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# Income disparity and mortality among patients with alcohol use disorder in South Korea

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ABSTRACT

Problems related to alcohol consumption, particularly alcohol disorders, occur frequently in South Korea and are gradually increasing due to the drinking culture and social atmosphere. We analyzed the relationship between mortality and income among patients with alcohol disorders. We used data from the National Sampling Claim Data 2003–2013, which included medical claims filed for 10,593 patients newly diagnosed with alcohol disorders. We performed survival analyses using a Cox proportional hazards model. 12.79% died during the study period. Patients with lower incomes were more positively associated with the risk of mortality than those with higher incomes (0–30 percentile: hazard ratio [HR] = 1.432, 95% confidence interval [CI] = 1.155–1.777; 31–60 percentile: HR = 1.318, 95% CI = 1.065–1.633; 61–90 percentile: HR = 1.352, 95% CI = 1.097–1.665; 91–100 percentile: ref). Such associations were significant in males, patients with mild conditions, or those who lived in metropolitan areas. In conclusion, we found that income disparity was related to mortality among patients diagnosed with disorders due to alcohol use. Thus, healthcare professionals need to provide active intervention in the early phase of alcohol disorders, and consider policy that would improve healthcare accessibility for low-income populations in order to reduce income disparity.

## 1. Introduction

South Korea has experienced remarkable economic and social development since the late 20th century. National Health Insurance was introduced in 1989, rapidly improving the overall health status and life expectancy of the population (Kwon, 2009). However, with such rapid developments, other types of problems such as mental health and chronic diseases have emerged (Kwon et al., 2009; Jung et al., 2015). One of these problems, alcohol consumption, is a major risk factor in South Korea (Rehm et al., 2009).

Alcohol consumption in South Korea is high compared to other countries; the World Health Organization (WHO) reports that South Korea has a total alcohol per capita consumption (APC) of 12.3 l of pure alcohol, while the WHO Western Pacific Region has an APC of 5.4 l of pure alcohol (World Health Organization, 2014). Although some campaigns and studies to reduce alcohol consumption have already been conducted, few definite solutions exist for coping with the problem (Kim et al., 2013). This is because the rapid social and economic developments were like two sides of the same coin-even though it had huge positive effects, it also had negative outcomes (Khang et al., 2005). With such remarkable changes, the population is under pressure to find and maintain their position in society, which increases the importance of economic and social factors. As a result, people in South Korea may consume alcohol in order to forget their economic and social problems. Furthermore, the social and cultural atmospheres in South Korea are conducive to alcohol consumption (Lee et al., 2010). However, excessive alcohol consumption can cause negative health outcomes. According to the WHO, the prevalence of alcohol use disorders and alcohol dependence in South Korea was higher than other countries (South Korea: 6.2%, WHO Western Pacific Region: 4.6%) (World Health Organization, 2014). In addition, the Health Insurance and Review Service (HIRA) reports show that the number of patients in South Korea

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**Table 1**
General characteristics of the study population by death.

| Variables | Total | | Survival | | Death | | *P*-value |
|---|---|---|---|---|---|---|---|
| | *N*/ Mean | %/ SD | *N*/ Mean | %/ SD | *N*/ Mean | %/ SD | |
| **Sex** | | | | | | | |
| Male | 7918 | 74.75 | 6706 | 84.69 | 1212 | 15.31 | < 0.0001 |
| Female | 2675 | 25.25 | 2532 | 94.65 | 143 | 5.35 | |
| **Age (Years)** | | | | | | | |
| 0–29 | 1217 | 11.49 | 1198 | 98.44 | 19 | 1.56 | < 0.0001 |
| 30–39 | 1781 | 16.81 | 1686 | 94.67 | 95 | 5.33 | |
| 40–49 | 2967 | 28.01 | 2633 | 88.74 | 334 | 11.26 | |
| 50–59 | 2484 | 23.45 | 2140 | 86.15 | 344 | 13.85 | |
| 60–69 | 1394 | 13.16 | 1104 | 79.20 | 290 | 20.80 | |
| 70 + | 750 | 7.08 | 477 | 63.60 | 273 | 36.40 | |
| **Income level** | | | | | | | |
| 0–30 percentile | 3403 | 32.12 | 2922 | 85.87 | 481 | 14.13 | 0.0046 |
| 31–60 percentile | 2959 | 27.93 | 2615 | 88.37 | 344 | 11.63 | |
| 61–90 percentile | 3169 | 29.92 | 2754 | 86.90 | 415 | 13.10 | |
| 91–100 percentile | 1062 | 10.03 | 947 | 89.17 | 115 | 10.83 | |
| **Types of insurance coverage** | | | | | | | |
| Medical aid | 852 | 8.04 | 696 | 81.69 | 156 | 18.31 | < 0.0001 |
| NHI, self-employed insured | 4784 | 45.16 | 4184 | 87.46 | 600 | 12.54 | |
| NHI, employee insured | 4957 | 46.80 | 4358 | 87.92 | 599 | 12.08 | |
| **Region** | | 0.00 | | | | | |
| Metropolitan | 4551 | 42.96 | 568 | 12.48 | 3983 | 87.52 | 0.406 |
| Others | 6042 | 57.04 | 787 | 13.03 | 5255 | 86.97 | |
| **Year of diagnosis** | | | | | | | |
| 2003 | 799 | 7.54 | 587 | 73.47 | 212 | 26.53 | < 0.0001 |
| 2004 | 828 | 7.82 | 651 | 78.62 | 177 | 21.38 | |
| 2005 | 931 | 8.79 | 743 | 79.81 | 188 | 20.19 | |
| 2006 | 913 | 8.62 | 761 | 83.35 | 152 | 16.65 | |
| 2007 | 990 | 9.35 | 829 | 83.74 | 161 | 16.26 | |
| 2008 | 1153 | 10.88 | 991 | 85.95 | 162 | 14.05 | |
| 2009 | 1058 | 9.99 | 957 | 90.45 | 101 | 9.55 | |
| 2010 | 936 | 8.84 | 848 | 90.60 | 88 | 9.40 | |
| 2011 | 976 | 9.21 | 901 | 92.32 | 75 | 7.68 | |
| 2012 | 1036 | 9.78 | 1012 | 97.68 | 24 | 2.32 | |
| 2013 | 973 | 9.19 | 958 | 98.46 | 15 | 1.54 | |
| **Disability** | | | | | | | |
| None | 9572 | 90.36 | 8396 | 87.71 | 1176 | 12.29 | < 0.0001 |
| Mild | 789 | 7.45 | 652 | 82.64 | 137 | 17.36 | |
| Severe | 232 | 2.19 | 190 | 81.90 | 42 | 18.10 | |
| **Charlson Comorbidity Index** | | | | | | | |
| 0 | 8332 | 78.66 | 7480 | 89.77 | 852 | 10.23 | < 0.0001 |
| 1 | 1694 | 15.99 | 1371 | 80.93 | 323 | 19.07 | |
| ≥ 2 | 567 | 5.35 | 387 | 68.25 | 180 | 31.75 | |
| **Clinical condition of disorders due to use of alcohol** | | | | | | | |
| Acute intoxication | 2290 | 21.62 | 2145 | 93.67 | 145 | 6.33 | < 0.0001 |
| Harmful use | 1407 | 13.28 | 1270 | 90.26 | 137 | 9.74 | |
| Dependence syndrome | 5879 | 55.50 | 4960 | 84.37 | 919 | 15.63 | |
| Withdrawal state | 327 | 3.09 | 254 | 77.68 | 73 | 22.32 | |
| Psychotic disorder | 690 | 6.51 | 609 | 88.26 | 81 | 11.74 | |
| **Average annual pharmaceutical expenditures for disorders due to use of alcohol** | 25,994.7 | 118,262.90 | 25,995.41 | 118,586.16 | 25,989.61 | 116,078.09 | 0.9987 |
| **Number of medical centers per 1000 residents** | 9.5 | 4.88 | 9.39 | 4.82 | 9.84 | 5.26 | 0.0017 |
| **Financial independence rate of local government** | 57.6 | 22.68 | 57.85 | 22.57 | 55.78 | 23.32 | 0.0018 |
| **Total** | **10,593** | **100.00** | **9238** | **87.21** | **1355** | **12.79** | |

with alcohol use disorder gradually increased (70,806 patients in 2010 to 77,232 in 2015) (Health Insurance Review & Assessment Service, 2010-15).

Nevertheless, there are few policies in place for reducing problems related to alcohol consumption. In South Korea, policy focuses primarily on the pricing of alcohol. In addition, there are few programs regarding the management of alcohol use disorder (Chun et al., 2011). The number of alcohol-attributable deaths in South Korea was higher than that of other countries (South Korea: 7.5 in 2012, the second highest in the WHO Western Pacific Region), highlighting the need to develop effective strategies to manage such patients (World Health Organization, 2014). Many studies have explored the relationship between alcohol dependence or alcohol use disorder and health outcomes (Perreira and Sloan, 2002; Rehm et al., 2009; Ronksley et al., 2011).

In this study, we focused on income disparity and mortality of patients with alcohol use disorder in South Korea. Among the many factors that could affect health outcomes, income is a major one that could affect health outcomes of patients with specific diseases (Kawachi et al., 1997). Generally, those with higher income tend to healthy behaviors and can easily access medical resources when necessary (Van Doorslaer et al., 2006; Pampel et al., 2010). By the reports in OECD (Organization for Economic Co-operation and Development), South Korea was continuously one of countries with greatest income inequality (Atkinson index for earning inequality: 0.32, 4th among the OECD in 2010) (OECD, 2010). The poor income disparity might be continued to the health inequality by the differences in economic accessibility and health behavior. Although the South Korean government introduced a case payment system in 2008 for patients with low income, there was much controversy related to optimal coverages. Many studies were conducted regarding income disparity and health