Association between community deprivation and practising health behaviours among South Korean adults: a survey-based cross-sectional study

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ABSTRACT

Objectives This study aimed to determine the association between community deprivation and poor health behaviours among South Korean adults.

Design This was a survey-based cross-sectional study.

Setting and participants Data of 224,552 participants from 244 communities were collected from the Korea Community Health Survey, conducted in 2015.

Primary and secondary outcome measures We defined health behaviours by combining three variables: not smoking, not high-risk drinking and walking frequently. Community deprivation was classified into social and economic deprivation.

Results Multilevel logistic analysis was conducted to determine the association of poor health behaviours through a hierarchical model (individual and community) for the 224,552 participants. Among them, 69.9% did not practice healthy behaviours. We found that a higher level of deprivation index was significantly associated with higher odds of not-practising healthy behaviours (Q3, OR: 1.15, 95% CI: 1.00 to 1.31; Q4 (highest), OR: 1.22, 95% CI: 1.06 to 1.39). Economic deprivation had a positive association with not-practising health behaviours while social deprivation had a negative association.

Conclusion These findings imply that community deprivation levels may influence individual health behaviours. Accordingly, there is a need for enforcing the role of primary healthcare centres in encouraging a healthy lifestyle among the residents in their communities, developing national health policy guidelines for health equity and providing financial help to people experiencing community deprivation.

INTRODUCTION

According to WHO, health has been defined as ‘a complete physical, mental and social well-being, and not merely the absence of disease or infirmity.'1 There are many factors that sustain health, with health behaviour being one of the essential ones. Health behaviours include practices such as avoiding smoking and consuming alcohol, and exercising regularly. When it comes to health maintenance, people can practice health behaviours and reduce the risk of diseases.2 3 On the other hand, an unhealthy lifestyle leads to unhealthy consequences such as cardiovascular diseases or increase in morbidity and mortality.4 5 Health is affected not only by physical conditions and activities, but also by the surrounding environment.6 It is well known that regional gaps in socioeconomic factors also result in health demerits.7-11

One of the most representative indicators reflecting regional disparity is the community deprivation index. It is a measurement of socioeconomic deprivation for a geographical area, and generally uses census variables. This index has been developed in various ways in multiple countries.12-15 It is also widely used in health research to establish whether relationships are associated with deprivation, as universal health coverage is one of the primary goals of the WHO.16 Health equities are also emphasised in the Sustainable Development Goals of the United Nations Organization.17

Studies on differences in health status due to community deprivation have been actively conducted in many countries. A previous study showed that neighbourhood deprivation in urban areas had an association with

Strengths and limitations of this study

- This study was conducted using a large sample data, hence its results may be considered to be representative of South Korea.
- We used multilevel logistic analysis for determining the relationship between community deprivation and practising health behaviour to consider individual-level and community-level factors simultaneously.
- Community deprivation scale used in this study has been developed considering the South Korean sociocultural context of other countries.
unmet needs; however, this was not true for rural areas.\textsuperscript{18} Another study found a positive relationship between physical and mental symptoms and community deprivation after adjusting the size of the areas.\textsuperscript{19} Several studies have also revealed the relationship between a community’s socioeconomic level and its health behaviours through a multilevel analysis.\textsuperscript{20–23} However, few studies have used the community deprivation index and classified community deprivation into economic and social deprivation, while studying the relationship between deprivation and health behaviours.

Based on the results of the previous studies, we hypothesised that the community deprivation index will have a positive relationship with poor health behaviours. Therefore, the objective of this study was to find the association between community deprivation index and not-practising health behaviours. In addition, we classified the components of the community deprivation index into economic and social deprivation to determine which deprivation is related to not-practising health behaviours.

\section*{METHODS}
\subsection*{Study population}
We used data from the Korea Community Health Survey (KCHS), which was carried out in 2015. This survey has been conducted annually by the Korean Centers for Disease Control and Prevention for adults aged 19 years or older since 2008 to establish and evaluate regional health plans, and standardise the survey performance system to produce comparable regional health statistics.\textsuperscript{24} The KCHS data used in this study included 198 questions across 19 fields including health behaviours, physical activities, medical service use and social environments. The KCHS distributes samples to each public health centre and targets an average of 900 people per public health centre. The participants, who accounted for 4\% of the total population in South Korea were surveyed and samples were distributed proportionally by administrative region.

The data of 228,558 participants were evaluated; we excluded those who answered ‘do not know’, gave invalid responses to the questions, or did not answer all the questions included in this study (n=4,006). Finally, data of 224,552 participants (100,998 men, 123,554 women) were analysed in the study.

\section*{Variables}
To define health behaviours, we combined three variables suggested by the KCHS survey: no smoking, not belonging to the high-risk drinking group and walking frequently. No smoking was reflected when a participant was not smoking at the time of investigation and had experienced a ‘0’ pack-year. Pack-year is a method of measuring the number of cigarettes a person has smoked; it is calculated by multiplying the number of packs of cigarette smoked per day by the number of years of continued smoking. We combined these two indicators to assess the exact status of smoking for each participant. Not belonging to the high-risk drinking group was defined as being a non-drinker, or drinking under five shots (for women) or under seven shots (for men) in a single sitting and consuming alcohol less than once per week. Walking frequently was defined as walking for over 30 min daily more than 5 days in the last week. Participants who met all three of these conditions were categorised into the practising-health-behaviour group, while those who failed to meet one or over of the above conditions were categorised into the not-practising-health-behaviour group.

The community deprivation index is a measure of the influence of socioeconomic status at the regional level. The index used in this study was developed by the Korea Institute for Health and Social Affairs which is the national research institution in South Korea. The index was developed based on data from 10\% of the 2015 population census in Korea.\textsuperscript{15} It is composed of nine indicators and is further classified into economic and social deprivation according to results of factor analysis.\textsuperscript{25} Economic deprivation is composed of low socioeconomic level, poor quality of housing, low educational level and the number of elder people, while social deprivation is composed of not owning a car, the portion of divorced or bereaved, the number of one-person households, female householder, and not living in an apartment. Each variable was calculated at the municipal level of Si (city), Gun (county) and Gu (borough) using z-scores and all the values were combined.\textsuperscript{15} Then we categorised the index into four quartiles: quartile 1 (Q1) was reflective of the lowest level of community deprivation, while quartile 4 (Q4) was reflective of the highest level (Q1 <6.52, –6.52≤Q2<–1.24 to –1.24≤Q3<5.37, Q4 >5.37). Since the KCHS survey was conducted in 254 public health centres, participants from each centre were allocated into one of the quartiles.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure1.png}
\caption{Directed Acyclic Graph representing the relationship between community deprivation and not-practising health behaviours.}
\end{figure}
### Table 1  General characteristics of the study population

| Variables                          | Practising health behaviours* | Total | Yes | No | P value |
|------------------------------------|-------------------------------|-------|-----|----|---------|
|                                    | Total                         | N     | %   | N  | %      |
|                                    | N                             |       |     |    |         |
| **Total (n=224,552)**              | 224,552                       | 100.0 | 67,506 | 30.1 | 157,046 | 69.9 |
| **Community level**                |                               |       |     |    |         |
| Region                             |                               |       |     |    |         |
| Metropolitan                       | 62,063                        | 27.6  | 23,346 | 37.6 | 38,717  | 62.4 |
| Urban                              | 64,034                        | 28.5  | 18,616 | 29.1 | 45,418  | 70.9 |
| Rural                              | 98,455                        | 43.8  | 25,544 | 25.9 | 72,911  | 74.1 |
| Community Deprivation Index        |                               |       |     |    |         |
| Quartile 1 (lowest)                | 56,554                        | 25.2  | 17,946 | 31.7 | 38,608  | 68.3 |
| Quartile 2                         | 54,983                        | 24.5  | 17,897 | 32.6 | 37,086  | 67.4 |
| Quartile 3                         | 56,097                        | 25.0  | 16,356 | 29.2 | 39,741  | 70.8 |
| Quartile 4 (highest)               | 56,918                        | 25.3  | 15,307 | 26.9 | 41,611  | 73.1 |
| **Individual level**               |                               |       |     |    |         |
| Age (years)                        |                               |       |     |    |         |
| 19–29                              | 24,323                        | 10.8  | 8,950 | 36.8 | 15,373  | 63.2 |
| 30–39                              | 32,006                        | 14.3  | 7,903 | 24.7 | 24,103  | 75.3 |
| 40–49                              | 41,235                        | 18.4  | 10,152| 24.6 | 31,083  | 75.4 |
| 50–59                              | 44,618                        | 19.9  | 13,158| 29.5 | 31,460  | 70.5 |
| ≥60                                | 82,370                        | 36.7  | 27,343| 33.2 | 55,027  | 66.8 |
| Sex                                |                               |       |     |    |         |
| Men                                | 100,998                       | 45.0  | 23,305| 23.1 | 77,693  | 76.9 |
| Women                              | 123,554                       | 55.0  | 44,201| 35.8 | 79,353  | 64.2 |
| Marital status                     |                               |       |     |    |         |
| Living with spouse                 | 153,408                       | 68.3  | 45,501| 29.7 | 107,907 | 70.3 |
| Living without spouse              | 71,144                        | 31.7  | 22,005| 30.9 | 49,139  | 69.1 |
| Occupational categories†           |                               |       |     |    |         |
| White                              | 43,391                        | 19.3  | 12,199| 28.1 | 31,192  | 71.9 |
| Pink                               | 29,412                        | 13.1  | 8,693 | 29.6 | 20,719  | 70.4 |
| Blue                               | 70,032                        | 31.2  | 18,065| 25.8 | 51,967  | 74.2 |
| Inoccupation                       | 81,717                        | 36.4  | 28,549| 34.9 | 53,168  | 65.1 |
| Educational level                  |                               |       |     |    |         |
| Middle school or less              | 81,205                        | 36.2  | 25,223| 31.1 | 55,982  | 68.9 |
| High school                        | 64,154                        | 28.6  | 17,838| 27.8 | 46,316  | 72.2 |
| College or over                    | 79,193                        | 35.3  | 24,445| 30.9 | 54,748  | 69.1 |
| Household income                   |                               |       |     |    |         |
| Low                                | 48,532                        | 21.6  | 14,523| 29.9 | 34,009  | 70.1 |
| Mid-low                            | 79,827                        | 35.5  | 24,045| 30.1 | 55,782  | 69.9 |
| Mid-high                           | 61,005                        | 27.2  | 17,883| 29.3 | 43,122  | 70.7 |
| High                               | 35,188                        | 15.7  | 11,055| 31.4 | 24,133  | 68.6 |
| Obesity status (BMI)‡              |                               |       |     |    |         |
| Underweight and Normal range       | 114,557                       | 51.0  | 35,994| 31.4 | 78,563  | 68.6 |
| Overweight                         | 53,022                        | 23.6  | 16,109| 30.4 | 36,913  | 69.6 |
| Obese                              | 56,973                        | 25.4  | 15,403| 27.0 | 41,570  | 73.0 |
| Practising exercise                |                               |       |     |    |         |

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centres, we divided administrative areas according to the unit of the public health centre.

Other covariates were also included in the analysis as potential confounding variables. At the individual level, these variables were sex, age, marital status, occupation category, educational level, household income, body mass index, comorbidity, perceived health status and perceived stress level. At the community level, these variables were region and the community deprivation index. Region was categorised into three entities: metropolitan, urban and rural. In South Korea, the metropolitan cities have a population of over 1 million and comprise small entities referred to as ‘Dong’, while the other cities have a population of more than 50,000 and comprise smaller entities referred to as ‘Dong’, ‘Eup’ and ‘Myeon’. A ‘Dong’ is the smallest unit of these three. We defined ‘Dongs’ in the metropolitan cities as metropolitan regions, ‘Dongs’ in the other cities as the urban regions; further, the rural regions included ‘Eups’ and ‘Myeons’. The variable of occupation was categorised according to the Korean version of the Standard Classification of Occupations, based on the International Standard Classification of Occupations by the International Labour Organization. We recategorised occupations into four categories: white (office work), pink (sales and service), blue (agriculture, forestry, fishery and armed forces) and inoccupation (those with no jobs, housewives and students). Comorbidities included in the study were hypertension, diabetes mellitus, hyperlipidaemia and arthritis. The number of comorbid diseases is the sum of the number of diagnosed above diseases.

### Table 1

| Variables                          | Practising health behaviours* | Total | Yes | No | P value |
|------------------------------------|-------------------------------|-------|-----|----|---------|
|                                    | N    | %    | N   | %  | N  | %    |       |
| Moderate or over                   | 51273| 22.8 | 18734| 36.5| 32539| 63.5|       |
| No                                 | 173279| 77.2 | 48772| 28.1| 124507| 71.9|       |
| The no of comorbid diseases§       |      |       | 39971| 29.6| 95162| 70.4| <0.0001|
| 0                                 | 135133| 60.2 | 39971| 29.6| 95162| 70.4| <0.0001|
| 1                                 | 50076| 22.3 | 15360| 30.7| 34716| 69.3|       |
| ≥2                                | 39343| 17.5 | 12175| 30.9| 27168| 69.1|       |
| Perceived health status            |      |       | 27089| 32.4| 56444| 67.6| <0.0001|
| Good                              | 83533| 37.2 | 40417| 28.7| 100602| 71.3|       |
| Bad                               | 141019| 62.8 |      |    |      |      |       |
| Perceived stress                   |      | <0.0001|      |    |      |      |       |
| Much                              | 57668| 25.7 | 14803| 25.7| 42865| 74.3|       |
| Less                              | 166884| 74.3 | 52703| 31.6| 114181| 68.4|       |

Inoccupation group includes housewives.

*Those who were classified under health behaviours group met all of three conditions: not smoking, not in high-risk drinking group and walking for 30 min over 5 days per week.

†The three groups (white, pink, blue) were based on the International Standard Classification Occupations codes.

‡BMI/obesity status defined by BMI based on the 2018 Clinical Practice Guidelines for Overweight and Obesity in Korea.

§Comorbidity diseases included hypertension, diabetes mellitus, hyperlipidaemia and arthritis. The number of comorbid diseases is the sum of the number of diagnosed above diseases.

**Statistical analysis**

The $\chi^2$ test was used to assess for significant differences in all the covariates between those who practised health behaviours and those who did not. Differences were considered statistically significant at $p<0.05$. We also conducted multilevel logistic regression (participants nested within communities) through hierarchical generalised linear models, because the outcome variable was categorical and non-normally distributed. The analysis used in this study was based on the conceptual framework proposed by Ene et al.²⁶

We established three models for the analysis. The first model, model 1, was a null model, which meant that it did not include any variables. This model was used to calculate the intraclass correlation coefficient (ICC), which measures how much variation in the outcome variable
Table 2 ORs for community deprivation and not-practising health behaviours using multilevel

| Variables                      | Not-practising health behaviours* | Total |
|--------------------------------|-----------------------------------|-------|
|                                | Model 1 (Null)                    | Model 2 OR (95% CI) | Model 3 OR (95% CI)† |
| Fixed effects                  |                                   |       |                       |
| Intercept (SE)                 | 0.87‡(0.03)                       | 0.48‡(0.04) | 0.03‡(0.07) |
| Community level                |                                   |       |                       |
| Region                         |                                   |       |                       |
| Metropolitan                   | 1.00                              |       |                       |
| Urban                          | 1.57 (1.41 to 1.75)               |       |                       |
| Rural                          | 1.73 (1.55 to 1.93)               |       |                       |
| Community Deprivation Index    |                                   |       |                       |
| Quartile 1 (lowest)            | 1.00                              |       |                       |
| Quartile 2                     | 1.02 (0.89 to 1.17)               |       |                       |
| Quartile 3                     | 1.15 (1.00 to 1.31)               |       |                       |
| Quartile 4 (highest)           | 1.22 (1.06 to 1.39)               |       |                       |
| Individual level               |                                   |       |                       |
| Age (years)                    |                                   |       |                       |
| 19–29                          | 1.00                              | 1.00  |                       |
| 30–39                          | 1.82 (1.75 to 1.90)               | 1.82 (1.74 to 1.89) |                       |
| 40–49                          | 1.75 (1.67 to 1.82)               | 1.74 (1.67 to 1.82) |                       |
| 50–59                          | 1.23 (1.18 to 1.28)               | 1.23 (1.18 to 1.28) |                       |
| ≥60                            | 0.87 (0.83 to 0.91)               | 0.86 (0.83 to 0.90) |                       |
| Sex                            |                                   |       |                       |
| Men                            | 1.00                              | 1.00  |                       |
| Women                          | 0.48 (0.47 to 0.49)               | 0.48 (0.47 to 0.49) |                       |
| Marital status                 |                                   |       |                       |
| Living with spouse             | 1.00                              | 1.00  |                       |
| Living without spouse          | 1.18 (1.15 to 1.21)               | 1.18 (1.15 to 1.21) |                       |
| Occupational categories§       |                                   |       |                       |
| White                          | 1.00                              | 1.00  |                       |
| Pink                           | 0.98 (0.94 to 1.01)               | 0.97 (0.94 to 1.01) |                       |
| Blue                           | 0.98 (0.95 to 1.02)               | 0.98 (0.94 to 1.01) |                       |
| Inoccupation                   | 0.89 (0.86 to 0.92)               | 0.89 (0.86 to 0.92) |                       |
| Educational level              |                                   |       |                       |
| Middle school or less          | 1.27 (1.22 to 1.31)               | 1.26 (1.21 to 1.30) |                       |
| High school                    | 1.16 (1.13 to 1.20)               | 1.16 (1.13 to 1.19) |                       |
| College or over                | 1.00                              | 1.00  |                       |
| Household income               |                                   |       |                       |
| Low                            | 0.99 (0.95 to 1.03)               | 0.98 (0.95 to 1.02) |                       |
| Mid-low                        | 0.94 (0.91 to 0.97)               | 0.93 (0.90 to 0.96) |                       |
| Mid-high                       | 0.98 (0.95 to 1.01)               | 0.98 (0.95 to 1.01) |                       |
| High                           | 1.00                              | 1.00  |                       |
| Obesity status (BMI)¶          |                                   |       |                       |
| Underweight and normal range   | 1.00                              | 1.00  |                       |
| Overweight                     | 0.95 (0.93 to 0.97)               | 0.95 (0.93 to 0.97) |                       |
| Obese                          | 1.04 (1.02 to 1.07)               | 1.04 (1.02 to 1.07) |                       |

Continued
remains between level-two units. The following equation was used for calculating ICC:

$$\text{ICC} = \frac{\tau_{00}}{\tau_{00} + \tau_{jj}}$$

$\tau_{00}$ is the community level variance and $\tau_{jj}$ corresponds to individual level variance, because this study has a dichotomous outcome variable.

The second model, model 2, included model 1 and the variables at the individual level. The results of this model indicated the relationship between the individual variables and the outcome. The third model, model 3, was the final model; it included model 2 and variables at the community level. The results of this model indicated the relationship between the community variables and the outcome. The results were reported using ORs and CIs. All statistical analyses were performed using SAS software (V.9.4, SAS Institute=).

**Patient and public involvement**

No patient involved.

**RESULTS**

Table 1 shows the general characteristics of the study population. Among the 224,552 study participants, 157,046 (69.9%) participants did not practice at least one of the health behaviours. A total of 244 administrative areas were included in this study; the percentage of rural, urban, and metropolitan areas was 43.8%, 28.5% and 27.6%, respectively.

The ORs for factors associated with not-practising health behaviours were determined using multilevel logistic regression analysis and are shown in table 2. The ICC value was 0.05289, indicating that 5.3% of the variability in the rate of not-practising health behaviours can be accounted for by communities, and that the odds of not-practising health behaviours vary significantly among community levels. The percentage change of variance was 27.8% ((0.18–0.13)/0.18 × 100) and the log likelihood ratio was 256514.9, indicating that model 3 was the best fitting model in this study. In model 3, a higher level of deprivation index was significantly associated with higher
Table 3 Subgroup analysis of not-practising health behaviours by interesting variable*

| Variables                      | Not-practising health behaviours† | OR (95% CI)   |
|-------------------------------|-----------------------------------|---------------|
| Economic Deprivation Index    |                                   |               |
| Quartile 1 (lowest)           |                                   | 1.00          |
| Quartile 2                    |                                   | 1.27 (1.12 to 1.45) |
| Quartile 3                    |                                   | 1.34 (1.15 to 1.57) |
| Quartile 4 (highest)          |                                   | 1.80 (1.46 to 2.20) |
| Social Deprivation Index      |                                   |               |
| Quartile 1 (lowest)           |                                   | 1.00          |
| Quartile 2                    |                                   | 0.93 (0.81 to 1.07) |
| Quartile 3                    |                                   | 0.87 (0.75 to 1.01) |
| Quartile 4 (highest)          |                                   | 0.81 (0.67 to 0.98) |

*Multilevel logistic analysis adjusted for variables including age, marital status, occupation, household income, BMI, the number of chronic diseases, perceived health status, perceived stress and region.
† Those who were classified under the practising health behaviours group met all of three conditions: not present smoking, not in high-risk drinking group, and walking for 30 min over 5 days per week. BMI, body mass index.

Table 3 presents the subgroup analysis of the community deprivation index. Results in this table were adjusted for all the variables that we used in this study. The results showed that economic deprivation was more associated with not-practising health behaviours than social deprivation. Moreover, living in rural areas was most significantly associated with not-practising health behaviours (urban, OR: 1.57, 95% CI: 1.41 to 1.75; rural, OR: 1.73, 95% CI: 1.55 to 1.93). Individual level variables associated with not-practising health behaviours were: ages 30–59 years, living without a spouse, having completed only high school or less, obesity, two or more comorbid diseases, bad perceived health status, and high perceived stress. In contrast, individual variables found to have a positive association with practising health behaviours were: ages 60 years and above, being a woman, not being professionally employed, having mid-low household income and being overweight.

Table 3 shows the combined effect of community deprivation and other independent variables. The difference in the community deprivation index between the lowest and the highest quartile was greater for women than for men. A similar tendency was seen in those living with a spouse; not professionally employed; having completed middle school or less, or college and over; and having low or high income.

DISCUSSION

This study was designed to determine the association between community deprivation level and health behaviours using multilevel logistic analysis. The primary outcome of the study was the association found between higher community deprivation level and not-practising health behaviours; these results were significant in Q3 and Q4 of community deprivation. After classifying community deprivation into economic and social deprivation, we found a positive relationship between economic deprivation and poor health behaviours, and a negative relationship between social deprivation and poor health behaviours.

Although the relationships between community deprivation and each variable of health behaviours were not significantly associated in this study (see online supplemental table S1), previous studies have found positive relationships between each of these variables. These studies have also evaluated regional and environmental effects among individuals. Some places can influence poor health behaviours even in areas with lower community deprivation as compared with areas with higher community deprivation.

Several studies support this study’s hypothesis. A meta-analysis confirmed that the greater the number of physical facilities in one’s surroundings, more is the amount of physical activity performed by people. Furthermore, people who live in deprived neighbourhoods and have peers in their surroundings are more prone to being heavy drinkers than those living in non-deprived neighbourhoods. The behaviour of smoking is particularly affected by the surrounding environment, and a study has determined a difference in the degree to which people are affected by the surrounding environment depending on the socioeconomic level of the area in which they live.

Meanwhile, this study obtained different results in comparison to previous studies. The results highlight the difference between material and social deprivation in terms of health; the material index can be said to be a more accurate estimate of estimating variations in health inequality within an urban area. Another previous study focused on the influence of material difference on health inequality. Since it is hard to differentiate economic from social deprivation, it is necessary to improve both conditions to achieve health equity. However, people with high economic status are more likely to practice health behaviours and this could enable social participation. Thus, it can be suggested that financial support is needed to overcome health inequality.
Another finding was the influence of sex in determining the extent to which community deprivation related to health behaviours. This study found a greater difference in the association of bad health behaviours between women living in the more deprived areas and less deprived areas than that between men from similar areas. A previous study focusing on the association between neighbourhood differences in self-rated health supports this result.33 In addition, women are more susceptible to the effect of neighbourhood socio-economic deprivation than men. Women who live in socio-economically deprived areas are more likely to be stressed and less likely to practise health behaviours.34 35 As seen in our results, women were more likely to practice health behaviours and were more vulnerable to deprived environments compared with men.

While the findings of the study shed important light on how individual and community-level variables relate to poor health behaviours, this study has several limitations. First, factors of health behaviour were self-reported. As such, the participants had to respond based on their memory, and their responses might not have been accurate. Second, we considered only three factors of health behaviour. Other health behaviours such as physical

### Table 4  Subgroup analysis of not-practising health behaviours by independent variables*

| Variables                  | Community Deprivation Index | OR (95% CI)                                      | OR (95% CI)                                      | OR (95% CI)                                      |
|----------------------------|-----------------------------|--------------------------------------------------|--------------------------------------------------|--------------------------------------------------|
| Age (years)                |                             |                                                  |                                                  |                                                  |
| 19–29                      | 1.00                        | 0.96 (0.83 to 1.10)                               | 1.04 (0.90 to 1.21)                               | 1.06 (0.90 to 1.25)                               |
| 30–39                      | 1.00                        | 1.14 (0.98 to 1.32)                               | 1.27 (1.10 to 1.48)                               | 1.46 (1.23 to 1.73)                               |
| 40–49                      | 1.00                        | 1.02 (0.88 to 1.20)                               | 1.21 (1.04 to 1.42)                               | 1.24 (1.05 to 1.47)                               |
| 50–59                      | 1.00                        | 0.94 (0.81 to 1.09)                               | 1.06 (0.91 to 1.23)                               | 1.12 (0.96 to 1.31)                               |
| ≥60                        | 1.00                        | 1.09 (0.94 to 1.26)                               | 1.18 (1.03 to 1.36)                               | 1.23 (1.06 to 1.41)                               |
| Sex                        |                             |                                                  |                                                  |                                                  |
| Men                        | 1.00                        | 0.99 (0.87 to 1.12)                               | 1.12 (0.99 to 1.27)                               | 1.17 (1.03 to 1.34)                               |
| Women                      | 1.00                        | 1.06 (0.91 to 1.23)                               | 1.18 (1.02 to 1.36)                               | 1.27 (1.09 to 1.47)                               |
| Marital status             |                             |                                                  |                                                  |                                                  |
| Living with spouse         | 1.00                        | 1.03 (0.90 to 1.19)                               | 1.18 (1.03 to 1.35)                               | 1.23 (1.07 to 1.42)                               |
| Living without spouse      | 1.00                        | 1.02 (0.89 to 1.17)                               | 1.10 (0.96 to 1.26)                               | 1.20 (1.04 to 1.42)                               |
| Occupational categories‡   |                             |                                                  |                                                  |                                                  |
| White                      | 1.00                        | 1.00 (0.86 to 1.15)                               | 1.12 (0.97 to 1.30)                               | 1.15 (0.98 to 1.35)                               |
| Pink                       | 1.00                        | 1.04 (0.89 to 1.21)                               | 1.15 (0.98 to 1.34)                               | 1.13 (0.96 to 1.34)                               |
| Blue                       | 1.00                        | 0.99 (0.83 to 1.17)                               | 1.17 (0.98 to 1.38)                               | 1.31 (1.10 to 1.55)                               |
| Inoccupation               | 1.00                        | 1.07 (0.95 to 1.21)                               | 1.15 (1.02 to 1.30)                               | 1.19 (1.05 to 1.35)                               |
| Educational level          |                             |                                                  |                                                  |                                                  |
| Middle school or less      | 1.00                        | 1.01 (0.87 to 1.18)                               | 1.16 (1.00 to 1.36)                               | 1.24 (1.06 to 1.44)                               |
| High school                | 1.00                        | 1.01 (0.87 to 1.16)                               | 1.09 (0.94 to 1.25)                               | 1.12 (0.96 to 1.29)                               |
| College or over            | 1.00                        | 1.05 (0.92 to 1.18)                               | 1.16 (1.02 to 1.31)                               | 1.19 (1.04 to 1.36)                               |
| Household income           |                             |                                                  |                                                  |                                                  |
| Low                        | 1.00                        | 1.06 (0.90 to 1.23)                               | 1.17 (1.00 to 1.36)                               | 1.30 (1.11 to 1.52)                               |
| Mid-low                    | 1.00                        | 1.01 (0.88 to 1.16)                               | 1.14 (0.99 to 1.31)                               | 1.17 (1.01 to 1.35)                               |
| Mid-high                   | 1.00                        | 1.02 (0.88 to 1.18)                               | 1.13 (0.98 to 1.31)                               | 1.15 (0.99 to 1.34)                               |
| High                       | 1.00                        | 1.04 (0.89 to 1.22)                               | 1.22 (1.03 to 1.44)                               | 1.20 (1.00 to 1.44)                               |

Inoccupation group includes students, housewives and those with no jobs.

*Multilevel logistic analysis adjusted for variables including age, marital status, occupation, household income, BMI, the number of chronic diseases, perceived health status, perceived stress and region.

†Those who were classified under the practising health behaviours group met all of three conditions: not present smoking, not in high-risk drinking group, and walking for 30 min over 5 days per week.

‡Three groups (white, pink, blue) were based on the International Standard Classification Occupations codes.

BMI, body mass index.
activity and diet habits may also be affected by community deprivation. Thus, we considered them as covariates in our study. Third, because of a lack of questions, we did not consider the intensity or purpose of walking in this study. Fourth, since this is a cross-sectional study, we did not consider any change in the practice of health behaviour and causal relationships. Last, since the community deprivation scale used in this study has been developed considering the South Korean society, it may need to be modified to suit the sociocultural context of other countries.

Despite these limitations, our study has several strengths. First, this study was conducted using a large sample data; hence, its results may be considered to be representative of the South Korean society. Second, we analysed and found a positive association between community deprivation and not-practising health behaviours using multilevel logistic regression to consider two-level variables, including those at the individual and community level. Thus, our results imply the influence of the community in individual health behaviours.

Based on these results, there is a need to enforce the role of primary healthcare centres in encouraging a healthy life for residents within communities, and to invest in education and awareness on the practice of health behaviour. At the national level, devoting adequate resources (eg, public sports facilities, health-care providers or financial aids) for deprived area and developing health policies are required to achieve health equity.

Considering that women are more affected in socioeconomically deprived areas than men, it is necessary to design customised healthcare strategies for the underprivileged (eg, elderly, single-parent families or those living in a low residential environment). Furthermore, an integrated model between the central and local administration is needed to manage people’s health systematically. Accordingly, further research is required to construct a health model to achieve health equity, to measure the effectiveness of the input resources, and to develop policies. Moreover, longitudinal study to determine the impact of how changing the community deprivation levels might affect residents’ health behaviour and health status, is warranted.

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