the peer and parent factors on the time trend remained largely the same after accounting for the effects of municipality-level socioeconomic conditions.

As indicated by the similar trends in alcohol use across different levels of the peer and parent factors (figure 1d–f), the interaction effects between each of the predictors and year of investigation were not significantly associated with adolescent alcohol use (data available upon request).

## Discussion

We examined whether peer and parent factors and municipality-level socioeconomic conditions were related to the trend in alcohol use among Swedish adolescents.<sup>8</sup> Using data from 1988 to 2011, we demonstrated that adolescents' social interactions with their peers shifted over time and that this might be related to the trend in their alcohol consumption.

The decrease in face-to-face peer interactions and increase in parent interactions may seem remarkable given previous studies showing that the peer group becomes increasingly important to adolescents in their transition to social independence.<sup>12</sup> These changes in social activities could be related to the marked increase in technology use in recent decades: adolescents may spend more time on computers and other devices, and less time face-to-face with their peers. As alcohol use is usually a social activity during adolescence,<sup>14</sup> fewer face-to-face interactions may have correspondingly limited the opportunities to drink alcohol. Consistent with earlier findings,<sup>8,17,18</sup> our results show that adolescents who drank frequently spent more time with their peers, which confirms that alcohol use may have some social utility.<sup>34</sup> Moreover, as time spent with peers decreased continuously since 1988, it may have had a protective effect on the level of frequent alcohol use during the subsequent investigation years. However, it was during the second half of the investigation years (i.e. when alcohol use decreased) that its practical significance began to approach a meaningful level. This complements a recent study that indicated other peer-related factors, i.e. attitudes and drinking among peers, as contributing to the decreased trend in alcohol use among Australian adolescents.<sup>9</sup> Notably, given the cross-sectional nature of the current study, it is not possible to exclude the possibility that the decreased trend in adolescent alcohol use may have contributed to the decreased trend in adolescent peer interactions.

Similar to previous research, spending more time with parents was associated with a lower likelihood of drinking alcohol frequently among adolescents.<sup>17,18,22,35</sup> Over the past decades, adolescents have spent increasingly more time with their parents. Spending time together seems to be an important manifestation of parental support, which is critical for adolescents' adjustment.<sup>21</sup> However, time spent with parents seems to be unrelated to the trend in alcohol use.

In our study, parental monitoring remained at a constant level and did not explain the trend in alcohol use. While this corroborates another Swedish study,<sup>10</sup> it contrasts with some Icelandic studies which showed that parental monitoring increased over time and partly explained the decrease in adolescent alcohol use.<sup>11,36</sup>

Time spent with peers and that with parents presented opposite trends over time, which is self-explanatory to some extent. It is notable that only the peer factor indicated a meaningful contribution to the trend in alcohol use during the 2000s. This is in line with a recent study suggesting that the trend in adolescent alcohol use might be influenced by risk factors (as was our peer factor) more so than protective factors<sup>9</sup> (as were our parent factors).

Descriptive analyses showed that the trend in alcohol use was similar for subgroups of adolescents based on gender, academic orientation and immigration background. The latter is in line with previous research which showed that decreasing alcohol use among adolescents could not be explained by demographic changes resulting from immigration.<sup>37</sup> The trend was also similar across different levels of the peer and parent factors, thus the decrease in alcohol use seems to be a more general phenomenon among Swedish adolescents.<sup>38</sup> Furthermore, the interactions between the peer and parent factors and year of investigation were not significant, indicating that the trend in alcohol use was not related to changes in the association between the peer and parent factors and adolescent alcohol use over time.

Our study had some limitations. First, the effects of the predictors on the time trend were not statistically tested due to the nested

structure of the compared models, hence they were essentially inferred. Second, the direction of effects cannot be confirmed due to the cross-sectional nature of the data. Third, the Young in Värmland study does not include data on parental socioeconomic position. However, because the survey included all adolescents in Värmland, we trust that the proportion of parents with a higher education in the municipality was a reliable measure of the socioeconomic conditions of the adolescent population within each municipality. Fourth, parental monitoring was assessed by whether adolescents informed their parents of their evening activities, which may be closer to 'adolescent disclosure'. However, adolescent disclosure may be a more valid proxy of parental monitoring than asking parents.<sup>39</sup> Lastly, because we examined only a few factors that may explain the trend in alcohol use, based on earlier findings,<sup>8</sup> there may be omitted variables operating in parallel to those reported in this article. For example, changes in parental attitudes towards adolescent alcohol use and the availability of alcohol may have had an impact on alcohol use both directly and interactively with the peer and parent factors.

## Supplementary data

Supplementary data are available at *EURPUB* online.

## Funding

This work was supported by the County Council of Värmland and Forte: the Swedish Research Council for Health, Working Life and Welfare [Programme grant number: 2012-1736].

*Conflicts of interest:* None declared.

## Key points

- Individual-level time spent with peers, time spent with parents and parental monitoring were associated with alcohol use among adolescents.
- Municipality-level socioeconomic conditions were also associated with adolescent alcohol use.
- Our evidence indicates that the decreased time spent with peers over time may have contributed to the trend of decreasing alcohol use.
- Public policy regarding adolescent alcohol use should consider changes in adolescents' social interactions over time.

## References

- 1 CAN. *Drug Trends in Sweden 2017: CAN Report 63*. Stockholm: The Swedish Council for Information on Alcohol and Other Drugs (CAN), 2017.
- 2 Bauman A, Phongsavan P. Epidemiology of substance use in adolescence: prevalence, trends and policy implications. *Drug Alcohol Depend* 1999;55:187–207.
- 3 Hibell B, Andersson B, Ahlström S, et al. The 1999 ESPAD report: alcohol and other drug use among students in 30 European countries. *Stockholm* 2000: 51–86.
- 4 The ESPAD Group. ESPAD report 2015: results from the European School Survey Project on Alcohol and Other Drugs. *Luxembourg* 2016: 69–81.
- 5 Sourander A, Koskelainen M, Niemela S, et al. Changes in adolescents mental health and use of alcohol and tobacco: a 10-year time-trend study of Finnish adolescents. *Eur Child Adolesc Psychiatry* 2012;21:665–71.
- 6 Looze M, Raaijmakers Q, ter Bogt T, et al. Decreases in adolescent weekly alcohol use in Europe and North America: evidence from 28 countries from 2002 to 2010. *Eur J Public Health* 2015;25(Suppl 2):69–72.
- 7 Johnston LD, Miech RA, O'Malley PM, et al. Monitoring the Future national survey results on drug use: 1975–2017: overview, key findings on adolescent drug use. *Ann Arbor* 2018: 37–38.

- 8 Bergh D, Hagquist C, Starrin B. Parental monitoring, peer activities and alcohol use: a study based on data on Swedish adolescents. *Drugs Educ Prev Policy* 2011;18:100–7.
- 9 Hodder RK, Campbell E, Gilligan C, et al. Association between Australian adolescent alcohol use and alcohol use risk and protective factors in 2011 and 2014. *Drug Alcohol Rev* 2018;37:S22–33.
- 10 Larm P, Livingston M, Svensson J, et al. The increased trend of non-drinking in adolescence: the role of parental monitoring and attitudes toward offspring drinking. *Drug Alcohol Rev* 2018;37:S34–41.
- 11 Arnarsson A, Kristofersson GK, Bjarnason T. Adolescent alcohol and cannabis use in Iceland 1995–2015. *Drug Alcohol Rev* 2018;37:S49–57.
- 12 Spear LP. The adolescent brain and age-related behavioral manifestations. *Neurosci Biobehav Rev* 2000;24:417–63.
- 13 Savin-Williams RC, Berent T. Friendship and peer relations. In: Feldman SS, Elliot GK, editors. *At the Threshold: The Developing Adolescent*. Cambridge, MA: Harvard University Press; 1990: 277–307.
- 14 Gallupe O, Bouchard M. The influence of positional and experienced social benefits on the relationship between peers and alcohol use. *Rational Soc* 2015;27:40–69.
- 15 Cruz JE, Emery RE, Turkheimer E. Peer network drinking predicts increased alcohol use from adolescence to early adulthood after controlling for genetic and shared environmental selection. *Dev Psychol* 2012;48:1390.
- 16 Overbeek G, Bot SM, Meeus WH, et al. Where it's at! The role of best friends and peer group members in young adults' alcohol use. *J Res Adolesc* 2011;21:631–8.
- 17 Kloep M, Hendry LB, Ingebrigtsen J, et al. Young people in drinking societies? Norwegian, Scottish and Swedish adolescents' perceptions of alcohol use. *Health Educ Res* 2001;16:279–91.
- 18 Barnes GM, Hoffman JH, Welte JW, et al. Adolescents' time use: effects on substance use, delinquency and sexual activity. *J Youth Adolesc* 2007;36:697–710.
- 19 Csikszentmihalyi M, Larson R, Prescott S. Ecology of adolescent activity and experience. *J Youth Adolesc* 1977;6:281–94.
- 20 Larson R, Richards MH. Daily companionship in late childhood and early adolescence: changing developmental contexts. *Child Dev* 1991;62:284–300.
- 21 Steinberg L. The family at adolescence: transition and transformation. *J Adolesc Health* 2000;27:170–8.
- 22 Thorlindsson T, Bjarnason T, Sigfusdottir ID. Individual and community processes of social closure: a study of adolescent academic achievement and alcohol use. *Acta Soc* 2007;50:161–78.
- 23 Ryan SM, Jorm AF, Lubman DI. Parenting factors associated with reduced adolescent alcohol use: a systematic review of longitudinal studies. *Aus N Z J Psychiatry* 2010;44:774–83.
- 24 Engels RC, Ter Bogt T. Influences of risk behaviors on the quality of peer relations in adolescence. *J Youth Adolesc* 2001;30:675–95.
- 25 Hansen WB, O'Malley PM. Drug use. In: DiClemente RJ, Hansen WB, Ponton LE, editors. *Handbook of Adolescent Health Risk Behavior*. Germany: Springer Science & Business Media, 1996: 161–92.
- 26 de Looze M, Vermeulen-Smit E, ter Bogt TFM, et al. Trends in alcohol-specific parenting practices and adolescent alcohol use between 2007 and 2011 in the Netherlands. *Int J Drug Pol* 2014;25:133–41.
- 27 Sigfusdottir ID, Kristjansson AL, Gudmundsdottir ML, Allegrante JP. Substance use prevention through school and community-based health promotion: a transdisciplinary approach from Iceland. *Glob Health Prom* 2011;18:23–6.
- 28 de Matos EG, Kraus L, Hannemann TV, et al. Cross-cultural variation in the association between family's socioeconomic status and adolescent alcohol use. *Drug Alcohol Rev* 2017;36:797–804.
- 29 Hanson MD, Chen E. Socioeconomic status and health behaviors in adolescence: a review of the literature. *J Behav Med* 2007;30:263–85.
- 30 Sweeting H, West P, Young R, Der G. Can we explain increases in young people's psychological distress over time? *Social Sci Med* 2010;71:1819–30.
- 31 Fairbrother M. Two multilevel modeling techniques for analyzing comparative longitudinal survey datasets. *Pol Sci Res Method* 2014;2:119–40.
- 32 StataCorp. *Stata Statistical Software: Release 14*. College Station, TX: StataCorp LP, 2015.
- 33 Rosenthal JA. Qualitative descriptors of strength of association and effect size. *J Soc Service Res* 1996;21:37–59.
- 34 Engels R, Scholte RHJ, van Lieshout CFM, et al. Peer group reputation and smoking and alcohol consumption in early adolescence. *Addict Behav* 2006;31:440–9.
- 35 Warr M. Parents, peers, and delinquency. *Soc Forces* 1993;72:247–64.
- 36 Kristjansson AL, James JE, Allegrante JP, et al. Adolescent substance use, parental monitoring, and leisure-time activities: 12-year outcomes of primary prevention in Iceland. *Prev Med* 2010;51:168–71.
- 37 Svensson J, Andersson D-E. What role do changes in the demographic composition play in the declining trends in alcohol consumption and the increase of non-drinkers among Swedish youth? A time-series analysis of trends in non-drinking and region of origin 1971–2012. *Alcohol Alcohol* 2016;51:172–6.
- 38 Norström T, Raninen J. Drinking trajectories of at-risk groups: does the theory of the collectivity of drinking apply? *Drug Alcohol Rev* 2018;37:S15.
- 39 Stattin H, Kerr M. Parental monitoring: a reinterpretation. *Child Dev* 2000;71:1072–85.