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ORIGINAL ARTICLE

Widening social disparities in alcohol-attributable deaths among Korean men aged 40–59 years during the transitional period of the economic crisis (1995–2005)

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Abstract
Objectives This study examined socioeconomic disparities in alcohol-related mortality among Korean men aged 40–59 years during the period before and after the economic crisis in the late 1990s.
Methods We used Korean Census data (1995, 2005) and data from the National Death Files (1994–1996, 2004–2006) on education and employment status as indicators of socioeconomic position. Based on the age-standardized rates of alcohol-attributable deaths, relative discrepancies across socioeconomic positions were estimated.
Results Socially disadvantaged men were substantially disadvantaged in terms of alcohol-attributable mortality in both years. The disadvantage of men with the lowest level of education relative to the highest was worse in 2005 than in 1995. The relative disadvantage in alcohol-attributable deaths seemed to narrow over time based on the rate ratios. However, the relative index of inequality was higher in 2005 compared to 1995 for both education and occupation.
Conclusions The results showed that alcohol-attributable mortality in Korea became socioeconomically polarized during the economic crisis. The serious impact of economic polarization following the economic crisis might have been transmitted to alcohol-attributable mortality.

Keywords Alcohol-attributable mortality · Economic crisis · Korea · Men age 40–59 years · Socioeconomic disparity

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Introduction

Socioeconomic disparities in alcohol-attributable mortality have been addressed in a number of countries (Makela 1999a; Hemstrom 2002; Leinsalu et al. 2003; Najman et al. 2007; Herttua et al. 2008; Emslie and Mitchell 2009; Pridemore et al. 2010; Bessudnov et al. 2012). Most studies have reported that low educational attainment and manual labor were incrementally associated with the risk of alcohol-attributable mortality. One study from Finland documented that socioeconomic variation in alcohol-attributable mortality accounted for a substantial part of the social disparity in overall mortality (Makela et al. 1997).

Economic crisis or recession may affect disparities in alcohol-attributable mortality rates across social groups (Makela 1999b; Valkonen et al. 2000; Kovács 2008; Rahu et al. 2009; Pärna and Rahu 2010). For instance, trends in economic conditions and alcohol-related mortality in Finland were associated in only lower educational and occupational groups (Herttua et al. 2007). During an economic downturn, socially disadvantaged people tended to consume less alcohol, thereby decreasing alcohol-related mortality. In Russia, however, the sudden rise in the mortality rates in the early 1990s was largely attributable to the increased alcohol consumption among those in the lower socioeconomic classes that was caused by economic unrest after the collapse of the Soviet Union (Shkolnikov et al. 1998).

South Korea experienced a severe economic crisis in the late 1990s. Although the crisis officially ended in 2001 when the government repaid most of the emergency relief funds to the International Monetary Fund (IMF), the adverse impact of the crisis remained in almost all spheres of Korean society. For instance, economic stratification increased, as indicated by the increased *Gini* coefficient (0.28 in 1995, 0.32 in 2000, and 0.31 in 2005), and the unemployment rate substantially

increased from 2 % in 1995 to 6.8 % in 1998 (Korean Statistical Information Service 2011). Studies even pointed out that Korean society had become economically polarized since the economic crisis, disrupting the gradient of social stratification (Khang et al. 2005a).

Given the negative relationship between economic crisis and social disparity in alcohol-related mortality previously reported in Russia, it is reasonable to presume that the social disparity in alcohol-related mortality increased among Korean men aged 40–59 years, among whom the major cause of death involves alcohol-related conditions, after the economic crisis. Alcohol consumption by Korean males, like that by Russian males, is considered to be a culturally important part of social life and is widespread in all social classes (Han 2000). Liver-related conditions (e.g., cirrhosis and liver cancer) have been the second or third leading cause of death among male Koreans in their 40s and 50s during the last two decades (Statistics Korea 2006). On the other hand, it is also possible that the disparity exists but was not aggravated by the economic crisis. In Russia, the increase in the social disparity in alcohol-related mortality was known to be due to alcohol consumption among those with less education (Shkolnikov et al. 1998). Unlike the case of Russia, no significant change in overall alcohol consumption was reported in Korea after the economic crisis compared to during previous years (The Korean Public Health Association 2011). Furthermore, a recent Korean study found little difference in binge drinking patterns across various social classes (KCDC and KIHASA 2007).

The aim of this study was to explore the relationship between alcohol-related mortality and socioeconomic status among men aged 40–59 years in Korea, focusing particularly on its association with the economic crisis in the late 1990s. This population was the most vulnerable to involuntary unemployment and early retirement during the global economic crisis (Shin and Lee 2000), and conditions related to alcohol have been the major cause of death in this population for decades. Although a study (Khang et al. 2005b) reported that the alcohol-related mortality rate in Korea was similar before and after the economic crisis, this study explored the mortality rate of only the overall population and did not consider issues related to social stratification. The current study compared alcohol-related mortality rates across social groups in Korea before and after the economic crisis.

Methods

Data

This study utilized the National Death Files (1994–1996, 2004–2006) and Korean Census data (1995, 2005) to compute 5-year interval age-specific mortality rates of deaths wholly attributable to alcohol. Korea's experience of economic crisis began in late 1997 and lasted until 2001. To compare the alcohol-attributable deaths before and after the economic crisis, we considered two time points: 1995 and 2005. Mean death rates for 1994–1996 and 2004–2006 were calculated to determine death rates in 1995 and 2005, respectively, as the mortality rates of 1 year could be atypical.

Measures

Conditions directly attributable to alcohol are pertinent when measuring the actual risk to life caused by alcohol consumption, although a number of fatal conditions are indirectly affected by alcohol intake. This study considered deaths caused wholly by alcohol consumption. The United States National Center for Health Statistics (US NCHS) classified several conditions as *wholly* attributable to alcohol consumption. According to the ICD-10 condition codes, 14 superordinate conditions are included in this classification. Table 1 lists conditions wholly attributable to alcohol according to the US NCHS. We used "conditions wholly attributable to alcohol" in the analyses.

Social groups were stratified by educational attainment and occupation. Three educational levels were identified: graduated from junior high school or less (0–9 years of education), graduated from or attended high school (10–12 years), and graduated from or attended junior college or higher (13+ years). In terms of occupational class, professionals, clerks, and service/sale workers were categorized as "non-manual" workers; agricultural/forestry/fishery workers, artisans, workers in related trades, and workers in elementary occupations were combined and categorized as "manual" workers; and those unemployed or not in the labor force were categorized as "unemployed/not in labor force." The level of education of the Korean population changed between 1995 and 2005. The proportion that graduated from or attended high school and graduated from or attended junior college or higher institutions increased significantly, whereas the proportion that had, at most, graduated from junior high school decreased significantly. Over the same period, the proportion of manual workers declined.

Statistical analyses

Age-standardized death rate was calculated based on the age structure from the 2005 census population and compared across social groups. To examine to what extent the social disparity in alcohol-attributable mortality changed as Korean society experienced the economic crisis, relative disparities in 1995 and 2005 were examined using rate

Table 1 Conditions wholly attributable to alcohol, classified by the United States National Center for Health Statistics (2009)

Condition	ICD-10 codes
Alcohol-induced pseudo-Cushing's syndrome	E24.4
Mental and behavioral disorders due to use of alcohol	F10
Degeneration of nervous system due to alcohol	G31.2
Alcoholic polyneuropathy	G62.1
Alcoholic myopathy	G72.1
Alcoholic cardiomyopathy	I42.6
Alcoholic gastritis	K29.2
Alcoholic liver disease	K70
Alcohol-induced acute pancreatitis	K85.2
Alcohol-induced chronic pancreatitis	K86.0
Excessive blood level of alcohol	R78.0
Accidental poisoning by and exposure to alcohol	X45
Intentional self-poisoning by and exposure to alcohol	X65
Poisoning by and exposure to alcohol, undetermined intent	Y15

ratios and the relative index of inequality (RII). Here, RII was estimated to consider the different population composition of social groups in the two study years (Pamuk 1985). Standard errors for death rates and rate ratios were estimated with the methods developed by Morris and Gardner (1988). The RIIs and their standard errors were estimated using methods suggested by Cheng et al. (2008). All mortality rates delineated in the current study reflect the number of deaths per 100,000 people.

Results

Table 2 shows the number of deaths attributable wholly to alcohol and the crude death rates by age, education, and occupation in 1995 and 2005. The number of alcohol-attributable deaths was 1,428 in 1995 and 2,739 in 2005. Note that deaths in unknown educational or occupational categories were omitted from the subsequent analyses. Table 2 also depicts the proportion of the population represented by each social group. The proportion of highly educated men clearly increased in 2005. Compared to 1995, the proportion of manual workers decreased in 2005, while that of non-manual workers and unemployed/not in labor force increased slightly.

Table 3 shows the age-standardized alcohol-attributable death rates per 100,000 by level of educational attainment and occupational class. The age-standardized death rates were inversely associated with educational attainment and occupational class in both study years. Over the decade of the study period, the death rate increased substantially among the least educated populations from 58 in 1995 to 121 in 2005. Similarly, alcohol-attributable deaths were highly concentrated among those unemployed/not in the labor force, and their death rate increased from 123 in 1995 to 235 in 2005. However, the death rate among manual workers decreased slightly.

Table 4 reports the relative differences in alcohol-attributable death rates across educational groups and occupational classes expressed as rate ratios. The death rates of those who had graduated from or attended college and non-manual workers were used as references. It is clear from the rate ratios that the relative disadvantage of the least educated and unemployed/not in labor force was substantial in both study years. This relative disadvantage increased slightly for education during the study period, while it diminished for occupation. Table 4 also shows the RII, which is a measure of the proportionate change in the death rate between the highest and lowest social groups incorporating the population distribution of the social groups. RII values increased over the two study years in terms of both occupation and education. This indicates that the relative differences in the alcohol-attributable death rates in occupation were larger in 2005 than in 1995, as changes in the population composition of occupation classes were considered.

Discussion

This study examined the social disparities in wholly alcohol-attributable deaths among Korean men aged 40–59 years, particularly focusing on trends associated with the economic crisis. Measuring socioeconomic status by educational attainment and occupational class, this study documented a substantial gap in age-standardized death rates between the most and the least advantaged populations in 1995 and 2005. We also revealed that the relative disparities in alcohol-related death rates between the most and the least advantaged social groups increased considerably during the 10-year study period. Although the relative inequality decreased for occupation as indicated by the rate ratios, it increased when changes in population share across occupational classes were considered, as indicated by the RII. Although not shown in the table, simple calculation of absolute differences in the age-standardized death rates between the most and the least advantaged social groups also confirms the widened gap of alcohol-related mortality during 1995 and 2005 (e.g., the absolute difference for occupation rose from 119 in 1995 to 225 in 2005, and the same pattern was observed for education).

In terms of the increased social disparity between the highest and lowest classes in alcohol-attributable death rates during the transition period of the economic crisis (1995–2005), the experience of Korea seems similar to that

Table 2 Number of deaths and crude death rates (per 100,000) wholly attributable to alcohol by age, education, and occupation, based on the Korea National Death Files (1994–1996, 2004–2006) and Korea Census data (1995, 2005)

	1995		2005	
	Population share (%)	*N* (death rates)	Population share (%)	*N* (death rates)
Age (years)				
40–44	33.0	365 (23)	31.6	573 (28)
45–49	26.3	350 (35)	29.7	837 (43)
50–54	21.5	358 (35)	21.6	756 (53)
55–59	19.3	355 (38)	17.1	573 (51)
Education				
Junior high school or less (0–9 years)	41.0	1,130 (57)	23.3	1,713 (112)
Graduated from or attended high school (10–12 years)	37.2	249 (14)	42.4	825 (30)
Graduated from or attended junior college or higher (over 13 years)	21.7	45 (4)	34.3	183 (8)
Unknown	0.1	4	0.0	18
Occupation				
Non-manual workers	28.1	52 (4)	31.3	186 (9)
Manual workers	61.1	817 (28)	52.6	884 (26)
Unemployed/not in labor force	10.3	544 (111)	13.4	1,616 (183)
Unknown	0.6	15	2.7	53

Deaths of unknown educational or occupational categories were not included in the analyses

Table 3 Age-standardized wholly alcohol-attributable death rates per 100,000 by education and occupation based on the Korea National Death Files (1994–1996, 2004–2006) and Korea Census data (1995, 2005)

	1995	2005
Education		
Junior high school or less (0–9 years)	58	121
Graduated from or attended high school (10–12 years)	15	30
Graduated from or attended junior college or higher (over 13 years)	5	9
Occupation		
Non-manual workers	4	10
Manual workers	28	25
Unemployed/not in labor force	123	235

The 2005 Census population was used as the index population for age standardization

of Russia and Estonia (Shkolnikov et al. 1998; Leinsalu et al. 2003). In these nations, economic crisis and recession after the collapse of the socialist economy caused major increases in the consumption of low-quality surrogate alcohol among socially disadvantaged people, resulting in a widened alcohol-related mortality gap between the highest and lowest socioeconomic groups (Shkolnikov et al. 1998; Rahu et al. 2009; Pärna and Rahu 2010). As mentioned previously, the level of alcohol consumption during the recession did not change, and the pattern of binge drinking in Korea does not differ according to social class. That is, we have insufficient evidence to conclude that the increased alcohol-related mortality gap between social groups in Korea is attributable to increased alcohol consumption by socially disadvantaged men aged 40–59 years after the economic crisis. However, we cannot simply rule out the possibility of increased differences in the pattern of alcohol consumption according to social class, because hazardous drinking; i.e., more frequent and greater alcohol consumption than binge drinking, might be more prevalent among Korean men in the lowest social class. Unfortunately, we have no empirical evidence of this.

In addition to the different pattern of alcohol consumption, we focus on the significant socioeconomic polarization and downward class mobility that suddenly occurred immediately following the onset of the economic crisis in 1997. The Korean government accepted a special relief loan and a structural adjustment program (SAP) from the IMF. As part of the typical conditions of the SAP (Easterly 2005), Korea began to minimize state regulations, maximize the market economy, and assure flexibility in the labor market. The result was a sudden rise in the unemployment rate and worsening economic polarization. As the labor market became more flexible, the concept of lifetime employment, which had been a fundamental feature of the labor market before the economic crisis, rapidly disappeared. Under these circumstances, a number of workers in their late 40s to early 50s were laid off or had their hours reduced, especially if they were unskilled and/or had a low level of educational attainment (Shin and Lee 2000).

Table 4 Relative differences (rate ratios and RII) of wholly alcohol-attributable death by education and occupation based on the Korea National Death Files (1994–1996, 2004–2006) and Korea Census data (1995, 2005)

	1995	2005
Education		
Graduated from or attended junior college or higher (over 13 years)	1.00 (reference)	1.00 (reference)
Graduated from or attended high school (10–12 years)	3.0	3.3
Junior high school or less (0–9 years)	11.6	13.4
Relative index of inequality (RII)	−2.6 (0.7)	−3.7 (1.5)
Occupation		
Non-manual workers	1.00 (reference)	1.00 (reference)
Manual workers	7.0	2.5
Unemployed/not in labor force	30.8	23.5
Relative index of inequality	4.8 (2.0)	6.7 (3.9)

Standard errors are shown in parentheses

These changes inevitably resulted in increased poverty, aggravating the quality of life among the socially disadvantaged populations. If an unskilled or less-educated person becomes unemployed during an economic crisis or recession, the shrinking job market severely limits his or her chance of reentry into the labor force. Persistent unemployment or degraded work conditions result in downward social mobility (Shin and Lee 2000). People who experience downward social mobility might become more vulnerable to alcohol-related conditions than are those who already live in poverty because a reduction in the quantity and quality of resources generally leads to deterioration in overall health (Billingsley 2009). Although the frequencies and quantities of alcohol consumption across social classes in Korea were similar, downward social mobility and deterioration in overall health facilitated the adverse effect of alcohol on those in the lower socioeconomic class (Kim 2002). In fact, since the mid-2000s, studies have reported that the overall level of health inequality due to social class differentials has increased (Kim and Kim 2007).

The relative disparity between the highest and middle classes changed only slightly for educational attainment and even decreased notably for occupation. We presume that the healthy-worker effect (Sterling and Weinkam 1986) had an impact here. That is, labor-market shrinkage during an economic crisis or recession makes those who retain their employment experience a strong desire to spend their time and money on human resource development and their own health, rather than wasting those resources on alcohol. Since alcohol consumption can cause health problems and may threaten their position and employment status, workers in danger of downward social mobility tend voluntarily to accept health-promotion behaviors by reducing alcohol consumption (Catalano et al. 1993a) or by increasing physical activity (Catalano et al. 1993b). Such a tendency is more easily observable in workers close to experiencing downward social mobility than among those in higher social classes. As stated previously, men aged 40–59 years in Korea have recognized that drinking is a cultural phenomenon regardless of their socioeconomic backgrounds. Even if the culture itself did not change after the crisis, coping behaviors for recovery after excessive drinking and interest in overall health and health promotion across social classes became more diversified. Another possibility is that those alcoholics might have been selectively fallen out from the labor market, particularly from the manual group, lowering their alcohol-related death rate. But given more than 20 times higher death rate of unemployed compared to those of non-manual workers from wholly alcohol-attributable deaths, we cannot simply dismiss the possibility that the survey results of no-difference in binge drinking across social class may not have captured the existing social disparities in drinking patterns properly.

Strengths and limitations

Recently, Riva et al. (2011) commented on the competing evidence on the inequalities in the health effects of economic changes, arguing that different socio-demographic groups, economic condition-sensitive health outcomes, and local contexts should be considered to better understand the relationship between economic crises and social disparities in health. Our study provided empirical evidence that socially disadvantaged adults aged 40–59 years became relatively more vulnerable to alcohol-attributable mortality, an economic condition-sensitive health outcome, during the extreme economic crisis in Korea, during which severe economic polarization took place.

This study had at least the following limitations. First, we did not consider accidental deaths caused directly by alcohol (e.g., drunk-driving accidents and falls due to

intoxication). Although these cases may represent alcohol-attributable deaths, the mortality file in Korea does not include information on the relationship between accidental deaths and alcohol. However, considering the general inverse relationship between social class and accidents, the real magnitude of social disparity in alcohol-attributable death rates may be even greater than that estimated by the current study. Second, this study utilized condition categories suggested by the US NCHS for defining deaths that were wholly attributable to alcohol. Although the biological processes of alcohol-related conditions are the same for everyone regardless of race or nationality, those disease categories may be limited when applied to the Korean context because alcohol-drinking behavior is culturally embedded. Third, since census and National Death Files were not matched by individual, a numerator–denominator bias may be generated, causing over- or underestimation of death rates (Leinsalu et al. 2009). If the 'promoting the dead' (Sorlie and Johnson 1996) exercised, there may be overestimation of the deaths rates of the high social class. In contrast, given the tendency of overreporting of socioeconomic background of the lower classes in an interview survey (Shkolnikov et al. 2007), the death rates of the low social class might be overestimated slightly. Finally, we cannot decisively argue that the economic crisis was the sole or even principal factor that caused the increased social disparity in alcohol-attributable mortality during the period 1995–2005 as we did not empirically show or test the impact of the economic crisis. Given the massive social impact of the economic crisis in the late 1990s, we believe that our argument is plausible and pertinent. However, other explanations are also possible.

Implications

The findings of this study suggest that the relative social inequality in certain causes of mortality, if not all, might increase during a period of economic crisis or recession. Since we investigated only alcohol-attributable deaths, other conditions or causes of death should be investigated in terms of the changes in the magnitude of relative social inequality during a sudden economic downturn. Future studies should also identify the causes of increasing social inequality in particular death rates. Our findings also suggest that the Korean Government should pay more attention to the most socially disadvantaged men aged 40–59 years by providing work opportunities, even at low wages, so that they can consider themselves healthy workers and refrain from extreme alcohol drinking, particularly when the economy is unstable.

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