

# Income-related inequalities in the prevalence of depression and suicidal behaviour: a 10-year trend following economic crisis

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*The issue of health inequalities has steadily gained attention in South Korea, as income inequality widened and social polarization increased following the country's economic crisis in the late 1990s. While official figures indicate a general trend of worsening mental health, with rapidly rising rates of suicide and depression in particular, the extent of socio-economic inequality with respect to mental health problems has not been well elucidated. This study aimed to measure income-related inequalities in depression, suicidal ideation and suicide attempts in South Korea and to trace their changes over a 10-year period (1998-2007). The concentration index approach was employed to quantify the degree of income-related inequalities, using four waves of the Korea National Health and Nutrition Examination Survey data. The study found persistent pro-rich inequality in depression, suicidal ideation and suicide attempts over the past decade (i.e., individuals with higher incomes were less likely to have these conditions). The inequalities actually doubled over this period. These findings imply a need for expanded social protection policies for the less privileged in the population.*

**Key words:** Depression, suicidal ideation, suicide attempt, income, inequality, concentration index, South Korea

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Persistent health inequalities between socio-economic groups have been observed in both developed and developing countries (1). Tackling such disparities has featured prominently in the policy agenda globally in recent years. The World Health Organization (2,3), the World Bank (4), and the United Nations Development Programme (5) have all emphasized its importance and made this issue a priority. South Korea is no exception. The New Health Plan 2010, established in 2005, aims to reduce health inequality and ultimately improve overall quality of life of the nation (6).

In South Korea, the issue of health inequalities has gained increasing attention with the widening income inequality and increasing social polarization following the country's economic crisis in the late 1990s (7). There have been widespread concerns that such social changes may also widen the health gap between socioeconomic groups (7). Recent studies examining this issue were largely consistent in reporting persistent and/or widening health inequality (7-9).

Despite growing awareness of mental health issues and their explicit presence in the New Health Plan 2010, the extent of socioeconomic inequality with respect to mental health problems in South Korea has not been thoroughly examined. Official figures (10,11) indicate a general trend of worsening mental health, with rising rates of suicide and depression in particular. The suicide rate rose dramatically from the national average of 13.0 per 100,000 in 1997 to 26.0 in 2008 (11), the highest among countries belonging to the Organization for Economic Cooperation and Development (OECD) (12). Similarly, the lifetime prevalence of major depression rose from 3.1% in 2001 (13) to 5.6% in 2006 (10), although it is still lower than that reported in Western countries (14-17).

A variety of factors may influence mental health, some of which are potentially amenable to change by individuals or society (e.g., income, education, housing, neighbourhood,

relationships, and employment). The mechanisms through which such factors affect the development of mental health problems are contentious (18-20). However, many of them are, directly or indirectly, related to income.

This study aimed to measure the magnitude of income-related inequalities in the prevalence of depression, suicidal ideation and suicide attempts in South Korea and trace the change in the inequalities over the past 10 years.

## METHODS

Data for this study were taken from four waves (1998, 2001, 2005 and 2007) of the Korea National Health and Nutrition Examination Survey (KHANES), a nationally representative cross-sectional household health survey conducted by the Ministry of Health and Welfare, in which subjects were selected from non-institutionalized civilians through a stratified multistage probability sampling design.

The present analysis was based on individuals aged at least 19 years (N=27745 for 1998, N=27413 for 2001, N=25487 for 2005, and N=3335 for 2007). The analysis on suicidal behaviour was based on a subset of the KHANES data (Health Awareness and Behaviour data) (N=8991 for 1998, N=8072 for 2001, N=7802 for 2005, and N=3335 for 2007). All data were weighted to represent the structure of the South Korean population.

The survey gathered information from respondents through face-to-face interviews, including socio-economic status, self-reported health status, incidence of acute and chronic illness, health behaviour (e.g., exercise, smoking, alcohol consumption), and health service utilization and spending on health.

Information on depression, suicidal ideation and suicide

attempts was obtained through self-report of whether the respondents: a) had been diagnosed with depression by a physician in the past 12 months (“yes” vs. “no”), b) had ever felt like dying in the past 12 months (“yes” vs. “no”), and c) had ever attempted suicide(s) in the past 12 months (“yes” vs. “no”). Income was defined as the average monthly gross income, and divided by an equivalence factor (equal to the number of household members powered to 0.5), to adjust for differences in household size and composition (8,21).

The concentration index (CI) approach (22,23) was employed to measure the extent of income-related inequalities in the prevalence of depression, suicidal ideation and suicide attempts (henceforth referred to as “illness” for ease of reference). The concentration curve can be plotted with the cumulative percentage of the illness on the vertical axis corresponding to the cumulative percentage of income distribution on the horizontal axis. The CI is defined as twice the area between the concentration curve and the 45° line, which ranges from a minimum value of -1 to a maximum of +1 and occurs when illness in an entire population is concentrated in the very poorest or very richest, respectively. A zero value indicates complete equality in the prevalence of the illness regardless of income level.

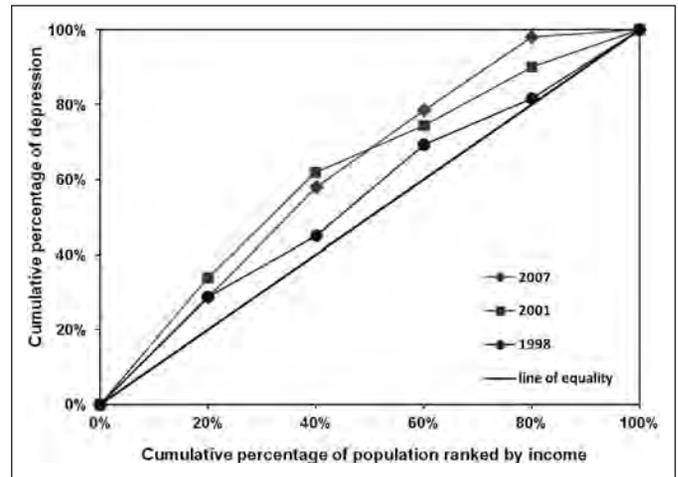
Depression, suicidal ideation or suicide attempts may be correlated with age and gender, both of which could possibly be unequally distributed across income groups. Hence, our study also calculated age- and gender-standardized CIs to control for the confounding impact of demographic variables. The prevalence of the illness was standardized by age and gender using the indirect standardization method (24). This was done by “correcting” the actual distribution of the illness prevalence by comparing it with the distribution that would be observed if all individuals had the same mean age-gender effect as the entire population.

In addition, age and gender could also be correlated with other socio-economic factors such as educational attainment and employment status, for which we do not want to standardize (since income was used as a proxy for the general socio-economic status of an individual), but which we nevertheless want to control for in order to tease out the independent impacts of age and gender on the illness. The prevalence of depression was thus adjusted for age and gender at the mean level of other non-confounding factors (i.e., educational attainment, employment status, urbanicity of the residential area, and marital status).

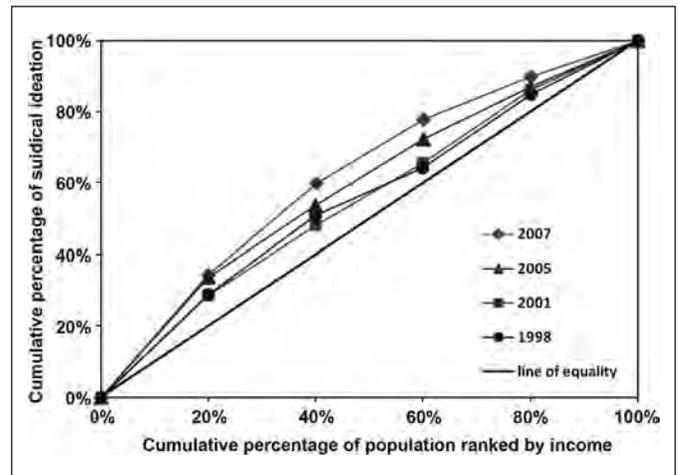
The CIs for (standardized) prevalence of the illness were calculated using the Newey-West regression (25). All analyses were conducted using STATA SE/10 (26).

## RESULTS

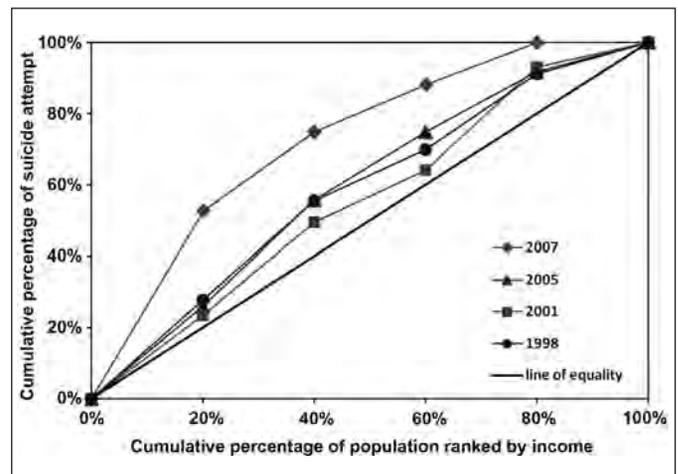
Figures 1-3 show the concentration curves for depression, suicidal ideation and suicide attempts, respectively, based on the four waves of the household survey data (1998, 2001, 2005 and 2007). The concentration curves plot the cumula-



**Figure 1** Concentration curves for depression in South Korea from 1998 to 2007



**Figure 2** Concentration curves for suicidal ideation in South Korea from 1998 to 2007



**Figure 3** Concentration curves for suicide attempts in South Korea from 1998 to 2007

tive percentage of each psychopathology on the vertical axis against the cumulative percentage of the sample ranked by income on the horizontal axis, beginning with the poorest and ending with the richest. The curves provide an indication of the nature of inequality in the prevalence of each psychopathology across income groups.

All curves were above the equality lines, implying that all three psychopathologies were more highly concentrated in lower income groups across years. The inequality observed was more pronounced in recent years, especially for suicide attempt, as indicated by the curves being even further away from the equality lines. In all three cases, the curves also tended to have the steepest slopes for the lowest income group, but the slopes in the other income groups exhibited different patterns across years. This suggests that the lowest income groups have the highest risk for depression, suicidal ideation or suicide attempt, a trend that is persistent across years, while the impact of income on these cases varied over time for the other income levels, especially for depression. For instance, the impact of income on depression was greater in the lowest income group as well as in the middle income group in 1998, while this was observed for only up to the second lowest income group in 2001, and by and large, till the second highest income group in 2007. On the other hand, suicidal ideation and suicide attempt exhibited clearer income-gradient curves in recent years.

As shown in Table 1, all the CIs were negative, implying the existence of pro-rich inequalities in the prevalence of depression, suicidal ideation and suicide attempt across the years (i.e., poorer groups are doing worse). The magnitude of the CIs doubled between 1998 and 2007 in all three instances, although they exhibited a different trend of the inequalities.

The CI for depression fell sharply from -0.126 (SE: 0.068) in 1998 to -0.278 (SE: 0.068) in 2001, and remained relatively constant thereafter (CI and its SE in 2007: -0.287 and 0.114). The CI for suicidal ideation fell over time, but its fall was rather gradual: it was -0.138 (SE: 0.012) in 1998 and gradually decreased to -0.250 (SE: 0.028) in 2007. In contrast, the CI for suicide attempt increased from -0.221 (SE: 0.062) in 1998 to -0.175 (SE: 0.075) in 2001 and -0.179 (SE: 0.089) in 2005, but plunged to -0.400 (SE: 0.116) in 2007.

After standardizing the distributions for the age and gender composition of income rank, smaller CIs were obtained in general (see Table 1), which suggests that, if every individual had the same mean age-gender effect as the entire population, the expected distribution of the illness would be less unequal. Nevertheless, the CIs still indicated pro-rich inequalities, implying that even if we control for the age-gender effect on income, the latter still plays a substantial role in the prevalence of depression, suicidal ideation and suicide attempts. In fact, after standardizing the demographic composition of income rank while controlling for the correlation with other socioeconomic factors such as educational attainment and employment, the CIs became closer to the unstandardized ones. This suggests that the impact of the demographic confounders on the income-related inequality in the prevalence of the three psychopathologies is rather small, while income has a major impact, either directly or indirectly, through other socio-economic variables.

## DISCUSSION

This study represents the first attempt to quantify the magnitude of income-related inequality in mental health in South Korea. The study also analyzed whether such inequality changed in the 10-year period following the country's major economic crisis of the late 1990s. The data provide evidence of persistent pro-rich inequalities in depression, suicidal ideation and suicide attempts over the past decade (1998-2007). The magnitude of the inequalities across all three psychopathologies was found to double during this period, although they exhibited different trends. For depression, inequality increased sharply between 1998 and 2001, and remained relatively stable thereafter. Similarly, inequality in the prevalence of suicidal ideation increased over time, but the increase was rather gradual. In the case of suicide attempts, inequality decreased between 1998 and 2001, but surged between 2005 and 2007.

While it is not clear why the trend of inequality differed between depression and suicide attempts, one explanation might be found in the multi-faceted impact of the economic

**Table 1** Unstandardized and standardized concentration indices (CI) for depression in South Korea from 1998 to 2007

		Unstandardized CI (SE)	Standardized CI (SE)	
			Age and gender only	Age and gender + other factors*
Depression	1998	-0.126 (0.068)	-0.084 (0.068)	-0.093 (0.068)
	2001	-0.278 (0.068)	-0.211 (0.068)	-0.270 (0.068)
	2007	-0.287 (0.114)	-0.175 (0.113)	-0.266 (0.117)
Suicidal ideation	1998	-0.138 (0.012)	-0.120 (0.011)	-0.145 (0.012)
	2001	-0.159 (0.015)	-0.123 (0.015)	-0.156 (0.015)
	2005	-0.200 (0.015)	-0.142 (0.015)	-0.184 (0.015)
	2007	-0.250 (0.028)	-0.166 (0.027)	-0.209 (0.027)
Suicide attempts	1998	-0.221 (0.062)	-0.259 (0.062)	-0.333 (0.062)
	2001	-0.175 (0.076)	-0.195 (0.072)	-0.232 (0.072)
	2005	-0.179 (0.089)	-0.227 (0.089)	-0.352 (0.089)
	2007	-0.400 (0.116)	-0.285 (0.116)	-0.390 (0.114)

\*Other factors controlled for were educational attainment, employment status, urbanicity and marital status

crisis, which broke out in late 1997 and unfolded over 1998. Following the crisis, the unemployment rate rose sharply from below 3.0% in 1997 to 7.0% in 1998 (27). The Gini coefficient, a measure of the magnitude of income inequality, also rose to above 0.3 in 1999 for the first time, and it increased to 0.325 in 2008 (28). Such a crisis is likely to have brought about rising poverty, greater insecurity, and stresses from social exclusion, which would plausibly have a major impact on the mental health of individuals, especially those in lower income groups. However, its impact on depression and suicidal acts may have not been evident in the same temporal fashion. The onset of depression is likely to involve a prolonged course of symptoms prior to clinical diagnosis. On the contrary, the emergence of suicide acts may reflect an acute response to the crisis. For instance, there was a surge in suicide rates in 1998: it was 13.6 per 100,000 population in 1997 but rose to 18.8 in 1998 and subsided thereafter (12).

Our study found that pro-rich inequalities doubled over the ten years for all three psychopathologies, and the inequalities also became prominently income-gradient in recent years, particularly for suicide attempts. While our study did not examine income-related inequality in the prevalence of suicide due to the paucity of data, such a trend may be similar to that of suicide attempts. Given the “epidemic” suicide phenomena in contemporary Korea (29), our findings urge for extended social protection policies for the less privileged populations.

The CIs in our study indicated that the magnitude of inequality might be greater in mental health than for general health. Based on the same KHANES data set which were employed in the present study, Shin and Kim (30) reported CIs of -0.0116 for 1998, -0.0179 for 2001 and -0.0278 for 2005 in their assessment of income-related inequality in self-reported general health. While their study also showed an inequality in general health in favour of the rich, the magnitudes were notably smaller than those found in our analyses. This observation is consistent with the international literature. Mangalore et al (31) reported a CI of -0.10572 for neurotic disorder and -0.43936 for probable psychosis in the UK, indicating a much greater inequality than that reported for self-reported (general) health (CI = -0.0129) (22). In Spain, Costa-Font and Gil (18) also reported greater income-related inequality in depression (CI = -0.1551) than in self-reported health (CI = -0.0066) (22).

While income may not have a clear link with depression or suicidal behaviour, it can serve as a proxy for the general socio-economic condition of an individual. In other words, its impact on depression or suicidal behaviour may be understood as a reflection of the complex links with a myriad of socio-economic factors (e.g., unemployment). Decomposition of income-related inequality would be a topic that deserves further research.

The present study has a number of limitations that should be noted in the interpretation of the findings. Firstly, although we used nationally representative survey data sets, which are commonly considered one of the most reliable data source in

health-related research, the validity and reliability of psychometric measures employed in the KHANES survey had been implicitly assumed rather than explicitly ascertained. Secondly, the analyses were based on a series of cross-sectional surveys, which precludes causal inference, a problem shared with almost all studies of health inequalities. The cross-sectional data, nevertheless, provide some early evidence in an area where there is currently no good source of representative panel data for mental health in South Korea. Thirdly, we used self-reported data, which is potentially subject to both recall bias and social desirability bias. While recall bias in reporting a formal diagnosis of depression is very unlikely, social desirability can lead to underreporting due to the stigma attached to mental illness. In addition, access to care is likely to vary by socio-economic status. Since the KHANES study measured “doctor-diagnosed depression”, depressed individuals in lower income groups might have been underrepresented in the survey due to potential barriers like financial difficulties in seeking professional help. It is therefore plausible that the actual income-related inequality in the prevalence of depression may be greater.

In conclusion, our study showed the existence of significant pro-rich inequalities in the prevalence of depression, suicidal ideation and suicide attempts. The inequalities in each instance have doubled over the past ten years, accompanied by widening income inequality following the nation’s economic crisis in the late 1990s. Furthermore, our results suggest that income-related inequality was more pronounced in mental health than in general health. These findings imply the need for expanded social protection policies for vulnerable populations and for a strengthening of the mental health safety net.

## References

1. van Doorslaer E, Wagstaff A, Bleichrodt H et al. Income-related inequalities in health: some international comparisons. *J Health Econ* 1997;16:93-112.
2. World Health Organization. The world health report 2000. Health systems: improving performance. Geneva: World Health Organization, 2000.
3. World Health Organization. Closing the gap in a generation. Geneva: World Health Organization, 2008.
4. World Bank. Health, nutrition and population sector strategy. Washington: World Bank, 1997.
5. United Nations Development Programme. Human development report 2007/2008. New York: United Nations, 2008.
6. Ministry of Health and Welfare, Korea Institute for Health and Social Affairs. Establish of New Health Plan 2010. Seoul: Ministry of Health and Welfare, 2005.
7. Kim YM, Kim MH. Health inequalities in Korea: current conditions and implications. *Korean J Prev Med* 2007;40:431-8.
8. Khang YH, Kim HR. Socioeconomic mortality inequality in Korea: mortality follow-up of the 1998 National Health and Nutrition Examination Survey (NHANES) data. *Korean J Prev Med* 2006;39:115-22.
9. Khang YH, Yun SC, Hwang YA et al. Changes in mortality inequality in relation to the South Korean economic crisis: use of area-based socioeconomic position. *Korean J Prev Med* 2005;38:359-65.

10. Cho MJ, Hahm BJ, Hong JP et al. The epidemiological survey of psychiatric illnesses in Korea 2006. Seoul: Ministry of Health and Welfare, 2007.
11. Korean Statistical Information Service. KOSIS data for causes of death (1983-2008). Seoul: Korean Statistical Information Service, 2009.
12. Organization for Economic Cooperation and Development. OECD health report. Paris: Organization for Economic Cooperation and Development, 2007.
13. Cho MJ, Kim JK, Jeon HJ et al. Lifetime and 12-month prevalence of DSM-IV psychiatric disorders among Korean adults. *J Nerv Ment Dis* 2007;195:203-10.
14. Alonso J, Angermeyer MC, Bernert S et al. Prevalence of mental disorders in Europe: results from the European Study of the Epidemiology of Mental Disorders (ESEMeD) project. *Acta Psychiatr Scand* 2004;109(Suppl. 420):21-7.
15. Bijl RV, Ravelli A, van Zessen G. Prevalence of psychiatric disorder in the general population: results of The Netherlands Mental Health Survey and Incidence Study (NEMESIS). *Soc Psychiatry Psychiatr Epidemiol* 1998;33:587-95.
16. Kessler RC, McGonagle KA, Zhao S et al. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. Results from the National Comorbidity Survey. *Arch Gen Psychiatry* 1994;51:8-19.
17. Kessler RC, Berglund P, Demler O et al. The epidemiology of major depressive disorder: results from the National Comorbidity Survey Replication (NCS-R). *JAMA* 2003;289:3095-105.
18. Costa-Font J, Gill J. Would socio-economic inequalities in depression fade away with income transfers? *Journal of Happiness Studies* 2008;9:539-58.
19. Andres AR. Determinants of self-reported mental health using the British household panel survey. *J Ment Health Policy Econ* 2004;7: 99-106.
20. Wildman J. Income related inequalities in mental health in Great Britain: analysing the causes of health inequality over time. *J Health Econ* 2003;22:295-312.
21. Atkinson AB, Rainwater L, Smeeding TM. Income distribution in OECD countries: evidence from the Luxembourg income study. Paris: Organization for Economic Cooperation and Development, 1995.
22. van Doorslaer E, Koolman X. Explaining the differences in income-related health inequalities across European countries. *Health Econ* 2004;13:609-28.
23. van Doorslaer E, Koolman X, Masseria C. Equity in the delivery of inpatient care in the European Union: a pooled analysis. Rotterdam: Department of Health Policy and Management, Erasmus University, 2004.
24. van Doorslaer E, Koolman X, Jones AM. Explaining income-related inequalities in doctor utilisation in Europe. *Health Econ* 2004;13: 629-47.
25. Newey WK, West KD. Automatic lag selection in covariance matrix estimation. *Review of Economic Studies* 1994;61:631-54.
26. StataCorp. Stata Statistical Software: Release 10. College Station: StataCorp LP, 2007.
27. Korean Statistical Information Service. KOSIS data for unemployment rate (1990-2008). Seoul: Korean Statistical Information Service, 2009.
28. Korean Statistical Information Service. KOSIS data for Gini coefficient (1990-2008). <http://kostat.go.kr>.
29. Kim M-H, Jung-Choi K, Jun H-J et al. Socioeconomic inequalities in suicidal ideation, parasuicides, and completed suicides in South Korea. *Soc Sci Med* 2010;70:1254-61.
30. Korean Institute for Health and Social Affairs. In-depth analyses of the Third National Health and Nutrition Examination Survey: the Health Interview and Health Behavior Survey Part. Seoul: Korean Institute for Health and Social Affairs, 2007.
31. Mangalore R, Knapp M, Jenkins R. Income-related inequality in mental health in Britain: the concentration index approach. *Psychol Med* 2007;37:1037-45.