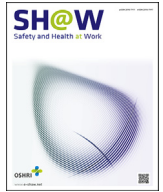




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Original article

## Impact of Long Working Hours and Shift Work on Unmet Health Care Need Among Korean Workers

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### ABSTRACT

**Background:** This study aimed to identify work-related risk factors, including long working hours and night/shift work, for unmet health care need using data of a representative panel of Korean adults.

**Methods:** Associations between work-related factors and unmet health care need were analyzed using data of 3,440 participants (10,320 observations) from the 2011–2013 Korean Health Panel Study. A generalized estimating equation was used for the analysis of repeated measures.

**Results:** The prevalence of unmet health care was 16.6%. After adjusting sex, age, socioeconomic status, work characteristics, and working more than 60 hours per week (odds ratio [OR]: 1.43, 95% confidence interval [CI]: 1.23–1.65) or 50–59 hours per week (OR: 1.26, 95% CI: 1.08–1.46) instead of 40–49 hours per week and night/shift work (OR: 1.27, 95% CI: 1.06–1.51) were associated with unmet health care need.

**Conclusion:** Long working hours and night/shift work are risk factors for unmet health care need among the Korean working population.

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## 1. Introduction

Working hours in Korea had been the longest among countries in the Organization for Economic Cooperation and Development until 2007. It was the second or third longest from 2008 to 2018 [1]. Approximately 50% of workers work more than 48 hours per week in Korea [2]. Approximately 10% of Korean workers are engaged in shift work. The most common shift type (50.4%) was rotating two groups with two shifts, in which system, the workers usually work for 12 hours per shift or 24 hours per shift [3]. Therefore, shift work in most cases is associated with long working hours and intensive workload in Korea.

Various studies have explored the association between long working hours or shift work and adverse health effects, including coronary heart disease [4], stroke [5], metabolic syndrome [6,7], anxiety and depression [8–10], sleep disturbances [11], health behaviors [12], accidents [13], and so on. As working hours become longer, time outside of labor becomes short, inevitably. Therefore, it has been commonly assumed that long working hours will lead to

sleep problems, depression, fatigue, and self-rated poor health by disrupting physiological recovery mechanisms [14]. Besides insufficient time for recovery, they might have insufficient time to visit a clinic or hospital for disease management, thus leading to unmet health care need.

Unmet health care need has been focused as one of the important underlying factors of health inequity. When individuals could not obtain adequate health care when they need it, their existing diseases may get worse or complicate [15]. It has been reported that unmet health care need is associated with increased mortality [16]. From this perspective, in World Health Report 2000, World Health Organization has declared that ensuring that health care is available when needed is more important than the ability to pay for it [17].

Korea has also made a lot of efforts to improve equity in access to health care. The most representative policy is the mandatory nationwide insurance system, which covers approximately 98% of the Korean population [18]. The rest of the population is covered by Medical Benefits for extremely lower income classes. However,

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there are still subgroups of the population who have difficulty accessing health care services because of financial issues or other obstacles [19].

From the policy perspective, it is important to identify vulnerable groups with unmet health care need and risk factors associated with the unmet health care need. Income level is the most well-known predictor of unmet health care need [20,21]. Gender, self-rated health, education, location, and having chronic diseases are also associated with unmet health care need [19,22]. According to a previous study in Korea, the most prevalent response to the reason for an unmet health care need was “do not have enough time” among the nonaged population [23]. A recent study reported that time constraint surpassed the economic burden for the reason of unmet health care needs in Korean adults in 2017 [24]. Furthermore, the prevalence of unmet health care need is higher in employees than that in employer, self-employed, unemployed, or economically inactive population [20]. This finding suggests that it is also important to define the risk factors of unmet health care need among the working population, especially regarding working time. There are limited studies on work-related factors compared with sociodemographic factors. It has been previously reported that employment status, including unemployment [25–28] and long working hours [28,29], are work-related risk factors for unmet health care need. However, there have been few studies investigating the relationship between shift work and unmet health care need. One previous study evaluated the effect of shift work on unmet health care need reported no association [28].

Therefore, the purpose of this study was to evaluate various work-related risk factors, focusing on long working hours and shift work, and determine their associations with unmet health care need in Korean workers using nationally representative data.

## 2. Materials and methods

### 2.1. Study population

Data were derived from the Korean Health Panel Study (KHPS) conducted in 2011–2013 by the Korean Institute for Health and Social Affairs in conjunction with the National Health Insurance Service. The KHPS was an annually conducting national panel survey on a representative sample of South Korean households. The KHP uses two-stage random sampling design according to region and residence based on the Population and Housing Census. This sampling strategy enabled the data to represent nationwide subjects of Korea. Trained medical staff interviewed household members using a computer-assisted personal interviewing technique. Collected information in the survey included socioeconomic characteristics, health care utilization, health expenditure, health behaviors, and occupational factors.

The KHPS has been conducted annually since 2008. However, occupational factors, including working time and shift work, were only measured in 2011–2013. Thus, we used data from those 3 years, which comprised of 17,035 observations from 2011, 15,872 from 2012, and 14,823 from 2013. Initially, observations for economically active individuals (employed workers, employers, self-employed, or family workers) aged between 18 and 59 years who worked 1 or more hours per week were included. Then the observations that had missing values of unmet health care needs or work-related variables used in the analysis were excluded. Finally, individuals who did not participate in all three consecutive years were excluded. As a result, a total of 3,440 workers remained in the analysis of balanced panel data. Ethical approval was obtained from the Institutional Research Board at Kyung Hee University Hospital (File No. KHUH 2017-04-044). We only used open data from the KHPS without including personal identification.

### 2.2. Variables

#### 2.2.1. Unmet health care needs

As an outcome measure, unmet health care need was used. Subjects were asked, “Have you failed to receive health care service when you needed to see a doctor over the past year?” Responses were categorized as “yes” or “no.” Respondents who answered “yes” were asked to choose one of the most important reasons among economic burden, not having enough time, mild symptoms, and others (too far from a hospital, unable to move due to ill-health, must care for children, don’t know where to go, and so on).

#### 2.2.2. Work-related factors

Occupational factors included job status (regular worker; temporary worker including day worker, part-time worker, and contract worker; employer; and self-employed), occupation classified according to Korean Standard Occupational Classification (legislators, senior officials, and managers; professionals; technicians and associate professionals; clerks; service workers and sale workers; agricultural, forestry, and fishery workers; craft and related trades workers; plant and machine operators, and assemblers; elementary occupations), the number of hours worked per week (<40, 40–49, 50–59, or ≥60), and whether or not the work schedule included night and/or shift work. All occupational factors were surveyed as of December 31 of the previous year. For example, in 2011 survey, the work characteristics on December 31, 2010, was collected.

#### 2.2.3. Other potential confounders

Potential confounding factors included age, gender, educational level, and household member income. KHPS provided quintile categories of household member income among whole participants. Household member income was calculated by using square root scale, which divides household income by the square root of household size [30]. For behavioral factors, smoking (nonsmoker, ex-smoker, and smoker), frequency of alcohol consumption and sleep hour per day were evaluated as potential mediators. Self-rated health was classified as good, fair, and bad.

### 2.3. Statistical analysis

Descriptive statistics were used to explore the basic characteristics of subjects from data pooled over 3 years. The unmet health care need prevalence rate was calculated according to sociodemographic and occupational factors and health-related factors. To analyze the association between occupational factors and unmet health care need after adjusting covariates, generalized estimating equation (GEE) was used considering fixed effects for repeated measures within an individual from three times of observation (“autocorrelation”) and correlation among the same family members. As a working matrix, the exchangeable correlation was used, which assumes equal correlation for measurements in each subject. We performed a cross-sectional analysis applying no time lag, using independent variables and outcome variables investigated in the same year. A two-sided *p* value <0.05 was considered statistically significant. All statistical analysis was performed using the SAS software (version 9.4; SAS Inc, Cary, NC).

## 3. Results

General characteristics of the study population and the prevalence of unmet health care need are shown in Table 1. In this study, we included 3,440 participants (10,320 observations) from 2,549 families. Overall unmet health care need prevalence was 16.6%. Male comprised 57.0% of these subjects. Approximately 40% of these respondents were in their 40s. Approximately 85% of these

**Table 1**  
Sample characteristics

Characteristics		N	%
	Number of families	2,549	
	Number of individuals	3,440	
	Number of observations	10,320	
Unmet health care need	No	8,606	83.4
	Yes	1,714	16.6
Age (years)	<30	670	6.5
	30–39	2,349	22.8
	40–49	4,188	40.6
	50–59	3,113	30.2
Sex	Male	5,883	57.0
	Female	4,437	43.0
Education	Middle school or less	1,517	14.7
	High school	5,671	55.0
	Greater than high school	3,132	30.4
Household income	1st quintile (lowest)	348	3.4
	2nd quintile	1,489	14.4
	3rd quintile	2,398	23.2
	4th quintile	2,937	28.5
	5th quintile (highest)	3,148	30.5
Job status	Regular workers	4,361	42.3
	Temporary workers	2,839	27.5
	Employers or self-employed	3,120	30.2
Occupation	Unclassified	13	0.1
	Legislators, senior officials, and managers	580	5.6
	Professionals	2,137	20.7
	Technicians and associate professionals	1,161	11.3
	Clerks	1,014	9.8
	Service and sale workers	1,269	12.3
	Agricultural, forestry, and fishery workers	679	6.6
	Craft and related trades workers	1,207	11.7
	Plant, machine operators, and assemblers	1,080	10.5
	Elementary occupations	1,180	11.4
Working hour (hours/week)	<40	1,495	14.5
	40–49	4,648	45.0
	50–59	1,844	17.9
	≥60	2,333	22.6
Shift work	No	9,283	90.0
	Yes	1,037	10.1
Smoking	Nonsmoker	5,583	54.1
	Ex-smoker	1,792	17.4
	Smoker	2,945	28.5
Frequency of alcohol consumption	None	1,837	17.8
	≤1 per month	2,600	25.2
	2–4 per month	2,973	28.8
	≥2 per week	2,910	28.2
Self-rated health	Good	5,112	49.5
	Fair	4,441	43.0
	Bad	767	7.4
Sleep hour (hours/day)	≤6	4,876	47.3
	7	3,640	35.3
	≥8	1,804	17.5

respondents had obtained a high school or higher education. Approximately 70% of these participants were employed workers (regular workers, 42.3%; temporary workers, 27.5%). Approximately 30% of participants were employers or self-employed. Common occupations were professionals (20.7%), service and sale workers (12.3%), and craft and related trades workers (11.7%), and approximately 45% of the participants worked 40–49 hours per week, and 10% of the participants engaged in night or shift work.

The prevalence of unmet health care need by sociodemographic and work-related characteristics is shown in Table 2. There were significant differences between men and women in the prevalence of unmet health care needs (women, 18.2%; men, 15.4%). Workers aged ≥40 years showed the highest prevalence of unmet health care need. Regarding the household income, the higher the household income, the less prevalence of unmet health care need. Compared with regular workers (14.4%), temporary workers (17.9%)

**Table 2**  
Prevalence of unmet health care need and related characteristics

Characteristics		N	%	p*	Total	
Age	<30	96	14.3	0.0027	670	
	30–39	347	14.8		2,349	
	40–49	704	16.8		4,188	
	50–59	567	18.2		3,113	
Sex	Male	906	15.4	0.0001	5,883	
	Female	808	18.2		4,437	
Education	Less than middle school	343	22.6	<0.0001	1,517	
	High school	921	16.2		5,671	
	Greater than high school	450	14.4		3,132	
Household income	1st quintile (lowest)	96	27.6	<0.0001	348	
	2nd quintile	281	18.9		1,489	
	3rd quintile	442	18.4		2,398	
	4th quintile	434	14.8		2,937	
	5th quintile (highest)	461	14.6		3,148	
Job status	Regular workers	627	14.4	<0.0001	4,361	
	Temporary workers	507	17.9		2,839	
	Employers or self-employed	580	18.6		3,120	
Occupation	Unclassified	2	15.4	<0.0001	13	
	Legislators, senior officials, and managers	82	14.1		580	
	Professionals	310	14.5		2,137	
	Technicians and associate professionals	150	12.9		1,161	
	Clerks	204	20.1		1,014	
	Service and sale workers	211	16.6		1,269	
	Agricultural, forestry, and fishery workers	142	20.9		679	
	Craft and related trades workers	223	18.5		1,207	
	Plant, machine operators, and assemblers	167	15.5		1,080	
	Elementary occupations	223	18.9		1,180	
Working hour (hours/week)	<40	265	17.7		<0.0001	1,495
	40–49	644	13.9			4,648
	50–59	322	17.5			1,844
	≥60	483	20.7	2,333		
Shift work	No	1,509	16.3	0.0039	9,283	
	Yes	205	19.8		1,037	
Smoking	Nonsmoker	945	16.9	0.0012	5,583	
	Ex-smoker	247	13.8		1,792	
	Smoker	522	17.7		2,945	
Alcohol	None	302	16.4	0.0647	1,837	
	≤1/month	453	17.4		2,600	
	2–4/month	451	15.2		2,973	
	≥2/week	508	17.5		2,910	
Self-rated health	Good	609	11.9	<0.0001	5,112	
	Fair	864	19.5		4,441	
	Bad	241	31.4		767	
Sleep hour (hours/day)	≤6	910	18.7	<0.0001	4,876	
	7	546	15.0		3,640	
	≥8	258	14.3		1,804	

\* p value based on the Chi-square test.

and employers or self-employed (18.6%) showed a higher prevalence of unmet health care need. Among occupations, agricultural, forestry, and fishery workers (20.9%) and clerks (20.1%) showed the highest prevalence of unmet health care need. Workers with long working hours ( $\geq 60$  hours; 20.7%) and workers who engaged in night or shift work (19.8%) showed a higher prevalence of unmet health care need. Smoking and alcohol showed no definite trend in association with unmet health care need. Poor self-rated health (31.4%) and short sleep hour ( $\leq 6$  hours/day; 18.7%) showed a higher prevalence of unmet health care need.

The results of the GEE model evaluating the association between work-related factors and unmet health care need are shown in Table 3. After controlling age, sex, and socioeconomic status (educational level, household income), compared with workers who work 40–49 hours per week, workers with longer working time (50–59 hours/week: odds ratio [OR]: 1.25, 95% confidence interval [CI] 1.08–1.46;  $\geq 60$  hours/week: OR 1.49, 95% CI: 1.29–1.71) showed higher risk of unmet health care need. Night or shift work was also identified as a significant risk factor (OR: 1.35, 95% CI: 1.13–1.61). After controlling work-related factors (job status, occupation, working hour, and shift work) and health-related factors (smoking, alcohol, and self-rated health) additionally, the results did not change considerably.

Among workers with unmet health care need, 48.2% reported that the reason for such unmet health care need was “not having enough time” (Table 4). The longer their work time, the more participants answered “not having enough time” as a reason for unmet health care need. In shift workers, the most common reason for unmet health care need was also “not having enough time.” However, “economic burden” was more frequently answered as the reason for unmet health care need compared with daytime workers.

#### 4. Discussion

The main finding of this study was that long working hours and night/shift work were associated with unmet health care need in Korean workers. There was also a dose–response relationship between long working hours and unmet health care need, with workers who reported working hours of  $\geq 60$  hours/week having the highest prevalence of unmet health care need. Long working hours and night/shift work were associated with unmet health care need after controlling for possible confounders, such as socioeconomic factors and other work-related factors.

These results are consistent with those of the previous studies, showing that long working hours are associated with unmet health care or low utilization of health care service [29,31–33]. Visiting a doctor is time consuming because it involves making a reservation, traveling, waiting, and getting medical care. In addition, hospital hours are almost overlapped with working hours of workers. In our

study, workers with long working hours reported that the main reason for unmet health care need was “not having enough time,” and the rate of this answer was higher in workers with long working hours. However, workers with shorter working hours of  $< 40$  hours also had a slightly higher risk of unmet health care need, although this result was not statistically significant. The Korean Labor Standard Act defines standard working hours as 40 hours per week. Prolonged work hour for up to 52 hours per week is permitted with the consent of workers. Therefore, most workers who work  $< 40$  hours are part-time or daily workers. In this study, the most common answer to the main reason for unmet health care among  $< 40$  h/w workers was “economic burden” (32.8%). For workers with short working hours, income levels may have a greater effect on unmet health care need than working hours.

Few studies have evaluated the relationship between shift work and unmet health care need. In the present study, night or shift work was a significant risk factor for unmet health care need. On the contrary, a previous study in Korea reported there was no association between shift work and unmet health care need (OR 0.66, 95% CI 0.29–1.52) [28]. One possible explanation of the association between shiftwork and unmet health care might be that shift work is linked to low socioeconomic position and long working hours. In Korea, approximately half of shift workers have a work schedule of two teams rotating two shifts [3]. This shift system includes two types of shift schedule: (1) day and night 8–12 hour shift, 5–6 days per week, shift rotating every week, mainly for manufacturing workers; (2) 24-hour shift, two teams with 2-day cycle where each team works one 24-hour shift followed by 24 hours off duty, mainly for surveillance workers. These work schedules inevitably resulted in long working hours. Although the working time of shift workers might not overlap with hospital time, shift workers may have to spend most of their nonwork time for fatigue recovery. The low socioeconomic position could be another explanation. Low wage often compels workers to choose shift work for night work allowance, although most workers do not want shift work because it disturbs normal circadian rhythm and affects family or social life. Economic difficulty and lack of time make it difficult for these workers to visit hospitals. In this study, the most common reason for unmet health care need among shift workers was “no having enough time” (43.2%) followed by “economic burden” (22.1%). The rate of “not having enough time” was lower, whereas the rate of “economic burden” was higher in shift workers than those in nonshift workers. However, after controlling household income and working hours (Model 2 and Model 3), shiftwork still remained a significant factor associated with unmet health care need. This result might be because of the fact that shift workers have a higher need for health care than nonshift workers. It has been reported that night or shift work can affect various health aspects, including cardiovascular disease, gastrointestinal problems, and mental health [9,34,35]. In a previous study, it was reported that shift work

**Table 3**  
Results of using generalized estimate equation model to analyze risk factors of unmet health care need

Work hour factors		Model 1 <sup>*</sup>			Model 2 <sup>†</sup>			Model 3 <sup>‡</sup>		
		OR	95% CI		OR	95% CI		OR	95% CI	
Working hour (hours/week)	$< 40$	1.08	0.91	1.28	1.06	0.88	1.26	1.04	0.87	1.24
	40–49	1.00			1.00			1.00		
	50–59	1.25	1.08	1.46	1.26	1.08	1.46	1.23	1.05	1.43
	$\geq 60$	1.49	1.29	1.71	1.43	1.23	1.65	1.36	1.17	1.58
Shift work	No	1.00			1.00			1.00		
	Yes	1.35	1.13	1.61	1.27	1.06	1.51	1.22	1.02	1.45

CI, confidence interval; OR, odds ratio.

<sup>\*</sup> Model 1 adjusted for sex, age, education, and household income.

<sup>†</sup> Model 2 adjusted for sex, age, education, household income, job status, occupation, working hour, and shift work.

<sup>‡</sup> Model 3 adjusted for sex, age, education, household income, job status, occupation, working hour, shift work, smoking, alcohol, and self-rated health.

**Table 4**  
Reasons for unmet health care need according to working hours and shift work

Work hour factors		Economic burden		Mild symptoms		Not enough time		Others		<i>p</i> *
		<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Working hour (hours/week)	<40	87	32.8	66	24.9	86	32.5	26	9.8	<0.0001
	40–49	102	15.8	194	30.1	300	46.6	48	7.5	
	50–59	51	15.8	88	27.3	169	52.5	14	4.4	
	≥60	96	19.9	91	18.8	272	56.3	24	5.0	
Shift work	No	291	19.3	388	25.7	735	48.7	95	6.3	0.50
	Yes	45	22.0	51	24.9	92	44.9	17	8.3	
Total		336	19.6	439	25.6	827	48.2	112	6.5	

\* *p* values based on the Chi-square test.

makes it more difficult to participate in normal social life, thus increasing stress and affecting behavior patterns, thus adversely affecting smoking, drinking, diet, and exercise [36].

The overall prevalence of unmet health care need among the Korean working population was 16.6%. This result is consistent with previous studies reporting that the prevalence of unmet health care need ranges from 12.1% to 22.9% in the Korean adult population [25,26,37].

Our findings showed that the prevalence of unmet health care need was higher in women than that in men. This result is also in line with the findings of previous studies [19,26,29]. Gender differences in unmet health care need in Korea might be because of the fact that the family role of males is different from that of female workers in Korean society. According to the 2015 National Survey on Family in Korea, whereas male workers in dual-earner couples spent 8 hours per week on housework, female workers spent 20 hours per week on housework [38]. As a result, female workers are likely to have less free time than male workers. Similar to the findings of previous studies [20,26], income level was found to be a significant risk factor for unmet health care need in the present study. Although there is a National Health Insurance system covering the whole population in Korea, unmet health care need still occurs depending on income level because of high out-of-pocket payment rate [39].

Our study has some limitations. First, unmet health care need was measured by self-report. Therefore, unmet health care need in our study may not reflect the clinical need. However, most previous studies have used self-reported unmet health care. This may better reflect subjective needs. Second, because we derived our data from a series of cross-sectional surveys, the causal relationship between unmet health care need and independent variables could not be determined. Since we used panel data, it was available to apply 1- or 2-year lag time between work-related factors and unmet health care need. However, we did not perform lag time analysis because it was expected that the time difference would not be large until work-related factors showed an impact on unmet health care need. We used work-related factors assessed as of December 31 of the last year, and we measured unmet health care need experience during the last year. For this reason, we could not rule out the possibility that unmet health care need might have an influence on working hours at that time. However, the work environment in the same job might not change suddenly in general. In case of long working hours, workers with unmet health care need because of time pressure or health problems are likely to reduce working hours rather than increase them. Therefore, we believe that it is reasonable to interpret that work-related factors such as working hours and shift work affect unmet health care need rather than that unmet health care need affects work-related factors.

Despite these limitations, the findings of the present study are meaningful. Our data were derived from a nationwide survey, and the statistical power was increased because of repeated measurements. In addition, to the best of our knowledge, the present study is the first

report that addresses the association between shift work and unmet health care.

Because unmet health care need can adversely affect future health status through delay in diagnosis or treatment and inadequate screening, reducing unmet need is very important from the public health perspective. This study found that workers with long working hours or shift work had a higher risk of having unmet health care need. This has important implications for labor and public health policy. To reduce unmet health care need in the working population, policies need to shorten working hours and improve working conditions for shift workers.

#### Conflicts of interest

All authors have no conflicts of interest to declare.

#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.shaw.2021.09.003>.

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