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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
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 (Haggquist, 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 (Grigolatto 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 drank 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
| Variables                                        | Male |                | Female |                |
|-------------------------------------------------|------|----------------|--------|----------------|-----------------------------------------------------------------|
| Drinking status                                 |      | Yes            | No     | P-value        | Yes               | No               | P-value               |
| N %                                             |      | 2340 11.3      | 18,332 88.7 | <0.0001    | 1975 8.9        | 20,275 91.1     | <0.0001               |
| Alcohol-induced blackout                        |      | 218 1.1        | 20,454 98.9 | <0.0001    | 744 10.9        | 6068 89.1      | <0.0001               |
| Perceived decline in family income due to       |      |                |        |                | Yes 10.9        | No               | 144 2429 96.8     | <0.0001               |
| covid-19                                        |      |                |        |                | No               | 206 5.0          | 3921 95.0         | <0.0001               |
| Grade                                           |      |                |        |                |                  |                 |                      |                      |
| Grade7                                          |      | 172 4.0        | 4146 96.0 | <0.0001    | 144 3.2        | 4290 96.8      | <0.0001               |
| Grade8                                          |      | 193 5.1        | 3596 94.9 | <0.0001    | 206 5.0        | 3921 95.0      | 26 0.6                |
| Grade9                                          |      | 317 8.8        | 3295 91.2 | <0.0001    | 263 6.9        | 3554 93.1      | 23 0.6                |
| Grade10                                         |      | 403 12.6       | 2802 87.4 | <0.0001    | 331 9.5        | 3143 90.5      | 61 1.8                |
| Grade11                                         |      | 567 18.9       | 2435 81.1 | <0.0001    | 479 13.9       | 2962 86.1      | 49 1.4                |
| Grade12                                         |      | 688 25.1       | 2058 74.9 | <0.0001    | 552 18.7       | 2405 81.3      | 73 2.5                |
| Academic level                                  |      |                |        | <0.0001    | Yes 7.6        | 7592 92.4      | <0.0001               |
| School type                                     |      |                |        | <0.0001    | No               | 3139 69.7      | <0.0001               |
| Income                                          |      |                |        | <0.0001    | Yes 859 10.0   | 8730 89.0      | <0.0001               |
| Region                                          |      |                |        | <0.0001    | No               | 915 15.0        | <0.0001               |
| Parent's education level                        |      |                |        | <0.0001    | Yes 1102 10.5  | 10,349 89.5      | <0.0001               |
| Smoking                                         |      |                |        | <0.0001    | No               | 871 15.0        | <0.0001               |
| Perceived stress                                |      |                |        | <0.0001    | Yes 1119 39.3  | 1728 60.7      | <0.0001               |
| a Including living with relatives, friends and  |      |                |        | <0.0001    | No               | 1221 6.8        | <0.0001               |
| living in dormitory or orphanage.               |      |                |        | <0.0001    | Yes 1832 12.4  | 12,995 87.6     | <0.0001               |
|                                                 |      |                |        | <0.0001    | No               | 508 8.7         | <0.0001               |

* Y.S. Park et al.
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. 

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

| Variables                               | Male drinking status | Alcohol-induced blackout | Male 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                     |
| 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*                                   | 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                     |

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

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 binging 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 | OR   | OR   | 95% CI |
|-----------|----------------|------|------|--------|
| Male      | Never          | 1.00 | 1.00 | 1.00   |
|           | Former         | 1.06 | (0.96 | 1.17) |
|           | 1–9 days/month | 1.26 | (1.11 | 1.42) |
|           | 10–19 days/month| 1.70 | (1.22 | 2.36) |
|           | over 20 days/month| 1.74 | (1.15 | 2.65) |
| Female    | Yes            | 1.13 | (1.03 | 1.23) |
|           | No             | 1.00 | 1.00 | 1.00   |
|           | 1.27 | (1.12 | 1.45) |
|           | 1.25 | (0.79 | 1.95) |
|           | 1.41 | (0.76 | 2.61) |

| Variables | Alcohol-induced blackout | OR   | OR   | 95% CI |
|-----------|--------------------------|------|------|--------|
| Male      | Never        | 1.24 | (1.11 | 1.38) |
|           | Former       | 1.81 | (1.29 | 2.54) |
|           | 1–2 days/month| 1.97 | (0.75 | 5.17) |
|           | 3–4 days/month| 1.07 | (0.48 | 2.39) |
|           | Over 5 days/month| 1.00 | 1.00 | 1.00   |
| Female    | Yes            | 1.21 | (1.08 | 1.37) |
|           | No             | 1.00 | 1.00 | 1.00   |
|           | 1.18 | (0.83 | 1.67) |
|           | 3.51 | (1.37 | 8.98) |
|           | 1.98 | (0.77 | 5.12) |
Declaration of competing interest

The authors have no conflict of interest to declare.

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