Association between community deprivation and practicing health behaviors among South Korean adults

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INTRODUCTION

- Health is affected not only by physical conditions and activities, but also by the surrounding environment. It is relatively well-known that regional gaps in socioeconomic factors also result in health disparity.
- Moreover, poor health status and health behaviors have been associated with socioeconomic deprivation at the community level.
- One of the most representative indicators reflecting regional disparity is the community deprivation index. It is widely used in health research to establish whether relationships are associated with deprivation, which is important to ascertain, as universal health coverage is one of the primary goals which has come up with WHO.
- Base on the previous studies, the objective of this study was to find the association between community deprivation index and not-practicing health behaviors.

MATERIALS AND METHODS

- **Data source**: Data from the Korea Community Health Survey (KCHS) surveyed in 2015
- **Study population**: After excluding inappropriate data, 224,552 participants from 244 communities were included.
- **Outcome variables**: To define health behaviors, 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 exposure 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 having drinks less than once per week. Walking frequently was defined as walking for over 30 minutes daily more than five days in the last week. Participants who met all three of these conditions were categorized into the practicing-health-behavior group, while those who failed to meet any of the above conditions were categorized into the not-practicing-health-behavior group.
- **Interesting variables**: The community deprivation index is a measure to indicate the extent of socioeconomic status at the regional level. The index used in this study was developed using 10% of the 2015 population census in Korea. It is composed of nine indicators: low socioeconomic level, poor quality of housing, low educational level, the number of elder people, not owning a car, the portion of divorced or bereaved, the number of one-person households, female householder, and not living in an apartment. The community deprivation index is further classified into economic deprivation and social deprivation. 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 using z-scores and all the values were combined.18 We categorized the index into four quantiles: Quantile 1 (Q1) was reflective of the lowest level of community deprivation, while Quantile 4 (Q4) was reflective of the highest level. Since the KCHS survey was conducted in 254 public health centers, we divided administrative areas according to the unit of the public health center.
- **Covariates:** The covariates were demographic (gender, age, number of family members, family generation, marital status, region), socioeconomic (education, income level, job classification), and health-related variables (body mass index, comorbidity, perceived health status, perceived stress level).
- **Statistical analysis**: We used $\chi 2$-tests to examine the general characteristics of the participants, by gender. We also used multilevel logistic regression (participants nested within communities) through the hierarchical generalized linear models, because the outcome variable was categorical and non-normally distributed. All statistical analyses were performed using SAS version 9.4 (SAS Institute, Inc., Cary, NC, USA). The level for statistical significance was 0.05.

RESULTS

Table 1. General characteristics of the study population

Variables	Practicing health behaviors[a] Total						
	TOTAL		Yes		No		*P-value*
	N	%	N	%	N	%	
Total(N=224,552)	224,552	100.0	67,506	30.1	157,046	69.9	
Community level							
Region							<0.0001
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							<0.0001
Quantile 1 (lowest)	56,554	25.2	17,946	31.7	38,608	68.3	
Quantile 2	54,983	24.5	17,897	32.6	37,086	67.4	
Quantile 3	56,097	25.0	16,356	29.2	39,741	70.8	
Quantile 4 (highest)	56,918	25.3	15,307	26.9	41,611	73.1	

- 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 health behaviors. 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.

Table 2. Odds ratios for community deprivation and not-practicing health behaviors using multilevel logistic regression

Variables	Not-practicing health behaviors[a] Total		
	Model 1 (Null)	Model 2 OR (95% CI)	Model 3 OR (95% CI)[c]
Fixed effects			
Intercept (S.E)	0.87*(0.03)	0.48*(0.04)	0.03*(0.07)
Community level			
Region			
Metropolitan			1.00
Urban			1.57 (1.41 - 1.75)
Rural			1.73 (1.55 - 1.93)
Community deprivation index			
Quantile 1 (lowest)			1.00
Quantile 2			1.02 (0.89 - 1.17)
Quantile 3			1.15 (1.00 - 1.31)
Quantile 4 (highest)			1.22 (1.06 - 1.39)

RESULTS

Table 2. Odds ratios for community deprivation and not-practicing health behaviors using multilevel

Variables	Not-practicing health behaviors[a] Total		
	Model 1 (Null)	Model 2 OR (95% CI)	Model 3 OR (95% CI)[c]
Individual level			
Age (years)			
19-29		1.00	1.00
30-39		1.82 (1.75 - 1.90)	1.82 (1.74 - 1.89)
40-49		1.75 (1.67 - 1.82)	1.74 (1.67 - 1.82)
50-59		1.23 (1.18 - 1.28)	1.23 (1.18 - 1.28)
≥60		0.87 (0.83 - 0.91)	0.86 (0.83 - 0.90)
Sex			
Male		1.00	1.00
Female		0.48 (0.47 - 0.49)	0.48 (0.47 - 0.49)
Marital Status			
Living with spouse		1.00	1.00
Living without spouse		1.18 (1.15 - 1.21)	1.18 (1.15 - 1.21)
Occupational categories[b]			
White		1.00	1.00
Pink		0.98 (0.94 - 1.01)	0.97 (0.94 - 1.01)
Blue		0.98 (0.95 - 1.02)	0.98 (0.94 - 1.01)
Inoccupation		0.89 (0.86 - 0.92)	0.89 (0.86 - 0.92)
Educational level			
Middle shool or less		1.27 (1.22 - 1.31)	1.26 (1.21 - 1.30)
High school		1.16 (1.13 - 1.20)	1.16 (1.13 - 1.19)
College or over		1.00	1.00
Household income			
Low		0.99 (0.95 - 1.03)	0.98 (0.95 - 1.02)
Mid-low		0.94 (0.91 - 0.97)	0.93 (0.90 - 0.96)
Mid-high		0.98 (0.95 - 1.01)	0.98 (0.95 - 1.01)
High		1.00	1.00
Obesity Status (BMI)[c]			
Underweight & Normal range		1.00	1.00
Overweight		0.95 (0.93 - 0.97)	0.95 (0.93 - 0.97)
Obese		1.04 (1.02 - 1.07)	1.04 (1.02 - 1.07)
Practicing exercise			
Moderate or over		1.00	1.00
No		1.62 (1.59 - 1.66)	1.62 (1.59 - 1.66)
The number of chronic diseases[d]			
0		1.00	1.00
1		0.99 (0.96 - 1.01)	0.98 (0.96 - 1.01)
≥2		1.06 (1.03 - 1.09)	1.06 (1.03 - 1.09)
Perceived health status			
Good		1.00	1.00
Bad		1.23 (1.20 - 1.26)	1.23 (1.21 - 1.26)
Perceived stress			
Much		1.31 (1.28 - 1.34)	1.31 (1.28 - 1.34)
Less		1.00	1.00
Error variance			
Level-2 intercept (S.E)	0.18*(0.02)	0.20*(0.02)	0.13*(0.01)
Model fit			
-2LL	267225.3	256614.4	256514.9
Pearson Chi-Square/DF	1.00	1.00	1.00

*p<.05; ICC (Intraclass correlation coefficient) : 0.05289(<.0001).

- The ICC value was 0.05289, indicating that 5.3% of the variability in the rate of not-practicing health behaviors can be accounted for by communities, and that the odds of not-practicing health behaviors 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 odds of not-practicing health behaviors (Q3, OR: 1.15, 95% CI: 1.00–1.31; Q4, OR: 1.22, 95% CI: 1.06–1.39). Moreover, living in rural areas was the most significantly associated with not-practicing health behaviors (urban, OR: 1.57, 95% CI: 1.41–1.75; rural, OR: 1.73, 95% CI: 1.55–1.93).

Table 3. Subgroup analysis of not-practicing health behaviors by interesting variable*

Variables	Not-practicing health behaviors[a] Total
	OR (95% CI)
Economic deprivation index	
Quantile 1 (lowest)	1.00
Quantile 2	1.27 (1.12 - 1.45)
Quantile 3	1.34 (1.15 - 1.57)
Quantile 4 (highest)	1.80 (1.46 - 2.20)
Social deprivation index	
Quantile 1 (lowest)	1.00
Quantile 2	0.93 (0.81 - 1.07)
Quantile 3	0.87 (0.75 - 1.01)
Quantile 4 (highest)	0.81 (0.67 - 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.

- 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 the economic deprivation index was more associated with not-practicing health behaviors than the social deprivation. Moreover, the higher the economic deprivation, the greater was the association with not-practicing health behaviors

DISCUSSION & CONCLUSION

- This study was designed to determine the association between community deprivation level and health behaviors using multilevel logistic analysis. The primary outcome of the study was the association found between higher community deprivation level and not-practicing health behaviors; these results were significant in Q3 and Q4 of community deprivation.
- Meanwhile, this study obtained different results in comparison to previous studies. Classifying community deprivation into economic and social deprivation found that economic deprivation was related to poor health behaviors, but social deprivation had the opposite relationship. 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 measure of estimating variations in health inequality within an urban area.
- While the findings of the study shed important light on how individual and community level variables relate to poor health behaviors, this study has several limitations. First, factors of health behavior were self-reported. Second, we considered only three factors of health behavior. Other health behaviors such as physical activity and diet habits may also be affected by community deprivation. Thus, we adjusted them as covariates in this study. Third, because of a lack of questions, we did not consider the intensity or purpose of walking in this study. 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.
- Based on these results, the enforcement of the role of primary healthcare centers to encourage a healthy life for residents in their communities is suggested. Developing heath policies for achieving health equity at the national level, and investing in education and awareness about practicing health behavior may also be needed. Furthermore, it is necessary to provide financial help for people with community deprivation.