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Association between perceived decline in family income due to COVID-19 and alcohol consumption among Korean adolescents

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ABSTRACT

Background: This study examines the relationship between the perceived decline in family income due to COVID-19 and alcohol consumption among Korean adolescents.

Methods: Korea Youth Risk Behavior Web-Based Survey 2020 data were used. The study included 42,922 participants (20,672 males; 22,250 females). Multiple logistic regression estimated the relationship between the decline in family income due to COVID-19 and drinking (yes or no) and alcohol-induced blackout (yes or no) status among Korean adolescents.

Results: Adolescent males who perceived worsened family income due to COVID-19 had a higher OR for drinking status and alcohol-induced blackout within 30 days (drinking status: OR 1.27, CI 1.15–1.42, alcohol-induced blackout: OR 1.60, CI 1.19–2.15). Females had a higher OR for current drinking (OR 1.22, CI 1.09–1.38). 7th grade females and 10th grade males were more likely to drink alcohol when their household income decline, compared to high school students (10th grade male: OR 1.54 CI 1.18–2.00; 7th grade female: OR 1.57 CI 1.08–2.27). The male group perceiving family financial loss were likely to have an increased frequency of drinking within 30 days (1–9 days: OR 1.26 CI 1.11–1.42, 10–19 days; OR 1.70 CI 1.22–2.36 over 20 days; OR 1.74 CI 1.15–3.09).

Limitations: Cross-sectional design and self-reported data are the main limitation of our study. And the cut-off points for drinking status and heavy drinking factors may be difficult to generalize our findings to different population.

Conclusions: A significantly positive association of perceived decline in family income due to COVID-19 with increased risks of alcohol consumption was observed among Korean adolescents of both sexes. 7th grade females and 10th grade males were more likely to drink alcohol when their household income changed, compared to high school students. Further, adolescents who perceived family financial loss had an increased frequency of drinking.

1. Introduction

COVID-19 caused a global pandemic, and the World Health Organization (WHO) declared a public health emergency of international concern (Ryu and Chun, 2020). In addition to a public health crisis, the pandemic has also had a massive socioeconomic impact. The Organization for Economic Co-operation and Development (OECD) expected the global real GDP to reduce by 4.5% in 2020 compared to 2019; Korea's real GDP was expected to decline by approximately 1% (OECD, 2020). The number of new applicants for unemployment benefits increased from 95,584 December 2019 to 211,818 in January 2021, and

the amount of benefits reached a record high of about 1 trillion won in Korea in February 2021 (Labor Market Trends in Employment Administration Statistics Ministry of Employment and Labor, 2021).

To deal with the pandemic, all OECD member countries introduced social distancing and complete lockdowns, thereby impacting incomes and expenses of families, as well as exacerbating poverty and wage inequality (Celik et al., 2020; Almeida et al., 2021). Family financial insecurity due to the COVID-19 pandemic caused an acute threat to the well-being of children and families (Prime et al., 2020). Parental economic hardship is strongly related to parents' depressive symptoms, stress, and negative interactions with children (Kalil et al., 2020). In

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addition, each patient's unstable childrearing behaviors adversely affected adolescent development (Conger et al., 1993). Moreover, worry about family economic hardship is strongly associated to the adolescents' perceived health, though their own relative economic deprivation also plays a significant role (Hagquist, 1998).

The COVID-19 pandemic has impacted the lives of adolescents in various ways. It has resulted in chronic and acute stress, concern for their families, unexpected bereavements, sudden school break, home confinement in many countries, increased access to the internet and social media, and concern for the economic future of their family and country (Guessoum et al., 2020; Dumas et al., 2020a; Cho et al., 2021). Also, in response to COVID-19, a record number of children did not attend school because of the mandated closures (Masonbrink and Hurley, 2020). During this period, students were offered online, self-directive learning materials (Byun and Slavin, 2020). Such a social isolation can result in mental problem like irritability, acting out, depression (Loades et al., 2020).

Another problem during COVID-19 is substance abuse in adolescents. Some studies on substance abuse in adolescents found that the relative frequency of alcohol use increased during the COVID-19 pandemic (Grigoletto et al., 2020; Kuehn, 2020; Augusti et al., 2021). Furthermore, one in ten teenagers is still consuming alcohol in Korea (Health Insurance Statistics, 2016), despite the Youth Protection Law, which bans alcohol sales to adolescents under the age of 19. Thus, alcohol continues to remain accessible to this vulnerable population (Choi, 2017).

Korea experienced several waves of COVID-19 infections. Research on the problem-induced response to COVID-19 is necessary because preventions, such as social distancing, can cause serious social problems. To the best of our knowledge, no study has examined the alcohol use of adolescents during the COVID-19 pandemic. Previous studies did, however, consider the gender difference of alcohol use and drinking motives (Kuntsche et al., 2015; Kuntsche and Kuntsche, 2009; Kuntsche et al., 2008). To fill this research gap, we focus on the differential effects of the pandemic on adolescent alcohol use, stratified by gender, particularly concerning the perceived decline in family income during this period.

2. Methods

This cross-sectional study used data from the 2020 Korea Youth Risk Behavior Web-Based Survey (KYRBWS), conducted by the Korea Centers for Disease Control and Prevention (KCDC). These data were collected from August 3 to October 13, 2020 for middle and high school students. The KYRBWS is a school-based, nationwide, internet-based, anonymous, self-administered questionnaire, intended to examine health-risk factors. It uses a complex sampling design, with participation rates as high as 95% to 99% in Korea, including stratification, clustering, and multistage sampling. The KCDC's institutional review board approved the protocol, and all participants signed a consent form before participating in the survey. The details of the survey procedure have been described previously (Kim et al., 2016).

2.1. Participants

The total survey population from 2020 included 54,809 individuals. After excluding missing data ($N = 11,887$), 42,922 participants (20,672 males; 22,250 females) were selected. Students from the seventh to the twelfth grade comprised the representative sample.

Since the KYRBWS is a secondary dataset available in the public domain without identifiable information, our study did not require approval from the Institutional Review Board or informed consent.

2.2. Variables

The dependent variables were alcohol status and alcohol-induced

blackout. Alcohol drinking status was assessed on the KYRBWS through the question, 'Have you ever had more than one drink so far?' Those who checked 'no' were classified as 'no' drinkers. Those who checked 'yes' answered the next question: 'In the last 30 days, how many days have you had more than the minimum of one drink?' Those who checked 'Not in the last 30 days' were classified as 'no' drinkers. Finally, those who checked '1-2 days per month', '3-5 days per month', '6-9 days per month', '10-19 days per month', '20-29 days per month', or 'everyday' were classified as 'yes' drinkers.

Alcohol-induced blackout was evaluated through the following question. 'In the last 30 days, how many days have you drunk until you lost consciousness or suffered alcohol-induced memory loss?' This 'blackout' represented an additional result of binge drinking (White et al., 2002). Those who checked 'Not in the last 30 days' were classified as 'no' drinkers. Those who checked '1-2 days per month', '3-4 days per month', and 'over 5 days per month' were classified as blackout drinkers.

The main independent variable was: 'Do you think COVID-19 has made the financial condition of the student's family more difficult than before?' The four nominal answers were divided into two groups: one group comprised adolescents who checked 'Strongly agree or agree'; the other group comprised those who checked 'Strongly disagree or disagree'.

We also controlled sociodemographic characteristics as follows: grade (7,8,9,10,11, and 12), subjective academic level (low, middle, high), and school type (mixed-sex school, single-sex school). The socioeconomic factors included parent's education level (middle school or below, high school, college or above, unknown), region (metropolitan, city, rural), household income (high, middle, low), smoking (yes or no), and perceived stress (yes or no).

2.3. Statistical analysis

To confirm the association between the perceived decline in family income due to COVID-19 and alcohol consumption, the covariates were compared using the chi-squared test. All analyses were conducted by sex to examine sex-specific differences in alcohol consumption and family economic hardship. Multiple logistic regression analysis was performed to evaluate the relationship between perceived financial loss and drinking and blackout-drinking status. Multinomial logistic regressions were used when the dependent variables contained more than two categories. The results were reported using odds ratios (ORs) and confidence intervals (CIs). Model fitting was performed using the PROC SURVEYLOGISTIC procedure and application of cluster and strata. The data were analyzed and further stratified by sex using SAS 9.4 (SAS Institute Inc.; Cary, North Carolina). Statistical significance was set at $P < 0.05$.

3. Results

Adolescents who consumed alcohol within the last 30 days included 2340 (11.3%) males and 1975 (8.9%) females. Among these, 218 (1.1%) males and 240 (1.1%) females drank until they experienced a loss of consciousness or suffered alcohol-induced memory loss during these 30 days (Table 1).

Table 2 describes the findings of the logistic regression analysis stratified by sex regarding the association between perceived decline in family income due to COVID-19 and alcohol consumption. Male adolescents whose family income worsened had a higher OR for a 'yes' status of current and blackout drinking (current drinking: OR 1.27, CI: 1.15–1.42; blackout drinking: OR 1.60, CI: 1.19–2.15); similarly, female adolescents with a perceived family income decline due to COVID-19 had a higher OR for a 'yes' drinking status (OR 1.22, CI: 1.09–1.38). Adolescents who passed a grade showed an increased association with a 'yes' drinking status and blackout drinking. Further, those who perceived their subjective academic level as low had a higher OR for

Table 1
General characteristics of the study population.

Variables	Male						Female													
	Drinking status			Alcohol-induced blackout			Drinking status			Alcohol-induced blackout										
	Yes	No	P-value	Yes	No	P-value	Yes	No	P-value	Yes	No	P-value								
	N	%	N	%	N	%	N	%	N	%	N	%								
Total 30,366	2340	11.3	18,332	88.7		218	1.1	20,454	98.9		1975	8.9	20,275	91.1		240	1.1	22,010	98.9	
Perceived decline in family income due to covid-19					<0.0001					<0.0001					<0.0001					<0.0001
Yes	876	14.0	5371	86.0		96	1.5	6151	98.5		744	10.9	6068	89.1		93	1.4	6719	98.6	
No	1464	10.1	12,961	89.9		122	0.8	14,303	99.2		1231	8.0	14,207	92.0		147	1.0	15,291	99.0	
Grade					<0.0001					<0.0001					<0.0001					<0.0001
Grade7	172	4.0	4146	96.0		7	0.2	4311	99.8		144	3.2	4290	96.8		8	0.2	4426	99.8	
Grade8	193	5.1	3596	94.9		9	0.2	3780	99.8		206	5.0	3921	95.0		26	0.6	4101	99.4	
Grade9	317	8.8	3295	91.2		27	0.7	3585	99.3		263	6.9	3554	93.1		23	0.6	3794	99.4	
Grade10	403	12.6	2802	87.4		43	1.3	3162	98.7		331	9.5	3143	90.5		61	1.8	3413	98.2	
Grade11	567	18.9	2435	81.1		58	1.9	2944	98.1		479	13.9	2962	86.1		49	1.4	3392	98.6	
Grade12	688	25.1	2058	74.9		74	2.7	2672	97.3		552	18.7	2405	81.3		73	2.5	2884	97.5	
Academic level					<0.0001					<0.0001					<0.0001					<0.0001
High	668	8.4	7303	91.6		45	0.6	7926	99.4		523	6.4	7664	93.6		54	0.7	8133	99.3	
Middle	609	10.1	5432	89.9		46	0.8	5995	99.2		537	7.7	6401	92.3		61	0.9	6877	99.1	
Low	1063	16.0	5597	84.0		127	1.9	6533	98.1		915	12.8	6210	87.2		125	1.8	7000	98.2	
School type					0.7764					0.2155					0.6733					0.5872
Mixed-sex school	774	11.4	6010	88.6		63	0.9	6721	99.1		683	9.0	6916	91.0		78	1.0	7521	99.0	
Single-sex school	1566	11.3	12,322	88.7		155	1.1	13,733	98.9		1292	8.8	13,359	91.2		162	1.1	14,489	98.9	
Income					<0.0001					0.0083					<0.0001					0.1502
High	859	10.0	7710	90.0		89	1.0	8480	99.0		667	8.1	7561	91.9		95	1.2	8133	98.8	
Middle	1024	10.9	8397	89.1		86	0.9	9335	99.1		939	8.5	10,156	91.5		106	1.0	10,989	99.0	
Low	457	17.0	2225	83.0		43	1.6	2639	98.4		369	12.6	2558	87.4		39	1.3	2888	98.7	
Region					0.0011					0.1489					<0.0001					0.0326
Metropolitan	1102	10.5	9346	89.5		99	0.9	10,349	99.1		871	8.0	9978	92.0		97	0.9	10,752	99.1	
City area	1081	12.0	7934	88.0		109	1.2	8906	98.8		922	9.3	9038	90.7		126	1.3	9834	98.7	
Rural	157	13.0	1052	87.0		10	0.8	1199	99.2		182	12.6	1259	87.4		17	1.2	1424	98.8	
Parent's education level					<0.0001					0.0279					<0.0001					0.0012
Middle school grade	28	15.3	155	84.7		6	3.3	177	96.7		25	13.7	157	86.3		3	1.6	179	98.4	
High school grade	638	16.2	3291	83.8		43	1.1	3886	98.9		662	13.7	4182	86.3		73	1.5	4771	98.5	
College or higher	1376	10.7	11,425	89.3		133	1.0	12,668	99.0		1058	7.5	13,107	92.5		124	0.9	14,041	99.1	
Unknown	298	7.9	3461	92.1		36	1.0	3723	99.0		230	7.5	2829	92.5		40	1.3	3019	98.7	
Type of residence					<0.0001					0.0027					0.0001					0.0100
With family	2178	11.0	17,559	89.0		199	1.0	19,538	99.0		1867	8.7	19,518	91.3		223	1.0	21,162	99.0	
Else ^a	162	17.3	773	82.7		19	2.0	916	98.0		108	12.5	757	87.5		17	2.0	848	98.0	
Smoking					<0.0001					<0.0001					<0.0001					<0.0001
Yes	1119	39.3	1728	60.7		171	6.0	2676	94.0		701	49.0	729	51.0		162	11.3	1268	88.7	
No	1221	6.8	16,604	93.2		47	0.3	17,778	99.7		1274	6.1	19,546	93.9		78	0.4	20,742	99.6	
Perceived stress					<0.0001					0.0006					<0.0001					<0.0001
Yes	1832	12.4	12,995	87.6		179	1.2	14,648	98.8		1815	9.7	16,942	90.3		227	1.2	18,530	98.8	
No	508	8.7	5337	91.3		39	0.7	5806	99.3		160	4.6	3333	95.4		13	0.4	3480	99.6	

^a Including living with relatives, friends and living in dormitory or orphanage.

Table 2
Results of factors associated with drinking status and binge drinking.

Variables	Male				Female				
	drinking status		Alcohol-induced blackout		drinking status		Alcohol-induced blackout		
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	
Perceived decline in family income due to covid-19									
Yes	1.27	(1.15 - 1.42)	1.60	(1.19 - 2.15)	1.22	(1.09 - 1.38)	1.26	(0.93 - 1.72)	
No	1.00		1.00		1.00		1.00		
Grade									
Grade7	1.00		1.00		1.00		1.00		
Grade8	1.00	(0.80 - 1.26)	0.82	(0.28 - 2.47)	1.24	(0.94 - 1.64)	3.43	(1.37 - 8.58)	
Grade9	1.39	(1.12 - 1.72)	2.04	(0.73 - 5.68)	1.88	(1.44 - 2.46)	3.51	(1.36 - 9.04)	
Grade10	1.91	(1.53 - 2.39)	3.64	(1.31 - 10.12)	2.32	(1.77 - 3.04)	6.78	(2.82 - 16.29)	
Grade11	2.89	(2.35 - 3.57)	4.93	(1.84 - 13.25)	3.42	(2.64 - 4.43)	5.22	(2.14 - 12.76)	
Grade12	3.96	(3.18 - 4.94)	6.21	(2.28 - 16.90)	5.24	(4.04 - 6.79)	10.77	(4.55 - 25.49)	
Academic level									
High	1.00		1.00		1.00		1.00		
Middle	1.05	(0.90 - 1.22)	1.06	(0.68 - 1.64)	1.08	(0.93 - 1.25)	1.19	(0.76 - 1.87)	
Low	1.38	(1.20 - 1.58)	1.86	(1.26 - 2.74)	1.41	(1.22 - 1.62)	1.32	(0.91 - 1.91)	
School type									
Mixed-sex school	1.00		1.00		1.00		1.00		
Single-sex school	0.84	(0.72 - 0.97)	0.62	(0.46 - 0.84)	0.86	(0.75 - 0.98)	0.88	(0.65 - 1.19)	
Income									
High	1.00		1.00		1.00		1.00		
Middle	0.90	(0.79 - 1.02)	0.76	(0.55 - 1.05)	0.77	(0.68 - 0.88)	0.61	(0.45 - 0.84)	
Low	1.06	(0.90 - 1.25)	0.70	(0.45 - 1.10)	0.82	(0.68 - 0.98)	0.48	(0.31 - 0.73)	
Region									
Metropolitan	1.00		1.00		1.00		1.00		
City area	1.11	(0.98 - 1.26)	1.12	(0.80 - 1.55)	1.18	(1.02 - 1.35)	1.40	(1.02 - 1.91)	
Rural	1.13	(0.88 - 1.45)	0.77	(0.37 - 1.62)	1.75	(1.33 - 2.31)	1.36	(0.64 - 2.87)	
Parent's education level									
Middle school grade	1.00		1.00		1.00		1.00		
High school grade	1.51	(0.84 - 2.69)	0.56	(0.20 - 1.56)	1.05	(0.63 - 1.77)	0.57	(0.15 - 2.13)	
College or higher	1.22	(0.69 - 2.17)	0.74	(0.28 - 1.98)	0.69	(0.41 - 1.15)	0.49	(0.14 - 1.71)	
Unknown	1.03	(0.58 - 1.85)	0.96	(0.34 - 2.76)	0.77	(0.46 - 1.31)	0.81	(0.24 - 2.77)	
Type of residence									
With family	1.00		1.00		1.00		1.00		
Else ^a	1.25	(0.96 - 1.64)	1.90	(1.10 - 3.29)	0.94	(0.72 - 1.24)	1.03	(0.57 - 1.85)	
Smoking									
Yes	5.97	(5.34 - 6.67)	13.61	(9.18 - 20.18)	11.08	(9.62 - 12.77)	23.54	(17.01 - 32.58)	
No	1.00		1.00		1.00		1.00		
Perceived Stress									
Yes	1.25	(1.11 - 1.40)	1.37	(0.92 - 2.05)	1.74	(1.46 - 2.08)	2.14	(1.12 - 4.06)	
No	1.00		1.00		1.00		1.00		

^a Including living with relatives, friends and living in dormitory or orphanage.

drinking status in both genders (male: OR 1.38 CI 1.20–1.58; female: OR 1.41 CI 1.22–1.62). Adolescents who perceived stress showed an increased risk of alcohol consumption (male: OR 1.25 CI 1.11–1.40; female: OR 1.74 CI 1.46–2.08). Conversely, on perceiving a worsened household, students who went to single-sex schools were less likely to drink alcohol than mixed-sex schools (male: OR 0.84 CI 0.72–0.97;

female: OR 0.86 CI 0.75–0.98). Living, or not, with parents was unrelated to the children's current drinking.

Fig. 1 presents subgroup analysis stratified by independent variables. Among 10th grade, male was more positively associated with alcohol consumption than for middle school students, when comparing students who did not perceive a family income decline (current drinking in grade

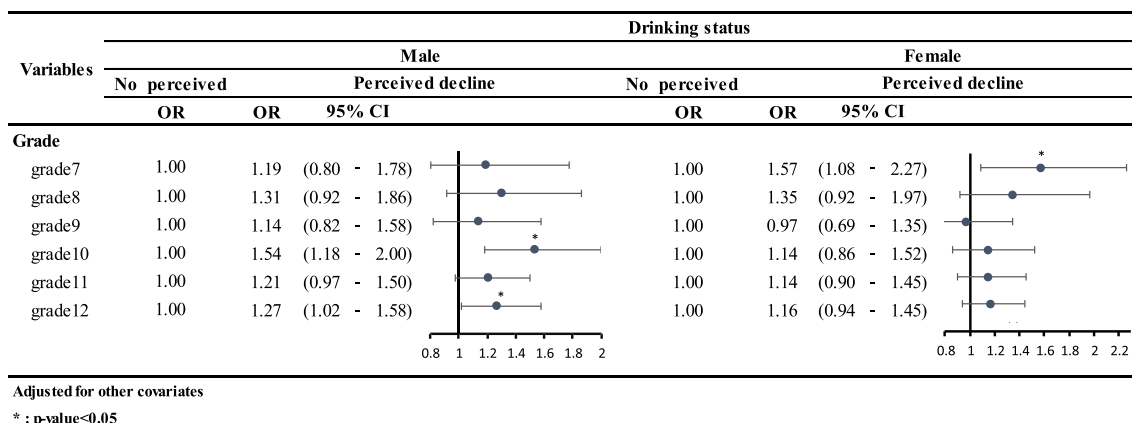


Fig. 1. The results of subgroup analysis stratified by grade*.

10: OR 1.54 CI 1.18–2.00, grade 12: OR 1.27 CI 1.02–2.58); in 7th grade, being female was more positively associated with alcohol consumption than in high school students, when comparing students who did not perceive a family income decline (current drinking in grade 7: OR 1.57 CI 1.08–2.27).

Table 3 displays logistic regression analysis results stratified by dependent variables. Compared with those who did not, adolescents who perceived a decline in family income due to COVID-19 had a significantly increased frequency of drinking in the male group (1–9 days: OR 1.26 CI 1.11–1.42, 10–19 days; OR 1.70 CI 1.22–2.36 over 20 days; OR 1.74 CI 1.15–3.09). Those who perceived family financial loss had an increased frequency of blackout drinking; however, it was not significant.

4. Discussion

In this study, we investigated the association between adolescents who perceived family income decline and their drinking status and blackout drinking by using nationally represented survey data. Adolescents who believed their household income had worsened had a higher association with drinking status as well as blackout drinking. Our findings, consistent with the results of prior studies, demonstrate a higher likelihood of alcohol use among adolescents with family income decline (Poonawalla et al., 2014; Melotti et al., 2011). Adolescents from economically unstable households may suffer more behavioral and mental health problems (Chase-Lansdale et al., 2003). These can especially lead to an increased alcohol dependency with frequent blackout drinking.

Some studies have shown similar results to ours. For instance, a report on South Korea under the International Monetary Fund (IMF) management found increasing youth delinquency, such as theft, alcohol consumption, and drug use (Hong et al., 2011). A potential effect of Greece economic recession on adolescent substance use showed a higher rate of cannabis and alcohol consumption. In stressful situations, such as sudden loss of household income or parents' unemployment, children and adolescents are more likely to misbehave and engage in risky

behaviors. In the US during the global economic crisis, the prevalence of drinking declined slightly, from 52% in 2006–2007 to 51.6% in 2008–2009. However, frequent binge drinking increased from 4.8% in 2006–2007 to 5.1% in 2008–2009 (Bor et al., 2013).

Contrarily, other studies showed that the unemployment rate is not linked to alcohol use among adolescents (Svensson and Hagquist, 2010). Experiencing an economic crisis did not increase alcohol consumption. This can be explained from three perspectives. The first is affordability and accessibility. Owing to the low price of alcohol in South Korea—a bottle can be sold for as low as two dollars—adolescents can afford it easily. Further, owing to 24-h convenience stores selling alcohol, it is easier for adolescents to purchase alcoholic beverages. Regular drinking leads to binge drinking and alcohol dependency for adolescents, aspects that are deeply linked to accessibility and ease of purchase. The second is that, in our study, the variable concerning the decline in family income was subjective, and did not measure the actual family income. In other words, the actual economic level of individuals who perceived a decline in family income may be high. The third is that, in Korea, under the Youth Protection Act, sellers are punished for selling alcohol to teenagers under 19 years. However, the law does not directly stipulate the restrictions applicable to adolescents who purchased alcoholic beverages (Baek and Sim, 2019). Thus, the drinking age restriction may not be effective in preventing adolescent alcohol-use.

The COVID-19 pandemic is a unique situation, requiring such measures as social distancing to curb the spread of the infection. Many adolescents have spent a significant amount of time with their families, waiting for the spread of COVID-19 to decrease (Sarvey and Welsh, 2021). Exposure to alcohol consumption in the family can be both a risk factor and trigger for adolescent substance use. In South Korea, parents are the main suppliers of alcohol (Asante et al., 2014). Parental alcohol consumption at home was found to increase the exposure of children and adolescents, as they can drink with ease (Dumas et al., 2020b). Additionally, some studies showed that the perceived availability of marijuana and alcohol declined during the COVID-19 pandemic. These results demonstrate the substantial challenges facing a supply-side approach to reduced adolescent substance consumption (Miech et al.,

Table 3
The results of subgroup analysis stratified by dependent variables.

Variables	Drinking status											
	Never			Former			1– 9 days/month		10– 19 days/month		over 20 days/month	
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Male												
Perceived decline in family income due to covid-19												
Yes		1.06	(0.96 – 1.17)	1.26	(1.11 – 1.42)		1.70	(1.22 – 2.36)		1.74	(1.15 – 2.65)	
No	1.00											
Female												
Perceived decline in family income due to covid-19												
Yes		1.13	(1.03 – 1.23)	1.27	(1.12 – 1.45)		1.25	(0.79 – 1.95)		1.41	(0.76 – 2.61)	
No	1.00											
Variables	Alcohol-induced blackout											
	Never			Former			1 ~ 2 days/month		3 ~ 4 days/month		Over 5 days/month	
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Male												
Perceived decline in family income due to covid-19												
Yes		1.24	(1.11 – 1.38)	1.81	(1.29 – 2.54)		1.97	(0.75 – 5.17)		1.07	(0.48 – 2.39)	
No	1.00											
Female												
Perceived decline in family income due to covid-19												
Yes		1.21	(1.08 – 1.37)	1.18	(0.83 – 1.67)		3.51	(1.37 – 8.98)		1.98	(0.77 – 5.12)	
No	1.00											

2021). However, this phenomenon is unlikely to occur in Korea, as it did not impose a lockdown policy and stores remain open.

In our study, compared to no perceived economic stress, perception of a decline of family income was found to be linked to alcohol-use. In this category, 7th grade females and 10th grade males indicated most alcohol use. This may be linked to the fact that the period of puberty for girls is usually experienced earlier than boys. In a previous study, substance use and misuse rarely occurred before puberty (Martin et al., 2002). Moreover, the interplay between parent–child relationship and on-time pubertal boys' and girls' alcohol use was found to be crucial in a previous study (Shelton and Van Den Bree, 2010).

Adolescents with alcohol use have an increased risk of social problems and suicidal behavior. Adolescents with depressive symptoms are more likely to have unhealthy patterns of consuming alcohol. Severe depressive symptoms are associated with more frequent consumption and intoxication (Johannessen et al., 2017). Further, teenage drinking is linked to increased risky sexual activity. One study found that sexual activity after drinking was more associated with binge drinking than normal drinking (Seo et al., 2017). In a study on the sexual behavior of college students, experience of rape was significantly higher in female binge drinkers than normal drinkers (Sohn and Park, 2006). The current findings recommend the need for continued alcohol control efforts during the COVID-19 pandemic, restricting youth access to alcohol and supporting prevention.

4.1. Limitations

The current study has certain limitations. First, it was based on data from a cross-sectional study. Therefore, though associations could be confirmed, causality could not be evaluated. Second, our study relied on self-reported data. Hence, the measurement of household financial loss might not be accurate. Future data and research are required to fully discern the impact of the pandemic on a new generation of adolescents. Future studies will also need to perform precise measurements of actual household income. Third, as the cut-off points for drinking status and heavy drinking factors were adopted from the KYRBWS, it may be difficult to generalize our findings to different settings or populations (Poortinga, 2007).

Despite these limitations, this study has several strengths. We used the most recent, nationally representative database to determine the association between perceived family income loss and the risk of alcohol consumption in adolescents. Therefore, the results obtained are highly representative of healthy South Korean adolescents.

5. Conclusion

A significantly positive association of perceived decline in family income due to COVID-19 with increased risks of alcohol consumption was observed among Korean adolescents of both sexes. 7th grade females and 10th grade males were more likely to drink alcohol when their household income changed, compared to high school students. Further, adolescents who perceived family financial loss had an increased frequency of drinking.

CRedit authorship contribution statement

Yun Hwa Jung conceived of the presented idea. Yu Shin Park and Yun Hwa Jung developed the theory and performed the computations. Yu Shin Park and Yun Hwa Jung verified the analytical methods. Eun Cheol Park and Jaeyong Shin encouraged Yu Shin Park to investigate 'Association between perceived decline in family income due to COVID-19 and alcohol consumption' and supervised the findings of this work. And no funding was received for conducting this study. All authors discussed the results and contributed to the final manuscript.

Declaration of competing interest

The authors have no conflict of interest to declare.

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