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Alcohol consumption and well-being among 25,000 Danish high school students

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ABSTRACT

Excessive alcohol consumption among young people is an international public health concern, as alcohol is associated with a range of adverse short- and long-term consequences. Furthermore, alcohol consumption has been associated with well-being in young people, but the association depends on the chosen measure of well-being. The objective of this study was to assess how weekly alcohol consumption was associated with poor well-being (poor school enjoyment, social inclusion in school, mental well-being, life satisfaction, self-esteem, and self-efficacy, and experiencing loneliness). Cross-sectional data from the Danish National Youth Study 2019 was used (a total of 25,910 students aged 15–25 years).

For most outcomes, there was a U-shaped association between weekly alcohol consumption and poor well-being e.g. students who never drank, students who only drank occasionally, and students who drank a lot (22 units of alcohol or more a week) had higher odds of poor well-being, compared to the reference group (1–7 units a week). This was the case for measures such as low school enjoyment (only females), poor mental well-being, low life satisfaction, low self-esteem (only females) and low self-efficacy (only males). Among females, odds of low self-efficacy was higher with higher weekly alcohol consumption. Higher weekly alcohol consumption was associated with lower odds of low social inclusion in school, experiencing loneliness often, and (among males) low self-esteem.

Conclusively, well-being in general was lowest among never-, occasional- and heavy drinking students. Understanding these associations can help to decrease alcohol consumption and promote well-being among young students.

1. Introduction

Excessive alcohol consumption among young people is an international public health concern, as alcohol is associated with several adverse consequences. In the short run, alcohol increases the risk of fatal and non-fatal accidents, violence and unsafe sex (World Health Organization, 2012), while long-term consequences include a range of health conditions and diseases, such as certain cancers, cardiovascular diseases, liver cirrhosis (World Health Organization, 2019), and mental disorders (Cargiulo, 2007).

Furthermore, research shows an association between alcohol consumption and well-being among young people. The association depends on the type of well-being measured. Alcohol consumption has been positively associated with several aspects of sociality (Copeland et al., 2018; Ali et al., 2014; Tartaglia, 2013; Pedersen and von Soest, 2015), self-esteem (Blank et al., 2016; Luhtanen and Crocker, 2005; Pedersen et al., 2013) and self-efficacy (Blank et al., 2016). On the other hand, alcohol consumption has been inversely associated with school connectedness (Cummins et al., 2019; Bond et al., 2007), mental well-being (Blank et al., 2016) and life satisfaction (Zullig et al., 2009; Kuntsche and Gmel, 2004) With regard to loneliness, inconsistent results have been obtained (Pedersen and von Soest, 2015; Varga and Piko, 2015; Stickley et al., 2014).

Research shows that drinking behavior among young people is characterized by social motives, and that alcohol consumption often serve an important social function at parties (Frederiksen et al., 2012;

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Demant and Østergaard, 2007; Järvinen and Gundelach, 2007). The association between alcohol consumption and well-being are likely to differ across countries depending on the drinking culture. E.g. the social consequences of abstinence or a low alcohol intake might be greater in countries with high alcohol consumption compared to countries, were drinking and intoxication are not as normalized and common among students. Danish youth have a high alcohol consumption in an international perspective (ESPAD Group, 2020).

Reports from Denmark about the association between alcohol consumption and well-being are not conclusive. A report from 2010 based on 15–24-year old Danes indicated that abstaining from drinking as well as low alcohol consumption were in general associated with poorer well-being compared to higher alcohol consumption (Nielsen et al., 2010). Later Danish reports have shown modest differences in well-being measures, when high school students were divided into two groups based on their weekly alcohol consumption or in three groups based on how often they drank alcohol during weekends (Christensen et al., 2017; Bramming et al., 2018).

It is possible that some associations between alcohol consumption and well-being have been overlooked in previous studies, as many of them dichotomized alcohol consumption. In the present study, we were able to investigate the association between several categories of alcohol consumption and well-being, allowing complex associations to emerge.

We hypothesize that students with no, low or very high alcohol consumption have the poorest outcomes in terms of well-being. This assumption of a U-shaped association is based on findings regarding alcohol and sociality (Frederiksen et al., 2012; Demant and Østergaard, 2007; Järvinen and Gundelach, 2007), and the fact that alcohol consumption can also be used as a coping mechanism to deal with mental health problems (Kuntsche et al., 2005).

The aim of this study was to assess how weekly alcohol consumption and binge drinking are associated with poor well-being (poor in terms of school enjoyment, social inclusion in school, mental well-being, life satisfaction, self-esteem, and self-efficacy, and experiencing loneliness,) among Danish students.

2. Methods

2.1. Design and participants

Data are from the Danish National Youth Study 2019 (UNG19), a national survey of high school students. A description of the study design and population is provided elsewhere (Pisinger et al., 2021). Data collection and linkage of data to registers was approved by the local Data

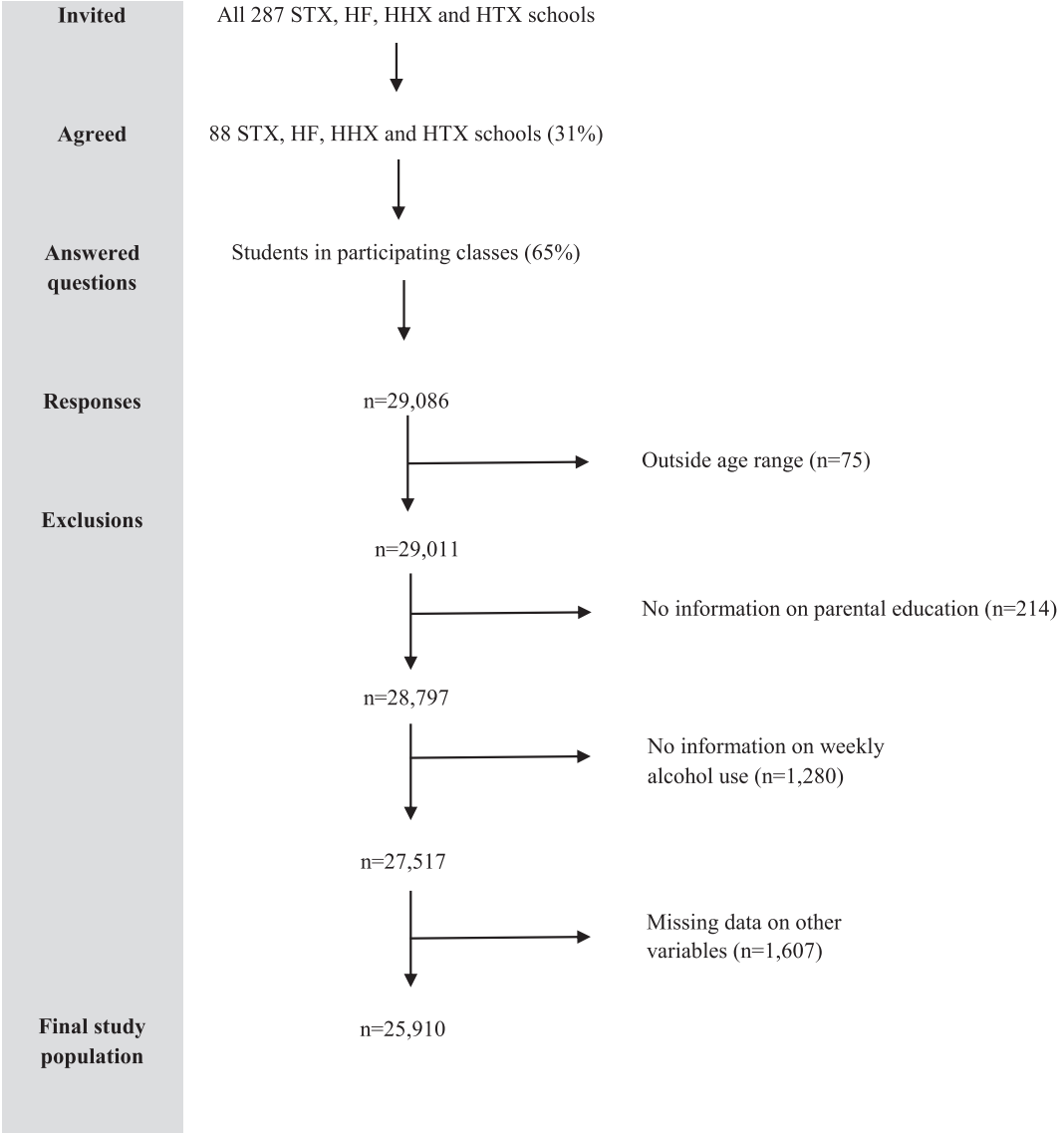

Fig. 1. Selection of the Danish National Youth Study 2019 collected in Denmark in 2019.

Protection Agency at the University of Southern Denmark (J.no. 10.130) based on the EU general data protection regulation and ensured that all local confidentiality and privacy requirements were met. All 287 Danish upper secondary educations (referred to as high school), including general-, preparatory-, commercial-, and technical high schools, were invited to participate. These educations can be attended after primary school, they have a duration between 2 and 3 years, and they all qualify students for admission to higher education. Of the invited schools, 88 (31 %) agreed to participate. Among the 43,961 students at the 88 participating schools, 29,086 (66 %) answered the questionnaire (Pisinger et al., 2021).

The analyses were restricted to students aged 15–25 years (n = 29,011). Students for whom it was not possible to link their questionnaire with their civil registration number, were excluded since their parents education could not be attained form Statistic Denmark (n = 214). Students with missing values on weekly alcohol consumption (n = 1280), school enjoyment (n = 888), social inclusion in school (n = 65), mental well-being (n = 545), loneliness (n = 38), life satisfaction (n = 30), self-esteem (n = 28), and self-efficacy (n = 13) were excluded. The final study sample comprised 25,910 students aged 15–25 years (89 % of the original study sample). The selection of the study sample is shown in Fig. 1.

2.2. Study measures

2.2.1. Weekly alcohol consumption

Weekly alcohol consumption was measured by the question "*How many units do you drink during the week (a normal week)?*" and responses were categorized into "Never drinks", "Occasionally drinks" (0 units in a normal week, but does drink alcohol), "1–7 units", "8–14 units", "15–21 units" and "22 units or more". In Denmark, one unit equals 12 g pure alcohol.

2.2.2. Demographic factors

Demographic factors included were sex (male, female), age (15–16, 17, 18, 19, 20–25 years), education (general-, preparatory-, commercial-, and technical high school), geographical region (Capital, Zealand, Southern, Central and North), and migrations background (Danish, Immigrant, Descendant). Furthermore, parental education was included from Statistics Denmark, where the highest educational level of the students' parents was used as an indicator of the student's social position (primary school, high school, vocational training, higher education $\leq$ 2 years, higher education 3–4 years, and higher education >4 years).

2.3. Well-being measures

2.3.1. School enjoyment

School enjoyment ("How do you feel about going to school, at the moment?") was dichotomized into high (very good/good) and low (not so good/bad).

2.3.2. Social inclusion in school

Social inclusion in school ("*Are you included in the social community at your school?"),* was dichotomized into high (yes, most of the time/always) and low (sometimes/seldom/never).

2.3.3. Mental well-being

The Short Warwick-Edinburgh Mental Well-being Scale (SWEMWBS) is a validated measure used to monitor mental well-being (Stewart-Brown et al., 2009; Koushede et al., 2019) and consists of seven positive worded questions. The scale was calibrated, and responses were dichotomized into medium ($\geq$19.98)/high ($\geq$27.03) and poor ($\leq$19.25) mental well-being.

2.3.4. Loneliness

Loneliness (*"Do you feel lonely?")* was dichotomized into "not/sometimes" (No/yes sometimes) and "often" (yes, often/very often).

2.3.5. Life satisfaction

Life satisfaction (*"On the scale below, 10 means "best possible life" and 0 means "worst possible life". Where on the scale do you feel you are, at the moment?"* (The Cantril Scale)) was dichotomized into high (7–10) and low (0–6).

2.3.6. Self-esteem

A single item ("*To which extent do you agree or disagree with the following statement: I am good enough as I am?")* was considered to be related to self-esteem, and was categorized into high/mediocre (completely agree/agree/neither agree nor disagree) and low self-esteem (disagree/completely disagree*)*.

2.3.7. Self-efficacy

A single item from Schwarzer's generalized self-efficacy scale (Schwarzer et al., 1995) ("*How often can you achieve, what you wish to do?")* was considered to be related to general self-efficacy and was grouped into high (very often/often) and low (sometimes/almost never/never).

2.3.8. Statistical analyses

The statistical package STATA/IC 11 was used for all analyses. Descriptive analyses were applied to show the characteristics of the study population and the distribution of weekly alcohol consumption and well-being, respectively, by sex. To test the association between weekly alcohol consumption and the different measures of well-being, we performed multilevel logistic regression analyses adjusted for age, education, geographical region, migration background, and parental education. As students within the same school may have more similar drinking patterns or well-being, we included school as a random effect in the multilevel logistic regression models. Students drinking 1–7 weekly units of alcohol was chosen as the reference group. Selected confounders were based on the literature and a priori knowledge. We did not adjust the well-being measures for each other.

Wald tests were conducted to assess the hypothesis of no overall difference between categories. We found a significant interaction between sex and alcohol consumption on well-being, and females and males were analyzed separately.

3. Results

3.1. Description of study population

There were more females (56 %) than males and the majority were aged 17–19 years (80 %) (Table 1). Most studied at a general high school (71 %) and a third came from the Capital region. The highest achieved education of the student's parents was primarily vocational training (30 %), higher education of 3–4 years (31 %) and higher education >4 years (26 %). Most students had a Danish background (92 %).

Almost 9 % of students did never drink alcohol, whereas 8 % did not drink alcohol in a normal week (occasional drinkers) (Table 2). More than half the population drank 1–7 or 8–14 units in a normal week. Males were more likely to drink 15 or more weekly alcohol units compared to females (38 % vs 23 %).

As seen in Table 3, 17 % of students reported low school enjoyment, and 22 % reported low social inclusion in school. Furthermore, 14 % had poor mental well-being, 9 % were often lonely, 29 % scored between 0 and 6 on the life satisfaction scale, 10 % had low self-esteem, and 18 % had low self-efficacy. On all measures, more females than males had a poor well-being.

3.2. Weekly alcohol consumption and school dimensions of well-being

There was no significant association between alcohol and low school

Table 1
Characteristics of all students in the Danish National Youth 2019 population (n = 25,910) in Denmark in 2019.

	n	(%)
Total	25,910	(100)
Sex		
Male	11,314	43.7
Female	14,596	56.3
Age		
15–16 years	3,765	14.5
17 years	7,734	29.9
18 years	8,224	31.7
19 years	4,721	18.2
20–25 years	1,466	5.7
Education		
General high school	18,272	70.5
Preparatory high school	1,712	6.6
Commercial high school	3,574	13.8
Technical high school	2,352	9.1
Geographical region		
Capital	8,462	32.7
Zealand	3,670	14.2
Southern	7,133	27.5
Central	5,265	20.3
North	1,380	5.3
Migration background		
Danish	23,759	91.7
Immigrant	494	1.9
Descendent	1,657	6.4
Parentś highest achieved education		
Primary school	895	3.5
High school	653	2.5
Vocational training	7,684	29.7
Higher education 1–2 years	1,953	7.5
Higher education 3–4 years	7,923	30.6
Higher education >4 years	6,802	26.3

Table 2
Weekly alcohol consumption in total and by sex among Danish students aged 15–25 years (n = 25,910) in Denmark in 2019.

Weekly alcohol consumption	All students		Males		Females	
	N	(%)	n	(%)	n	(%)
Never drinks	2,251	8.7	987	8.7	1,264	8.7
Occasionally drinks	2,081	8.0	921	8.1	1,160	8.0
1–7 units	7,127	27.5	2,533	22.4	4,594	31.5
8–14 units	6,807	26.3	2,544	22.5	4,263	29.2
15–21 units	4,246	16.4	2,123	18.8	2,123	14.6
22 units or more	3,398	13.1	2,206	19.5	1,192	8.2

enjoyment among males (p = 0.16) (Table 4). Among females, there was a U-shaped association between weekly alcohol consumption and low school enjoyment. For instance, those who never drank (OR = 1.22 95 % CI [1.02–1.46]) and those drinking 22 weekly units or more (1.31; 1.11–1.54) had higher odds of low school enjoyment than those drinking 1–7 drinks/week (reference group). There was an inverse association between weekly alcohol consumption and **low social inclusion in school** in both sexes. For instance, the odds of low social inclusion were approximately 3 times higher for never drinkers and 2 times higher for occasional drinkers, compared to the reference group (1–7 drinks/week), whereas students drinking 8 units or more in a normal week had significantly lower odds of low social inclusion.

Table 3
Distribution of school dimensions and personal dimensions of well-being in total and by sex among Danish students aged 15–25 years (n = 25,910) in Denmark in 2019.

	All students		Male		Female	
	N	(%)	n	(%)	N	(%)
School dimensions						
School enjoyment						
High school enjoyment	21,587	83.3	9,573	84.6	12,014	82.3
Low school enjoyment	4,323	16.7	1,741	15.4	2,582	17.7
Social inclusion in school						
High social inclusion	20,346	78.5	9,255	81.8	11,091	76 0.0
Low social inclusion	5,564	21.5	2,059	18.2	3,505	24.0
Personal dimensions						
Mental well-being						
Medium/high	22,301	86.0	10,210	90.2	12,091	82.8
Low	3,609	13.9	1,104	9.8	2,505	17.2
Loneliness						
Not/sometimes lonely	23,678	91.4	10,614	93.8	13,064	89.5
Often lonely	2,232	8.6	700	6.2	1,532	10.5
Life satisfaction						
7–10 (high)	18,323	70.7	8,710	77.0	9,613	65.9
0–6 (low)	7,587	29.3	2,604	23.0	4,983	34.1
Self-esteem						
High/mediocre	23,441	90.5	10,578	93.5	12,863	88.1
Low	2,469	9.5	736	6.5	1,733	11.9
Self-efficacy						
High	21,143	81.6	9,738	86.1	11,405	78.1
Low	4,767	18.4	1,576	13.9	3,191	21.9

Table 4
Odds ratios for school dimensions of well-being by weekly alcohol consumption by sex (n = 25,910) in Denmark in 2019.

	Males (n = 11,314)		Females (n = 14,596)	
	Adjusted[1] OR (95 % CI)	P-value[2]	Adjusted[1] OR (95 % CI)	P-value[2]
Low school enjoyment				
Alcohol consumption		0.16		0.0001
Never drinks	1.00 (0.80–1.24)		1.22 (1.02–1.46)	
Occasionally drinks	1.10 (0.89–1.35)		1.16 (0.98–1.37)	
1–7 units	1 (ref)		1 (ref)	
8–14 units	0.85 (0.73–1.00)		0.91 (0.81–1.02)	
15–21 units	0.96 (0.81–1.13)		1.07 (0.93–1.22)	
22 units or more	1.03 (0.88–1.21)		1.31 (1.11–1.54)	
Low social inclusion in school				
Alcohol consumption		<0.0001		<0.0001
Never drinks	3.06 (2.57–3.65)		3.39 (2.90–3.95)	
Occasionally drinks	2.02 (1.71–2.40)		2.18 (1.90–2.50)	
1–7 units	1 (ref)		1 (ref)	
8–14 units	0.49 (0.42–0.57)		0.53 (0.48–0.59)	
15–21 units	0.36 (0.30–0.43)		0.49 (0.43–0.56)	
22 units or more	0.35 (0.29–0.41)		0.57 (0.48–0.67)	

[1] Multilevel logistic regression analysis with school as cluster level. Adjusted for age, education, geographical region, migration background, and parentś highest achieved education.

[2] A Wald test was conducted to assess the hypothesis of no overall difference by categories of weekly alcohol consumption.

3.3. Weekly alcohol consumption and personal dimensions of well-being

Table 5 shows odds for poor well-being on different measures of personal well-being in regard to weekly alcohol consumption, stratified by sex.

For both sexes, there was a U-shaped association between alcohol consumption and poor **mental well-being**. Never drinking and occasionally drinking students had between 30 and 43 % higher odds of poor mental well-being, and students drinking 22 units or more likewise had higher odds (1.28;1.06–1.55 for males and 1.51;1.28–1.77 for females), compared to students drinking 1–7 weekly units.

The association between weekly alcohol consumption and experiencing **loneliness** often, varied by sex. Odds of experiencing loneliness often were lower among students drinking 8–14 units in a normal week (0.56;0.44–0.72 for males and 0.83;0.72–0.96 for females) and for those drinking 15–21 units in a normal week, (0.49;0.37–0.64 for males and 0.72;0.60–0.87 for females), compared to students drinking 1–7 units. Among females, the association was U-shaped, as never drinkers (1.36;1.10–1.68) and occasionally drinkers (1.50;1.25–1.81) also had higher odds of experiencing loneliness often compared to females drinking 1–7 units in a normal week.

In males, odds of low **life satisfaction** were higher among occasional drinkers (1.24;1.05–1.48) and lower for those drinking 8–14 weekly units (0.83;0.72–0.95) or 15–21 weekly units (0.86;0.75–0.99), compared to the reference group drinking 1–7 weekly units. Among females, odds of low life satisfaction were higher for never drinkers (1.18;1.02–1.36), occasional drinkers (1.17;1.02–1.34), and those drinking 22 weekly units or more (1.28;1.12–1.46), compared to the reference group.

For males, odds of **low self-esteem** were higher among occasional drinkers (1.35;1.03–1.75), whereas it was lower for those drinking 8–14 (0.60;0.47–0.76) and 15–21 weekly units (0.64;0.49–0.83), compared to the reference group drinking 1–7 weekly units. Among females, never drinkers (1.26;1.02–1.55), occasional drinkers (1.44;1.20–1.73) and those drinking 22 weekly units or more (1.36;1.13–1.64), had higher odds of low self-esteem compared to the reference group.

Among males, odds of **low self-efficacy** was higher in occasional drinkers (1.33;1.07–1.64, and those drinking 15–21 (1.19;1.00–1.41) and 22 weekly units or more (1.38;1.17–1.64), compared to the reference group drinking 1–7 weekly units. Among females, odds of low self-efficacy was higher among those drinking 8–14 (1.7;1.06–1.30), 15–21 (1.37;1.21–1.56) and 22 or more weekly units (1.77;1.52–2.05), compared to the reference group.

Table 5
Odds ratios for personal dimensions of well-being by weekly alcohol consumption by sex (n = 25,910) in Denmark in 2019.

	Males (n = 10,358)		Females (n = 13,886)	
	Adjusted[1] OR (95 % CI)	P-value[2]	Adjusted[1] OR (95 % CI)	P-value[2]
Poor mental well-being				
Alcohol consumption		<0.0001		<0.0001
Never drinks	1.30 (1.02–1.65)		1.43 (1.20–1.70)	
Occasionally drinks	1.38 (1.09–1.74)		1.35 (1.15–1.59)	
1–7 units	1 (ref)		1 (ref)	
8–14 units	0.78 (0.63–0.95)		1.00 (0.89–1.13)	
15–21 units	0.71 (0.57–0.88)		1.03 (0.89–1.19)	
22 units or more	1.28 (1.06–1.55)		1.51 (1.28–1.77)	
Often lonely				
Alcohol consumption		<0.0001		<0.0001
Never drinks	1.26 (0.95–1.66)		1.36 (1.10–1.68)	
Occasionally drinks	1.28 (0.98–1.67)		1.50 (1.25–1.81)	
1–7 units	1 (ref)		1 (ref)	
8–14 units	0.56 (0.44–0.72)		0.83 (0.72–0.96)	
15–21 units	0.49 (0.37–0.64)		0.72 (0.60–0.87)	
22 units or more	0.80 (0.63–1.01)		1.03 (0.83–1.26)	
Low life satisfaction				
Alcohol consumption		0.0001		<0.0001
Never drinks	0.97 (0.81–1.17)		1.18 (1.02–1.36)	
Occasionally drinks	1.24 (1.05–1.48)		1.17 (1.02–1.34)	
1–7 units	1 (ref)		1 (ref)	
8–14 units	0.83 (0.72–0.95)		0.92 (0.84–1.01)	
15–21 units	0.86 (0.75–0.99)		1.02 (0.92–1.14)	
22 units or more	1.00 (0.87–1.14)		1.28 (1.12–1.46)	
Low self-esteem				
Alcohol consumption		<0.0001		<0.0001
Never drinks	1.30 (0.99–1.71)		1.26 (1.02–1.55)	
Occasionally drinks	1.35 (1.03–1.75)		1.44 (1.20–1.73)	
1–7 units	1 (ref)		1 (ref)	
8–14 units	0.60 (0.47–0.76)		0.89 (0.78–1.02)	
15–21 units	0.64 (0.49–0.83)		1.01 (0.86–1.19)	
22 units or more	0.94 (0.75–1.19)		1.36 (1.13–1.64)	
Low self-efficacy				
Alcohol consumption		0.001		<0.0001
Never drinks	1.19 (0.95–1.49)		1.11 (0.94–1.32)	
Occasionally drinks	1.33 (1.07–1.64)		1.08 (0.92–1.27)	
1–7 units	1 (ref)		1 (ref)	
8–14 units	1.04 (0.88–1.23)		1.17 (1.06–1.30)	
15–21 units	1.19 (1.00–1.41)		1.37 (1.21–1.56)	
22 units or more	1.38 (1.17–1.64)		1.77 (1.52–2.05)	

[1] Multilevel logistic regression analysis with school as cluster level. Adjusted for age, education, geographical region, migration background, and parents highest achieved education.

[2] A Wald test was conducted to assess the hypothesis of no overall difference by categories of weekly alcohol consumption.

4. Discussion

In this study with>25,000 Danish students, we investigated the association between alcohol consumption and seven different measures of poor well-being. Overall, our hypothesis of a U-shaped association (e.g. that no, low or very high alcohol consumption was associated with poorer outcomes) was confirmed.

With regard to ***school dimensions*** of well-being, there was an inverse association between weekly alcohol consumption and **low social inclusion** in school, e.g. higher weekly alcohol consumption was associated with lower odds of low social inclusion in school. There was a U-shaped association between weekly alcohol consumption and low **school enjoyment** among females, but no association was found for males.

Concerning ***personal dimensions*** of well-being, there was a U-shaped association between weekly alcohol consumption and poor well-being on most measures (poor mental well-being poor life satisfaction, poor self-esteem among females, poor self-efficacy among males), however with some exceptions (loneliness, poor self-esteem among males, poor self-efficacy among females).

4.1. Comparison with other studies and discussion of results

Where previous descriptive Danish reports have shown modest differences in well-being measures across categories of alcohol consumption in high school students (Bramming et al., 2018; Christensen et al., 2017), we found stronger associations between alcohol consumption and well-being. This is likely due to our many categories of alcohol consumption, allowing complex associations to emerge.

4.1.1. Social inclusion in school

Like our result for ***social inclusion*** in school, other studies have found a positive association between alcohol consumption and different measures of sociality, including number of friendship nominations (Ali et al., 2014), number of friends' friends (Ali et al., 2014), perceived social support (Tartaglia, 2013) and social integration (Pedersen and von Soest, 2015). Furthermore, not having any friends in school has been linked to lower alcohol use (Copeland et al., 2018). Although the measures are not similar and not all of them relate specifically to the school setting, these results all support that alcohol and socializing go hand in hand in youth culture. In many social arenas alcohol is a prerequisite for feeling socially included among peers, meeting new friends, increasing popularity, and feeling like experiencing youth to its fullest (Frederiksen et al., 2012; Demant and Østergaard, 2007; Järvinen and Gundelach, 2007). The reverse direction is also likely, as social relations also may facilitate alcohol consumption, and socially included individuals may therefore be more likely to participate in parties and other social gatherings were alcohol is present.

4.1.2. School enjoyment

Where social inclusion in school and other measures of sociality have been positively associated with alcohol consumption, higher degree of school connectedness – on the other hand – has been associated with lower alcohol consumption (Cummins et al., 2019; Bond et al., 2007). This contrasts with the present study, where a U-shaped association between weekly alcohol consumption and lower levels of school enjoyment was observed among females, while no association was found for males.

4.1.3. Mental well-being

In contrast to the U-shaped association between alcohol consumption and poor mental well-being in the present study, Davoren et al. did not find any association between mental health measured by WEMWBS and hazardous drinking among Irish students (Davoren et al., 2013). One reason might be the dichotomization of alcohol consumption, not allowing a potential U-shaped association to be identified. In another study among university students in New Zealand, men who reported drinking hazardously or moderate, and women drinking hazardously, had lower mental well-being compared to abstaining students (Blank et al., 2016).

4.1.4. Loneliness

We found an inverse association between weekly alcohol consumption and odds of experiencing loneliness, although only up to a weekly alcohol consumption of <22 units. This is in line with two other studies, reporting a negative association between different measures of alcohol use and loneliness among Norwegian (Pedersen and von Soest, 2015) and Hungarian adolescents (Varga and Piko, 2015). In contrast, Stickley (Stickley et al., 2014) found a higher risk of past 30-day alcohol consumption and binge-drinking associated with loneliness among U.S. adolescent, but not among Russian adolescents. Stickley's populations were only 13–15 years old, which could be an explanation for why they find the opposite association than we and other studies do (Pedersen and von Soest, 2015; Varga and Piko, 2015). The inverse association between alcohol consumption and loneliness, that we observed, may be due to fewer social connections and isolation, and thus fewer social gatherings where alcohol is involved, among lonely youths. It can also be speculated that young people who chose not to drink or drink less than their peers, are – or feel – socially excluded from the fellowship and hence feel lonely.

4.1.5. Life satisfaction

Our finding of a U-shaped association between weekly alcohol consumption and life satisfaction are not consistent with other studies, reporting lower life satisfaction associated with alcohol consumption among young people (Zullig et al., 2009; Kuntsche and Gmel, 2004). However, it is possible that these studies would have identified a more complex association between alcohol consumption and life satisfaction, if they have had several categories of alcohol consumption instead of dichotomization it. There exist several possible explanations for our finding of a U-shape. For instance, uncontrolled confounders – e.g. illnesses, loneliness or social exclusion among non-drinkers and occasional drinkers – may account for the association. The higher odds of low life-satisfaction among females drinking 22+ weekly units might be caused by drinking alcohol to cope with low life satisfaction, or that high amounts of alcohol decrease life-satisfaction.

4.1.6. Self-esteem

Beside from our results for those drinking 22 weekly units or more, our findings regarding self-esteem are partly in line with two other studies reporting higher self-esteem associated with higher alcohol consumption (Blank et al., 2016; Pedersen et al., 2013). Another study found no association (Luhtanen and Crocker, 2005).

4.1.7. Self-efficacy

While we showed higher odds of low self-efficacy among the heaviest drinking students, another study found an association between self-efficacy and higher levels of drinking among university students in New Zealand (Blank et al., 2016). However, the effect sizes were small. The conflicting results may be due to different methodology, e.g. the measures of self-efficacy. While we used a single item, they relied on five different items combined.

4.2. Study limitations and strengths

Our study had a relatively high response rate and a large study sample, which can be considered representative of Danish high school students aged 15–25 years (Pisinger et al., 2021). The findings do not necessarily transfer to other countries, as drinking culture differs, and the Danish youth have a very high alcohol consumption in an international perspective (ESPAD Group, 2020). The legal age for purchasing alcohol off-premises is only 16 years in Denmark, which is lower than most other comparable countries. Contrary to high schools in other countries, Danish high schools are allowed to sell and provide alcohol to their students at school parties, regardless of the age of their students, and parties with alcohol are very common at Danish upper secondary education schools. Hence, abstinence or a low alcohol intake might make it particularly difficult to become an integrated part of social life at school in a Danish context.

It is a strength of our study that we were able to link the school-based survey with national registers, allowing for adjustment of parental education. This is relevant as parental socioeconomic position is associated with alcohol consumption (Tolstrup et al., 2019; Kendler et al., 2014) and well-being in youth (Pedersen et al., 2005; Bannink et al., 2016).

By including seven well-being measures, this study presents a broad perspective on the association between alcohol consumption and well-being among high school students. While the self-reported nature of the data is a strength and a necessity in order to assess how the respondents feel, it can have introduced bias if respondents overestimated their well-being to be viewed favorable. Reporting of alcohol consumption is also subject to social desirability bias (Lintonen et al., 2004; Boca and Darkes, 2002; Northcote and Livingston, 2011). This bias is most likely to have weakened associations, although other possibilities cannot be ruled out.

The Danish National Youth Study 2019 aims to measure many aspects of young peoples' health, health behavior, and well-being, and due to limited time and space we needed to use short measures. We therefore only had single items related to self-efficacy and self-esteem. This can limit the validity of the constructs, however we consider the items to be valuable contributions to our broader aim of measuring different aspects of well-being.

The data were cross-sectional and thus it is not possible to make

causal inferences from the observed associations. While alcohol consumption may affect well-being, it is also likely that well-being affects alcohol consumption – or that some common causes underlies both. For example, it is possible that higher alcohol consumption at parties leads to higher social inclusion in school. However, it is also likely, that higher social inclusion increases alcohol consumption because of more social activities involving alcohol consumption. Rather than reflecting causal relations between alcohol consumption and well-being, we believe that our findings largely reflect the drinking culture among young people in Denmark. Non-drinkers and occasional drinkers constitute only 17 % of the study population and may diverge from the majority in other aspects than alcohol consumption.

We did not adjust the well-being measures of each other, because we were interested in each of them by their own right, and we were concerned of over-adjustment. Therefore, it is possible that some of the noted associations are explained by other well-being measures. It is a strength of our study that we were able to assess several categories of weekly alcohol consumption, as the association between alcohol consumption and well-being varied over these categories. On the other hand, the dichotomization of our well-being measures may have simplified the associations.

4.3. Public health implications

Our findings suggest that there is an urgent need to change the way that sociality and alcohol are linked together in Danish youth culture. We need to promote forms of sociality and parties in Danish high schools, where alcohol does not play the central role, and where everyone can participate on equal terms regardless of their alcohol consumption. Furthermore, our findings suggest that we need to pay special attention to heavy drinkers and the possible reasons behind their huge alcohol consumption, as they may use alcohol to cope with poor well-being. As a high alcohol consumption is normalized among Danish adolescents, there is a risk of overlooking well-being issues and alcohol problems.

5. Conclusion

Overall, we found lower well-being among never-drinkers, occasional drinkers and those drinking 22 units a week or more, compared to students with a weekly alcohol consumption between 1 and 7 units. Findings may largely reflect the drinking culture among Danish youth, where intoxication and alcohol consumption in moderate and larger amounts is common and normalized. Future longitudinal studies are needed to achieve a comprehensive understanding of the association between alcohol consumption and well-being.

CRediT authorship contribution statement

Anne Sofie Plum Christensen: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Writing – original draft, Visualization, Project administration, Funding acquisition. **Veronica Pisinger:** Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Data curation, Writing – review & editing, Supervision. **Anne Friis Krarup:** Conceptualization, Methodology, Validation, Writing – review & editing, Funding acquisition. **Peter Dalum:** Conceptualization, Methodology, Validation, Writing – review & editing, Funding acquisition. **Lau Caspar Thygesen:** Conceptualization, Methodology, Software, Validation, Investigation, Writing – review & editing, Supervision. **Janne Schurmann Tolstrup:** Conceptualization, Methodology, Software, Validation, Investigation, Data curation, Writing – review & editing, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

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