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Tables: 3

Figures: 1

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Supplemental material

**Adolescent and Young Adult Drunkenness and Future Educational Attainment and Labor
Market Integration: A Population-Based Longitudinal Study**

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ABSTRACT. Objective: Drunkenness is common among youth and has been linked to injuries and other acute consequences as well as subsequent alcohol problems. Less is known about the long-term consequences of drunkenness regarding future education and labor market integration, and how risk changes during the developmental course. We identified trajectories of drunkenness from early adolescence to young adulthood and examined how drunkenness was associated with subsequent outcomes in the domains of education, income, unemployment, and disability.

Method: We used four-wave longitudinal data from 3,116 participants (1,428 men; 1,688 women) from the population-based Young in Norway Study (ages 13 to 31). Questionnaire data on drunkenness were linked to register data on subsequent educational and occupational outcomes. **Results:** The frequency of drunkenness during the past 12 months increased from ages 13 to 21, followed by a levelling off and decline from age 25 to 31. Early drunkenness (at age 13) was related to lower educational attainment, lower income, and higher risk for disability and unemployment at age 32; yet, after control for covariates, most of these associations became nonsignificant. Later drunkenness (>21 years) was either not associated or inversely associated with educational and employment outcomes. **Conclusions:** Our results indicate that the effect of drunkenness changes during the developmental course. In early teenage years, drunkenness seems to be a marker of risk and is linked to poor educational outcomes and weak labor market integration. From the early twenties, drunkenness instead seems to be related to positive educational and work-related outcomes. (*J. Stud. Alcohol Drugs*, 84, 000–000, 2023)

Many studies have investigated the associations between excessive drinking and adverse outcomes, but few have examined associations with future educational attainment and labor market integration. Even fewer have examined whether such associations vary across adolescence and young adulthood. By using a large-scale population-based longitudinal study, we address this gap in the literature and examine how drunkenness through adolescence and young adulthood is related to future educational and occupational outcomes.

Early research on negative consequences of adolescent drinking indicated that “age at first drink” was related to a variety of problem behaviors, in particular higher risk of future alcohol problems (Grant et al., 2001; Pedersen & Skrondal, 1998). The association was often interpreted as causal. However, most of these early studies did not sufficiently rule out possible confounding factors reflecting individual and familial genetic and environmental risk, such as externalizing problem behaviors, mental health problems, or parental alcohol use (Kuntsche et al., 2016; Silins et al., 2018). A growing literature demonstrates that the relationship between age at first drink and later problems typically disappears when one or several of these factors are taken into account (for a review, see Kuntsche et al., 2016). Moreover, more recent studies conclude that early drunkenness, and not drinking alcohol per se, is a key risk factor (Kuntsche et al., 2013).

As a result, researchers now more often focus on the consequences of excessive drinking, such as binge drinking (Piano et al., 2017) or subjective reports of feeling drunk (Rossow & Kuntsche, 2013). Drunkenness may be associated with acute negative consequences, such as injuries and violence (Kuntsche et al., 2017). Early adolescent binge drinking is also associated with later problematic patterns of alcohol use, even after adjustment for potential confounders (Chassin et al., 2002). However, few studies have examined how excessive adolescent drinking

is linked to later educational and occupational outcomes. There are some exceptions: In a British study, binge drinking at age 16 predicted leaving school without any qualification and lower social class at age 30, even after adjusting for parental socioeconomic status (Viner & Taylor, 2007). Moreover, two studies from the United States showed that youth binge drinking was linked to lower adult earnings, adjusted for factors believed to affect the decision to binge drink, such as religious affiliation and alcohol prices (Keng & Huffman, 2007; Renna, 2007). Similarly, a Swedish study showed that frequent drunkenness in adolescence was associated with an increased risk of obtaining disability pension, after adjustment for family background, school-related factors, and physical and mental health (Sidorchuk et al., 2012). In contrast, in samples from Australia and New Zealand, adolescent heavy drinking was unrelated to adult income, welfare dependence, high school noncompletion, and university nonattainment after controlling for mental health, conduct problems, parental substance use, and deviant peer affiliations (Silins et al., 2018).

Interestingly, reports about adverse consequences of excessive adolescent drinking seem partly to be in contrast to research on the adult population. Several studies have shown that at least moderate alcohol use, and to some degree heavy drinking, may be associated with better work-related outcomes when compared with alcohol abstinence (Barrett, 2002; French & Zarkin, 1995). For example, in a study from Ireland, household incomes of both moderate and heavy adult drinkers were higher than those of nondrinkers (Ormond & Murphy, 2016). Moreover, studies from the Nordic countries have found that alcohol abstainers have higher risk of unemployment, more sickness absence, and higher frequency of disability pension awards than moderate alcohol users (Jørgensen et al., 2017; Skogen et al., 2012, Vahtera et al., 2002).

Thus, the literature seems to indicate that the association between alcohol use and later occupational outcomes may differ according to the age at which the level of drinking was assessed. However, little systematic research on this issue has been conducted, especially in a Nordic context. We addressed this topic by using a large-scale population-based longitudinal study from Norway, a country with one of the most restrictive alcohol policies and lowest rates of early drinking in Europe (ESPAD Group, 2016). We tested whether drunkenness in early adolescence might have more negative long-term consequences than drunkenness later in life, when such a pattern of alcohol use becomes normative. Moreover, we controlled for a number of covariates, which may reflect a shared vulnerability to both adolescent drinking behavior and adult educational and work-related outcomes. Such factors include parental socioeconomic status, parental alcohol use, school performance, mental health, social integration, and conduct problems (McCambridge et al., 2011; Shortt et al., 2007).

Method

Participants and procedure

We used survey data from the population-based Young in Norway Study. Data were collected at four time points and linked to register data from Statistics Norway. The initial sample in 1992 (T1) was drawn from 67 junior and senior high schools in Norway, with a response rate of 97%. Every school in the country was included in the register from which schools that participated were selected. The sample was stratified according to geographic region and urbanization (see von Soest et al., 2020).

Students who still attended the same school were reassessed in 1994 (T2), with a response rate of 92% based on those who participated at T1 ($n = 3,844$). Because the study was originally planned to be a two-wave study, new informed consent was obtained at T2. Those then

consenting ($n = 3,507$; 91%) received questionnaires by mail in 1999 (T3) and 2005 (T4), with data received from 2,924 (84%) and 2,890 (82%) participants, respectively. At T4, respondents were asked for their consent to register linkages, to which 2,602 respondents (90%) agreed. The overall participation rate of the final sample in this study, based on all eligible students at T1 who still were at their original school at T2, was 68% at T3, 67% at T4, and 60% concerning assessment of register data. The students were mainly born between 1974 and 1979 and were 13 to 18 years of age at T1 and 27 to 31 years of age at T4. Only data from students born in these years and who had participated in the study at least at one time point in young adulthood (i.e., T3 or T4) were included in the study ($N = 3,116$).

Attrition analysis showed that older age, male gender, drunkenness at T1, parental alcohol intoxication, low levels of social integration, and conduct problems significantly predicted attrition ($p < .05$).

All participants provided informed consent. The study was approved by the Regional Committee for Medical Research Ethics.

Measures

Drunkenness. Frequency of drunkenness was measured by asking, “During the past 12 months, have you had so much to drink that you felt clearly intoxicated?”, with response options *never, once, 2 to 5 times, 6 to 10 times, 10 to 50 times, and more than 50 times*. Because of the categorical nature of the variable and our aim to describe changes in the frequency of drunkenness as detailed as possible, we constructed four different indicators of drunkenness. As a first measure, drunkenness was categorized by contrasting those who had never reported to be drunk the previous 12 months (coded 0) with those who had reported to be drunk at least once (coded 1). To assess more frequent drunkenness episodes, we constructed another measure where

participants with fewer than two reported drunkenness episodes (i.e., never or once drunk) were contrasted with those who reported at least two drunkenness episodes. In the same manner, we contrasted those with fewer than 6 and fewer than 11 drunkenness episodes, respectively, with participants who reported more drunkenness.

Education and labor market integration. Information about educational attainment and labor market integration was obtained at age 32. Highest level of education was obtained from the Norwegian Educational Database, which provides nationwide data about completed education in Norway. We coded into categories ranging from 1 (*junior high school*) to 5 (*higher university degree*). Income data were obtained from tax records and included income from wages, self-employment, capital income, and government assistance such as child benefits. Gross annual income was recoded into 10 equally sized groups, with values from 0 to 1, with 0 representing 10% of respondents with the lowest incomes and 1 representing 10% of respondents with the highest incomes; other groups received values in between. Dummy variables were constructed to indicate whether participants had received social or unemployment benefits, thereby indicating whether participants were ever registered unemployed in the year the participants turned 32 years of age. Moreover, we constructed a dummy variable to indicate whether participants had received disability or rehabilitation benefits at age 32, thereby indicating severe labor market marginalization with limited opportunities for future return to the labor market.

Covariates. Gender and the age of the participants were assessed. At T2, school grades in Norwegian, mathematics, and English were assessed by self-report. Mean scores were computed, ranging from 1 (*lowest grade*) to 6 (*highest grade*). We used a 15-item measure of conduct problems at T1, which approximated diagnostic criteria for conduct disorder in the *Diagnostic*

and *Statistical Manual of Mental Disorders, Third Edition, Revised* (DSM-III-R; American Psychiatric Association, 1987; Wichstrøm et al., 1996). Response options ranged from 1 (*never*) to 6 (*more than 50 times*). Mean scores were computed, and internal consistency was $\alpha = .75$. Kandel and Davies' (1982) six-item Depressive Mood Inventory was used at T1 to assess depressive symptoms during the preceding week on a four-point scale from *affected not at all* to *affected extremely* ($\alpha = .78$). Social integration was measured at T1 by the five-item Social Acceptance subscale of a revised version of the Self-Perception Profile for Adolescents (Wichstrøm, 1995). Mean scores were computed, ranging from 1 to 4, where high values indicated high social acceptance ($\alpha = .77$). Heavy parental drinking was assessed at the first three waves with the question, "Have you ever seen your parents drunk?". Response options ranged from *never* to *a few times a week* and composite scores across all three time points were created (values: 0–12). Using register data, we collected information about highest parental educational level when the respondents were 16 years old, measured on a four-point scale ranging from 1 (*compulsory elementary school*) to 4 (*high university level*).

Analysis

Developmental trajectories of drunkenness were modeled by means of cohort-sequential latent growth curves. More specifically, we used multiple group analysis to divide respondents into six age cohorts according to their birth year. The same latent growth curve model was constructed in each group, based on dichotomous indicators of drunkenness. Factor loadings for growth factors were parameterized according to the individual's age, such that common growth trajectories for drunkenness across all six groups were specified (see Preacher et al., 2008), representing development of drunkenness from age 13 to age 31 for each participant. We constructed one latent growth curve model for each of the four indicators of drunkenness. Probit

regressions in the framework of latent response variable transformation was used (Masyn et al., 2014) to transform dichotomous responses into normally distributed continuous variables before estimating the growth curves (Lee et al., 2018). Linear and nonlinear trajectories were tested by including linear and quadratic slope factors in growth curve models. We thus estimated three growth curve parameters: the intercept, representing the estimated frequency of drunkenness episodes at a particular age; the linear slope, representing linear change; and the quadratic slope, representing quadratic change in the risk of drunkenness from age 13 to 31.

Potential consequences of alcohol trajectories were examined by regressing indicators of educational attainment and labor market integration on the intercept of drunkenness, representing the estimated frequency of drunkenness episodes at a specific age. Probit and linear regressions were used for dichotomous and continuous dependent variables, respectively. Because a main aim of the study was to examine how drunkenness at different ages was related to educational attainment and work-related outcomes, we estimated three different models with different parameterizations of the intercept. More specifically, the intercept was parameterized at ages 13, 22, and 31, respectively, such that the intercepts in the different models indicated the risk for drunkenness in early adolescence (age 13), in the transition from adolescence to adulthood (age 22), and in young adulthood (age 31). We tested for gender differences in the regression coefficients by means of latent interaction analyses in a structural equation modeling framework (Klein & Moosbrugger, 2000).

All analyses were conducted by using the statistical program Mplus Version 8.5 (Muthén & Muthén, 2020). Robust weighted least squares estimation was used, and missing data were handled by the pairwise deletion approach. This approach provides consistent estimates when data are missing at random with respect to covariates (see Asparouhov & Muthén, 2010).

Results

Table 1 presents frequency of drunkenness for all four waves. At T1, only 34.5% of the participants reported to have been drunk at least once in the previous 12 months. The share of respondents with drunkenness experiences increased substantially at T2 and T3, whereas it decreased somewhat at T4. See Table 2 and the online supplemental material to this article for more information about the descriptive statistics. (Supplemental material appears as an online-only addendum to this article on the journal's website.) Table 2 shows considerable correlations of drunkenness from one point to the next. Conduct problems were rather strongly related to drunkenness, whereas other covariates showed small to moderate relationships with frequency of drunkenness.

[COMP: Tables 1 and 2 about here]

Drunkenness trajectories

We constructed a linear growth model indicating whether respondents had felt clearly drunk at least once in the past 12 months; however, the model fit was not satisfactory; $\chi^2(54) = 455.79$, comparative fit index (CFI) = .87, Tucker–Lewis index (TLI) = .91, root mean square error of approximation (RMSEA) = .120. By including a quadratic growth component, the model fit was acceptable; $\chi^2(53) = 208.33$, CFI = .95, TLI = .97, RMSEA = .075. The variance of the quadratic slope was set to 0 to allow for convergence of the model. Models were run as well for the three other measures of drunkenness, with similar model fit. The estimated trajectories are depicted in Figure 1 and show a steep increase in risk of drunkenness at least once in the past 12 months from age 13 to about age 21, whereas levels were rather stable thereafter, followed by a small decline in risk from age 25 to 31. Similar developmental trends were obtained for more frequent episodes of drunkenness.

Gender was then included as a predictor of the intercept and slope of the drunkenness variables where at least one episode of drunkenness was compared with not having been drunk. The results showed that gender predicted both the intercept ($\beta = .07, p = .01$) and the slope of drunkenness ($\beta = -.19, p < .001$), thereby indicating that girls had a somewhat higher risk of drunkenness at age 13, whereas the boys' rate of drunkenness increased more rapidly. The patterns were similar for all drunkenness thresholds (see the online supplemental material).

Drunkenness trajectories and educational attainment and labor market integration

We examined how drunkenness trajectories predicted educational attainment and labor market integration, by regressing outcomes on the intercept of drunkenness with and without control for covariates. In the unadjusted model, estimated risk for drunkenness at age 13 was significantly related to all measures of education and labor market integration at age 32 (Table 3, Model 1). More specifically, having been drunk at least once at age 13 was significantly associated with lower levels of education and income and higher risk of unemployment and disability at age 32. Similar results were obtained when examining higher drunkenness thresholds, even though some associations with disability and income did not reach significance. Although the association with education remained, the associations of drunkenness at age 13 with other outcomes were markedly attenuated and most associations were no longer statistically significant when controlling for covariates.

[COMP: Table 3 about here]

In contrast, when drunkenness at age 22 and age 31 was used as a predictor by re-parameterizing the growth curve model (see Models 2 and 3), the associations between drunkenness and adverse educational and work-related outcomes were substantially reduced or vanished, and several results even showed inverse associations: At age 22, more episodes of

drunkenness showed to be related to higher education when adjusting for covariates. Also at age 31, high frequency of drunkenness was significantly related to higher educational attainment, both with and without adjustments. Drunkenness at ages 22 and 31 was consistently associated with higher income. Concerning unemployment, the increased risk observed at age 13 disappeared when drunkenness was parameterized at ages 22 and 31. Drunkenness at ages 22 and 31 was, with few exceptions, associated with a lower risk of disability.

Finally, we tested for gender differences in the association between the intercept of drunkenness and the outcomes. For all 48 regression models estimated, two significant interactions with gender were identified with $p < .05$, which is not more than would be expected by chance.

Discussion

These results showed a rapid increase in the frequency of drunkenness from age 13 to the mid-twenties with a slight decrease thereafter. Moreover, there were striking age differences in associations to educational and work-related outcomes: Although drunkenness at age 13 was consistently associated with higher risk of low educational attainment, low income, and unemployment, such negative effects of drunkenness were not observed in the twenties and early thirties. On the contrary, in this age span drunkenness was partly related to positive outcomes, such as higher educational attainment and income and lower risk of disability. The associations of drunkenness in early adolescence with later outcomes were furthermore markedly attenuated, or even disappeared when adjusting for a variety of confounders. However, such effects of confounders were not observed at ages 22 and 31.

Whereas previous research has documented that heavy episodic drinking in adolescence may continue into adulthood and be manifested in alcohol problems (Chassin et al., 2002;

Dawson et al., 2004), we lack evidence regarding potential educational and work-related consequences of such patterns of alcohol use (Marshall, 2014; McCambridge et al., 2011). The present study provides solid evidence for a longitudinal association between drunkenness in early adolescence and later negative educational and work-related outcomes. Moreover, the associations between early adolescent drunkenness and later outcomes seem to be confounded by covariates reflecting familial and individual risk, such as conduct problems, school grades, depressive symptoms, and parental education level and drinking. As such, our findings are in line with scholars suggesting that early onset should be considered a marker of risk rather than an independent risk factor (King & Chassin, 2007). However, alternative explanations are possible, as adolescent drunkenness may adversely influence individual risk factors such as school grades and depressive symptoms (Hemphill et al., 2014, Pedrelli et al., 2016). In this case, variables that we conceptualized as confounders would instead act as mediators, such that adolescent drunkenness through indirect pathways would affect future educational attainment and labor market outcomes. Still, the study adds to the literature by demonstrating that early drunkenness is a marker of risk, not only of alcohol-related outcomes, but also of educational attainment and labor market integration.

The present study furthermore provided surprisingly consistent findings for age-specific associations, as drunkenness in the twenties and early thirties did not show associations to detrimental work-related outcomes as seen for drunkenness in early adolescence. On the contrary, at age 22 and particularly at age 31, drunkenness was related to higher income and to some degree lower risk of disability. Unemployment was not predicted by drunkenness at these ages. We need more research to shed light on reasons for why drunkenness in adulthood may be related to some types of work-related outcomes but not others. In conclusion, drunkenness in

young adulthood may not be a marker of risk for educational attainment and labor market integration, as in adolescence, but rather the opposite.

Several studies have shown moderate alcohol consumption in adulthood to be related to better long-term outcomes compared with abstinence (Jørgensen et al., 2017; Ormond & Murphy, 2016; Skogen et al., 2012). However, few studies have shown that a risky drinking pattern, such as alcohol intoxication, is associated with subsequent positive educational and work-related outcomes, although further investigations of these relationships with a more objective measure of alcohol exposure is warranted. We argue that this association could be understood in light of normative alcohol use, which changes with age and the broader social context. At age 13, most abstain from any alcohol use. With increasing age, however, alcohol may take on a new meaning whereby drinking alcohol, even excessively, becomes a central part of social gatherings, also in college and university settings (Wicki et al., 2010). In such contexts, excessive alcohol use may indicate being integrated and socially adjusted (Peele & Brodsky, 2000, Pedersen & von Soest, 2015). Also at work, alcohol users may benefit from taking part in drinking cultures that may be important for work-related networking (Barrett, 2002; Ormond & Murphy, 2016). As such, it is taking part in these contexts that may be beneficial, rather than the alcohol use per se.

However, our analyses do not provide definite information about the causal nature of the association between drunkenness and work-related outcomes in young adulthood. For example, our findings are also in line with the notion that young adults who are marginalized in the labor market and are poorly socially integrated may drink less because of poor health or lack of social arenas where alcohol consumption is common. Such alternative explanations may be possible, particularly because we only controlled for covariates in adolescence, and not in adulthood.

Limitations

Several limitations are important to note. First, the measure of drunkenness is based on subjective feelings of intoxication and provides no objective measure of number of drinks per occasion. Particularly, feeling “clearly intoxicated” is probably related to lower alcohol intake early in adolescence than later in life. Furthermore, even though we hypothesize that getting drunk at different ages may have different social implications, it would have been an advantage to know more about the drinking context (Gmel et al., 2011). Likewise, more detailed information about labor market outcomes would have been of value. For example, our study provides no information about how drunkenness is related to type of work, job status, and number of working hours. We also acknowledge that our analytical approach—examining the association between different drunkenness thresholds and educational and labor market outcomes—may have resulted in a loss of statistical power, compared with using frequency of drunkenness as a continuous predictor variable.

Second, findings may be specific to the Nordic context with a strict alcohol policy and relatively low per capita consumption (Österberg & Karlsson, 2003; World Health Organization, 2014). Further, Norway has a history of well-developed welfare schemes aimed at fighting social exclusion, as well as low unemployment rates (Barth et al., 2014). Also, participants in this study were adolescents in the 1990s, the decade before a general downward trend in adolescent alcohol use was observed in many Western countries, including Norway (Bye, 2012). It remains to be seen whether our findings can be generalized to later generations. We also note that attrition analyses revealed a disproportionately high dropout rate among those with high initial levels of drunkenness, parental drunkenness, and conduct problems, which may influence estimates of drunkenness trajectories and associations between drunkenness and outcomes. Moreover, other

approaches to missing data handling than pairwise deletion, such as full information maximum likelihood, would have been preferable as they can handle less restrictive missing data assumptions. Unfortunately, such methods cannot be implemented when using a robust weighted least square estimator (Asparouhov & Muthén, 2010).

Third, we adjusted for covariates measured in adolescence, rather than controlling for time-varying covariates. Although the latter approach also controls for confounding, there is a risk that it would result in control for factors that may be the result of alcohol use, such as depressive symptoms (Pedrelli et al., 2016), and not an underlying predictor for both alcohol use and labor market outcomes. We also acknowledge that the parametrization of the growth curve intercepts at ages 13, 22, and 31 to examine how associations change with increasing age is somewhat arbitrary. Last, although our study provides evidence that adult drunkenness is related to favorable outcomes, future studies need to assess whether such links are the result of a causal relationship, uncontrolled confounding, or reversed causality.

Conclusion

The role of drunkenness may change during the developmental course from being a marker of risk to being related to positive educational and work-related outcomes. Our findings furthermore provide indications that the relationship between early adolescent drunkenness and educational attainment and labor market integration in adulthood is of a noncausal nature. These findings have implications for alcohol policies and prevention strategies. For example, interventions aimed at enhancing young people's educational attainment and labor market integration in adulthood may very well benefit from targeting early binge drinkers. However, the efforts may be more effective when addressing a wider range of familial and individual vulnerability factors. The positive associations of drunkenness in young adulthood with

important life outcomes may, on the other hand, pose a challenge for maintaining a restrictive alcohol policy, as the high alcohol consumption may be partly sustained by a group of young, well-integrated, and resourceful people. Future research should explore mechanisms underlying these associations and examine whether these associations are the same in other cultural contexts with different alcohol policies and welfare systems.

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TABLE 1. Frequency of drunkenness episodes at all four time points

Frequency of episodes of drunkenness last 12 months	Time 1 (13–18 years)		Time 2 (15–20 years)		Time 3 (20–27 years)		Time 4 (26–31 years)	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Never	1,883	65.5	1,378	45.1	337	13.7	483	17.6
Once	220	7.7	280	9.2	170	6.2	207	7.6
2 to 5 times	322	10.3	559	18.3	576	21.0	646	23.6
6 to 10 times	164	5.3	307	10.1	444	16.2	492	18.0
More than 10 times	285	9.1	530	17.4	1,182	43.0	911	33.3
Total	2,874	100.0	3,054	100.0	2,749	100.0	2,739	100.0

TABLE 2. Descriptive statistics and intercorrelations for variables under study

Variable	<i>M</i>	<i>SD</i>	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
Drunkenness																
1. Frequency of drunkenness (T1)	1.88	1.41														
2. Frequency of drunkenness (T2)	2.48	1.60	.65**													
3. Frequency of drunkenness (T3)	3.77	1.52	.16**	.29**												
4. Frequency of drunkenness (T4)	3.48	1.54	.09**	.19**	.51**											
Education and labor market integration																
5. Education	3.65	1.03	-.05*	-.06**	-.03	.02										
6. Income in 100,000 NOK	4.22	2.22	-.07**	-.04	.12**	.15**	.20**									
7. % Unemployed	7.89%	0.03	.04	.03	.01	-.16**	-.26**									
8. % Disabled or on rehabilitation	5.34%	0.00	-.03	-.06**	-.05*	-.19**	-.23**	.31**								
Covariates																
9. % Female gender	54.17%	0.03	.00	-.18**	-.25**	.08**	-.23**	.03	.04*							
10. Parental education	2.51	0.83	.02	-.03	.02	.08**	.31**	.08**	-.07**	-.07**	-.02					
11. Parental alcohol intoxication	0.82	0.80	.29**	.32**	.22**	.16**	-.14**	-.02	.03	.01	-.01	-.15**				
12. Social integration	3.08	0.51	.14**	.12**	.05*	.02	.04*	.05*	-.01	-.04	.02	.03	.00			
13. Conduct problems	1.37	0.41	.50**	.46**	.22**	.18**	-.17**	-.03	.07**	.03	-.18**	-.01	.24**	.05**		
14. Depressive symptoms	1.71	0.56	.17**	.17**	-.02	-.05*	-.04*	-.18**	.03	.10**	.18**	.01	.13**	-.20**	.17**	
15. School grades	3.54	0.72	.04	-.02	-.06**	-.05*	.44**	.11**	-.11**	-.10**	.07**	.30**	-.11**	.08**	-.12**	.00

Notes: T = time; NOK = Norwegian krone.

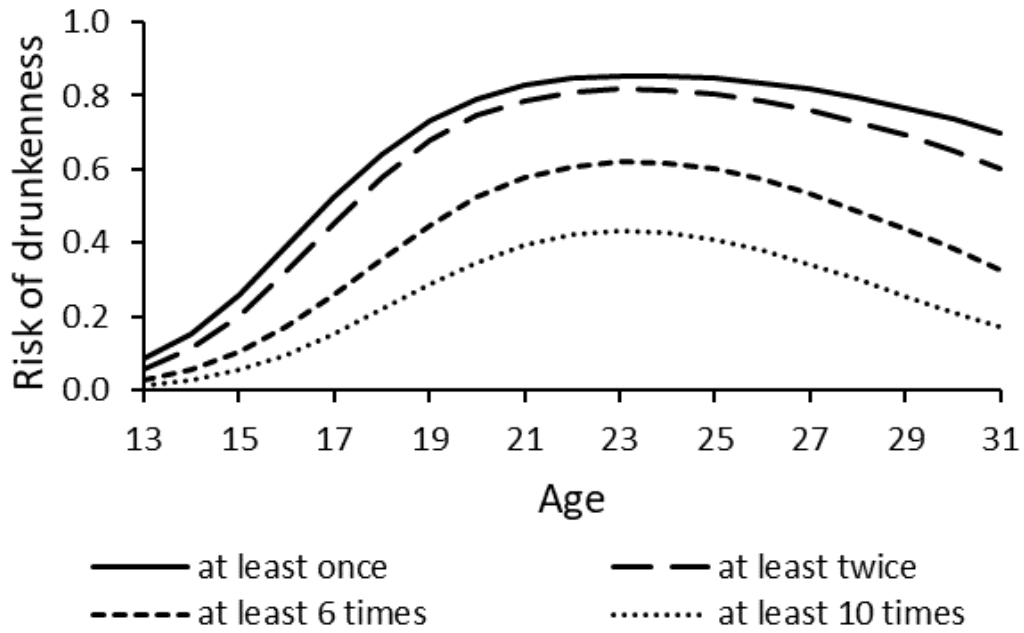
* $p < .05$; ** $p < .01$.

TABLE 3. Standardized regression coefficients of estimated frequency of drunkenness predicting measures of education and labor market integration (N = 3,116)

Variable	Without control for covariates				With control for covariates ^a			
	Drunk at least once past 12 months	Drunk more than once past 12 months	Drunk more than 5 times past 12 months	Drunk more than 10 times past 12 months	Drunk at least once past 12 months	Drunk more than once past 12 months	Drunk more than 5 times past 12 months	Drunk more than 10 times past 12 months
Model 1 (intercept parameterized at age 13)								
Education	-.30***	-.26***	-.26***	-.27***	-.18***	-.14**	-.21***	-.38***
Income	-.12***	-.12***	-.22***	-.05	-.11**	-.09*	.06	.00
Unemployed	.19**	.22***	.19**	.19**	.05	.08	.07	.07
Disabled or on rehabilitation	.14*	.14	.09	.12	.04	.05	.06	.10
Model 2 (intercept parameterized at age 22)								
Education	-.12**	-.06*	-.05	-.04	.11**	.14***	.11***	.10**
Income	.12***	.13***	.11***	.11***	.17***	.15***	.08**	.07*
Unemployed	.06	.03	.06	.07	-.03	-.03	.02	.02
Disabled or on rehabilitation	-.13*	-.16*	-.15**	-.06	-.18*	-.19**	-.15**	-.09
Model 3 (intercept parameterized at age 31)								
Education	.02	.05	.08**	.11***	.14***	.16***	.15***	.20***
Income	.19***	.19***	.23***	.15***	.18***	.15***	.04	.06*
Unemployed	-.03	-.08	-.04	-.03	-.05	-.06	.00	.00
Disabled or on rehabilitation	-.21**	-.23***	-.21**	-.13*	-.20**	-.19**	-.13**	-.09

Notes: ^aControl for gender, highest parental education level, parental alcohol intoxication, social integration, conduct problems, depressive symptoms, and grades in school. Coefficients for education and income are based on linear regressions, whereas coefficients for unemployment and disability/rehabilitation are based on probit regressions.

FIGURE 1. Estimated risk for high number of drunkenness episodes the past 12 months from age 13 to age 31, with different threshold for high number of drunkenness episodes



Online Supplemental Material

1. Detailed Description of Descriptive Results

Descriptive statistics are displayed in Table 2 in the article. The same information is included in Table S1 with additional information about the range of the variables. As Table S1 shows, the means of drunkenness frequency (with a range from 1 – *Never* to 6 – *More than 50 times*) indicates a substantial increase in the frequency of drunkenness from T1 to T3 with a slight decline from T3 to T4. With a mean score of 3.65, study participants’ highest education at age 32 was on average between having finished senior high school (score 3) and having lower college/university degree (score 4). Participants had an average annual income of 422,000 Norwegian Kroner at age 32, which is equivalent to about 45,000 USD. A minority, 7.89% of the participant, had received social or unemployment benefits in the year they turned 32 years of age. Moreover, 5.34% of all participants had received disability or rehabilitation benefits at age 32.

Table S1 shows that women were slightly overrepresented in the sample. The mean score of 2.51 indicates that the highest parental education on average was completed senior high school (score 2) or completed lower college/university degree (score 3). Heavy parental drinking showed a low mean score, with a mean score below 1 on a scale from 0 to 12. Participants reported rather high scores on social integration at T1 as measured by the Social Acceptance subscale of the revised version of the Self-Perception Profile for Adolescents, because the mean was clearly above the midpoint of the scale. Self-reported conduct problems at T1 were rather low, with a score of 1.37 on a scale from 1 (*Never*) to 5 (*More than 50 times*) where we assessed the average frequency of 15 indicators of conduct problems. Also, the mean of depressive symptoms was on the lower end of the scale. Finally, the mean for school grades of 3.54 at T1 reflects that the respondents on average had school grades on the midpoint of the scale.

*Table S1
Descriptive Statistics of all Variables Under Study*

	<i>M</i>	<i>SD</i>	Range
<i>Drunkenness</i>			
Frequency of drunkenness (T1)	1.88	1.41	1–6
Frequency of drunkenness (T2)	2.48	1.60	1–6
Frequency of drunkenness (T3)	3.77	1.52	1–6
Frequency of drunkenness (T4)	3.48	1.54	1–6
<i>Education and labour market integration</i>			
Education	3.65	1.03	1–5
Income in 100,000 NOK	4.22	2.22	
% Unemployed	7.89%		
% Disabled or on rehabilitation	5.34%		
<i>Covariates</i>			
% Female gender	54.17%		
Parental education	2.51	0.83	1–4
Parental alcohol intoxication	0.82	0.80	0–12
Social integration	3.08	0.51	1–4
Conduct problems	1.37	0.41	1–5
Depressive symptoms	1.71	0.56	1–4
School grades	3.54	0.72	1–6

Note. * $p < .05$, ** $p < .01$. *M* = mean; *SD* = standard deviation. NOK = Norwegian Kroner

2. Gender-Specific Trajectories of Drunkenness

To examine whether drunkenness trajectories varied across gender, we included gender as a predictor of the intercept and slope of the drunkenness growth curves. Table S2 presents results from these analyses for all four dichotomizations of drunkenness. The results show that for all drunkenness thresholds, girls have a somewhat higher risk of drunkenness at age 13. Compared to girls, boy’s rate of drunkenness increases more rapidly with increasing age.

Table S2

Association between gender and intercept and slope of drunkenness for different dichotomizations of drunkenness

Drunkenness thresholds	Association between gender and intercept of drunkenness				Association between gender and slope of drunkenness			
	<i>B</i>	95% CI	β	<i>p</i>	<i>B</i>	95% CI	β	<i>p</i>
Drunk at least once past 12 months	0.30	0.07; 0.53	0.07	.010	-0.93	-1.27; -0.53	-0.19	<.001
Drunk more than once past 12 months	0.41	0.19; 0.62	0.10	<.001	-1.11	-1.40; -0.81	-0.25	<.001
Drunk more than 5 times past 12 months	0.41	0.20; 0.62	0.12	<.001	-1.26	-1.52; -1.00	-0.33	<.001
Drunk more than 10 times past 12 months	0.22	0.02; 0.43	0.08	.034	-1.09	-1.33; -0.84	-0.31	<.001

Note. *B* = unstandardized regression coefficient. 95% CI = 95% confidence interval of *B*. β = standardized regression coefficient. Gender was scored 0 = male and 1 = female.

3. Association Between Estimated Frequency of Being Drunk and Measures of Education and Labour Market Integration

Potential consequences of alcohol trajectories were examined by regressing indicators of educational attainment and labour market integration on the intercept of drunkenness. We estimated models where the intercept was parameterized at age 13, 22, and 31. Results of these analyses were presented in Table 3 in the article. We display a more detailed account of the results of a subset of these analyses in Tables S3 and S4. More specifically, we present results for models where educational and labour market outcomes were regressed on the estimated risk of having been drunk at least once at age 13, with and without controlling for covariates, respectively. We present results for education and income in Table S3 whereas results for unemployment and disability/rehabilitation are presented in Table S4.

Table S3

Results of Linear Regression Analyses of the Association Between Estimated Frequency of Being Drunk at Least Once at Age 13 and Education and Income at Age 32

	Education				Income			
	Estimate	95% CI	β	p	Estimate	95% CI	β	p
<i>Model without control for covariates</i>								
Drunk at least once past 12 months	-0.12	-0.15; -0.09	-0.30	<.001	-0.02	-0.03; -0.01	-0.12	<.001
<i>Model with control for covariates</i>								
Drunk at least once past 12 months	-0.08	-0.12; -0.04	-0.18	<.001	-0.02	-0.03; -0.01	-0.11	.007
Female gender	0.23	-0.08; 0.53	0.05	.139	-0.19	-0.27; -0.11	-0.33	<.001
Parental education	-0.26	-0.30; -0.22	-0.25	<.001	-0.01	-0.03; 0.00	-0.04	.051
Parental alcohol intoxication	0.02	-0.03; 0.07	0.02	.508	0.03	0.01; 0.04	0.07	.003
Social integration	0.06	-0.03; 0.15	0.03	.178	0.04	0.02; 0.07	0.06	.002
Conduct problems	-0.17	-0.30; -0.04	-0.08	.013	0.01	-0.04; 0.05	0.01	.815
Depressive symptoms	-0.06	-0.13; 0.01	-0.04	.104	-0.05	-0.07; -0.02	-0.08	<.001
Grades in school	0.46	0.41; 0.51	0.39	<.001	0.05	0.03; 0.07	0.12	<.001

Table S4

Results of Probit Regression Analyses of the Association Between Estimated Frequency of Being Drunk at Least Once at Age 13 and Unemployment and Disability/Rehabilitation at Age 32

	Unemployed				Disabled or on rehabilitation			
	Estimate	95% CI	β	<i>p</i>	Estimate	95% CI	β	<i>p</i>
<i>Model without control for covariates</i>								
Drunk at least once past 12 months	0.09	0.04; 0.15	0.19	.001	0.07	0.00; 0.13	0.14	.039
<i>Model with control for covariates</i>								
Drunk at least once past 12 months	0.02	-0.05; 0.09	0.05	.545	0.02	-0.06; 0.10	0.04	.650
Female gender	0.12	-0.23; 0.46	0.06	.505	0.66	0.16; 1.16	0.30	.010
Parental education	0.06	-0.02; 0.15	0.05	.150	0.06	-0.06; 0.18	0.05	.319
Parental alcohol intoxication	0.00	-0.09; 0.10	0.00	.940	-0.06	-0.18; 0.05	-0.05	.302
Social integration	0.00	-0.15; 0.16	0.00	.961	0.00	-0.21; 0.21	0.00	.988
Conduct problems	0.29	0.04; 0.54	0.10	.025	0.09	-0.22; 0.40	0.03	.563
Depressive symptoms	0.07	-0.07; 0.20	0.04	.345	0.31	0.12; 0.51	0.16	.002
Grades in school	-0.27	-0.41; -0.13	-0.19	<.001	-0.22	-0.40; -0.04	-0.15	.014