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Relationship between Changes in the Working Condition due to COVID-19 and Unmet Medical Needs: Results from the 2021 Korean Community Health Survey

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ABSTRACT

The purpose of this study was to identify the association between changes in the working condition due to COVID-19 and Unmet Medical Needs (UMN) for those aged 19 or older in South Korea. In this study, the 2021 Korea Community Health Survey was used to analyze 127,520 participants excluding missing values. Chi-square, logistic regression were used to investigate the association between changes in the working condition due to COVID-19 and UMN. 'Negative change than before' group had higher odds of UMN than 'unchanged from before' group (AOR: 1.552, 95% CI: 1.457-1.653). after stratified analysis by sex, age, income and type of occupation, Female, under 49 years, high income and blue collar groups had a strong association between positive/negative changes in the working condition due to COVID-19 and UMN. However, among the Male, over 50 years, low income and white collar group, negative changes group had an association between relationship. As a result of the study, it was found that negative change in the working condition due to COVID-19 had a higher rate of UMN than unchanged group. However, among the Female, under 49 years, high income, the experience rate of UMN was higher in the positive/negative change in the working condition. Based on these research findings, it is anticipated that by identifying groups experiencing decreased access to healthcare due to changes in the employment market, highlighted as a major social issue during the pandemic period, and further providing policy evidence to address UMN that can be prevented through adequate access to medical services, such as severe illnesses and deaths, it will be possible to reduce healthcare inequalities.

1. Introduction

COVID-19 continues to spread in South Korea (Arora, Rajput, & Changotra, 2021). One of the major issues caused by COVID-19 is related to individuals' mental health. According to the "COVID-19 National Mental Health Survey" conducted by the Ministry of Health and Welfare in the second quarter of 2022, the rate of suicidal ideation increased to 12.7%, indicating a continued high level compared to the early stages of the pandemic (Lee & Kim, 2021).

Also, COVID-19 has also had a significant impact on individuals' physical health. Due to government social distancing policies, various sports facilities were restricted in use, leading to increased physical inactivity, which in turn contributed to the rise in metabolic syndrome (Kwon et al., 2023). Even in the acute phase of COVID-19 recovery, health complications such as respiratory complications, cardiovascular complications, renal complications, and dermatological symptoms have been reported (Nalbandian, Desai, & Wan, 2023).

Moreover, COVID-19 has affected not only individuals' mental health but also the domestic economy. According to Statistics Korea's "April 2020 Employment Statistics," (Statistics Korea, 2020), the employment rate for individuals aged 15 to 64 was 65.1% after the first wave of the COVID-19 pandemic, marking a decrease of 1.4 percentage points compared to the same period the previous year, showing a decline similar to the level during the 2009 global financial crisis. Particularly, non-regular workers were the hardest hit. Temporary workers decreased by 587,000, and daily workers decreased by 195,000, resulting in an expanded decline (Statistics Korea, 2020). prior study indicated that in the case of workers in special forms of employment, income decreased due to work vacancies caused by COVID-19 infections, and job satisfaction decreased due to increased workload (Kim, Nam, & Kim, 2023).

The restriction of labor activities due to COVID-19 implies a decrease in income. According to Statistics Korea's announcement, labor income decreased by 0.5%, and business income decreased by 5.1% (Statistics Korea, 2021). The decrease in household income due to COVID-19 is likely to have a significant impact on Unmet Medical Needs (UMN). UMN refer to the situation where individuals, despite being deemed necessary by healthcare professionals or desired by the individuals themselves, do not receive the required medical services due to various factors (Shin, Lim, & Han, 2014; Huh & Kim, 2007). UMN carry significant implications for the evaluation of healthcare systems. When UMN occur at the individual and household levels, there is an increased likelihood of complications alongside the severity of diseases, leading to rising medical expenses (Jung & Lee, 2017). Recently, in Korea, various policies have been implemented to reduce UMN; however, a limitation is that these policies primarily target healthcare coverage and the elderly population.

According to previous studies, the change in total income due to COVID-19 resulted in significantly more UMN occurring annually in households experiencing income decreases compared to those with stable incomes, with a 1,301-fold increase. Additionally, there was a strong association between decreased total income due to COVID-19 and UMN, especially driven by economic reasons, which were identified as the primary cause in previous research (Lee, Myeong, & Kim, 2023). Furthermore, in other previous studies, self-employed individuals, non-regular workers, unemployed individuals, and regular workers experienced fewer instances of UMN, with unemployment being 2.74 times

more likely, non-regular employment 2.14 times more likely, and self-employment 4.8 times more likely to experience UMN due to economic burdens compared to regular employment (Choi, 2018).

Therefore, this study aimed to analyze the association between changes in working condition due to COVID-19, such as increased job insecurity and decreased job quality, and UMN based on the findings of previous research indicating higher rates of UMN among economically vulnerable groups compared to other demographics. In addition, unlike previous studies, this study aimed to identify changes in the working condition before and after the pandemic and to understand the association between these changes and UMN.

Finally, the hypotheses of this study are as follows: First, UMN will be higher in the Negative change than before the COVID-19 period group. Second, stratified analysis by socioeconomic status will identify groups that are vulnerable in terms of access to healthcare services.

2. Methods

2.1 Study sample and population

This study is a cross-sectional study utilizing raw data from the Community Health Survey conducted by the Korea Disease Control and Prevention Agency (KDCA) in 2021. The Korea Community Health Survey (KCHS) has been conducted annually since 2008 targeting adults aged 19 and older nationwide in 255 public health centers to produce regional statistics based on the Regional Public Health Act. Sampling involves a two-stage complex sampling design, where sampling points are initially selected based on the number of households by type of housing unit in towns/villages, and final sample households are selected using a systematic sampling method. The data used in this study, collected from August 16 to October 31, 2021, during a period of ongoing community spread due to continuous group infections, employed trained surveyors who conducted household visits adhering to infection control guidelines and conducted face-to-face interviews using Computer Assisted Personal Interviewing (CAPI) in a 1:1 manner.

In this study, the association between changes in working condition during the COVID-19 pandemic and UMN was analyzed using data from 127,520 individuals, excluding 101,722 individuals with missing values, out of a total of 229,242 participants.

2.2 Variables

2.2.1 Independent variable

In this study, the independent variable is the change in working condition due to COVID-19 pandemic compared to the period before the pandemic (before January 2020). Respondents were asked, “Did you experience any changes in your job compared to before the COVID-19 pandemic?” Those who responded, “I was not economically active even before the COVID-19 pandemic,” were classified as the non-economic activity group and excluded from the analysis. Those who responded “Unchanged from before” were categorized as the “Unchanged from before” group, while those

who responded “Lost my job” or “My working condition worsened” were categorized as the “Negative change than before” group. Also, those who responded “My working condition improved” were categorized as the “Positive change than before” group.

Overall, the “Unchanged from before” group refers to those whose working condition remained the same regardless of COVID-19, while the “Worse than before” group signifies those whose working condition deteriorated since the pandemic. the “Better than before” group is defined as those whose working condition has actually improved since the pandemic.

2.2.2 Dependent variable

The dependent variables in this study were UMN. A UMN were defined as ‘Have you ever needed a hospital treatment but not received it in the past 12 months?’.

2.2.3 Control variables

This study utilized the Andersen Behavioral Model to analyze factors influencing UMN (Newacheck et al., 2000). This model is widely used for analyzing factors that impact UMN. The Andersen Model categorizes the factors that determine individual behavior related to healthcare utilization into three main categories: predisposing factors, enabling factors, and need factors. It analyzes the relationship these factors have with healthcare utilization through regression analysis.

Sociodemographic factor variables selected from the 2021 KCHS include ‘age’, ‘sex’, ‘residential area’, ‘marital status’, ‘educational level’, ‘income level’, and ‘type of occupation’. Age groups were classified as ‘19-29 years’, ‘30-39 years’, ‘40-49 years’, ‘50-59 years’, ‘60-69 years’, and ‘70 years and above’, while sex was categorized as ‘male’ or ‘female’. Residential areas were classified as ‘urban area- large city’, ‘urban area- small city’, and ‘rural area’, while marital status was categorized as ‘married’ or ‘unmarried (including separated, divorced, etc.)’. educational level was categorized as ‘under elementary school’, ‘middle school’, ‘high school’, and ‘over college’, while income level was divided into ‘low’, ‘low to middle’, ‘high to middle’, and ‘high’. Lastly, type of occupation was defined as ‘white-collar’ and ‘blue-collar’.

For health behavior factor variables ‘smoking status’, ‘drinking status’, ‘exercise per a week’, ‘hypertension diagnosis’, and ‘diabetes diagnosis’ were classified. Smoking status was categorized as ‘smoker’ or ‘non-smoker’, alcohol consumption as ‘drinker’ or ‘non-drinker’, weekly exercise as ‘yes’ or ‘no’, and diagnosis of hypertension and diabetes as ‘yes’ or ‘no’.

2.3 Statistical analysis

In this study, we analyzed the association between changes in working condition due to COVID-19 and UMN. We controlled for variables such as age, sex, marital status, education level, residential area, income level, smoking status, drinking status, exercise per a week, hypertension diagnosis, and diabetes diagnosis. We utilized chi-square tests and logistic regression for analysis. For all analyses, the criterion for statistical significance was a 2-tailed p-value < 0.05. We conducted all analyses using SAS version 9.4 (SAS Institute Inc., Cary, NC, USA).

3. Results

Table 1 presents the general characteristics of the subjects to examine the association between changes in working condition due to COVID-19 and UMN. Among the total subjects of 127,520, the group experiencing UMN accounted for 5.3% (n=6,820). Among the total subjects, the 'Positive change than before' group comprised 2.4% (n=3,117), among which the experience of UMN was 6.9% (n=214). The 'Unchanged from before' group accounted for 74.9% (n=95,470), with 4.8% (n=4,562) experiencing UMN. The 'Negative change than before' group constituted 22.7% (n=28,933), among which 7.1% (n=2,044) experienced UMN.

Table 1. General characteristics of study sample

Variables	Total		UMN				P-value
	n	%	No	%	Yes	%	
Total	127,520	100.0	120,700	94.7	6,820	5.3	
Changes in the working condition due to COVID-19							<.0001
Positive change than before	3,117	2.4	2,903	93.1	214	6.9	
Unchanged from before	95,470	74.9	90,908	95.2	4,562	4.8	
Negative change than before	28,933	22.7	26,889	92.9	2,044	7.1	
Age							0.0062
19-29	11,131	8.7	10,518	94.5	613	5.5	
30-39	17,083	13.4	16,175	94.7	908	5.3	
40-49	25,300	19.8	23,854	94.3	1,446	5.7	
50-59	30,337	23.8	28,688	94.6	1,649	5.4	
60-69	26,163	20.5	24,861	95.0	1,302	5.0	
≥70	17,506	13.7	16,604	94.8	902	5.2	
Sex							<.0001
Female	61,103	47.9	57,199	93.6	3,904	6.4	
Male	66,417	52.1	63,501	95.6	2,916	4.4	
Marital status							<.0001
Married	91,043	71.4	86,388	94.9	4,655	5.1	
Single (including separated, divorce)	36,477	28.6	34,312	94.1	2,165	5.9	
Educational level							<.0001
Under elementary school	19,904	15.6	18,657	93.7	1,247	6.3	
Middle school	12,843	10.1	12,132	94.5	711	5.5	
High school	39,606	31.1	37,419	94.5	2,187	5.5	
Over the college	55,167	43.3	52,492	95.2	2,675	4.8	
Residential region							<.0001
Urban area- large city	35,294	27.7	33,651	95.3	1,643	4.7	
Urban area- small city	23,250	18.2	22,070	94.9	1,180	5.1	
Rural area	68,976	54.1	64,979	94.2	3,997	5.8	
Income level							<.0001
Low	11,444	9.0	10,670	93.2	774	6.8	
Middle to low	17,016	13.3	15,969	93.8	1,047	6.2	
Middle to high	19,835	15.6	18,694	94.2	1,141	5.8	
High	79,225	62.1	75,367	95.1	3,858	4.9	

Table 1. Cont.

Variables	Total		UMN				P-value
	n	%	No	%	Yes	%	
Total	127,520	100.0	120,700	94.7	6,820	5.3	
Type of occupation							<.0001
White Collar	56,316	44.2	53,474	95.0	2,842	5.0	
Blue Collar	71,204	55.8	67,226	94.4	3,978	5.6	
Smoking status							0.0008
Smoker	51,289	40.2	48,678	94.9	2,611	5.1	
Non-smoker	76,231	59.8	72,022	94.5	4,209	5.5	
Drinking status							0.2818
Drinker	105,235	82.5	99,574	94.6	5,661	5.4	
Non-drinker	22,285	17.5	21,126	94.8	1,159	5.2	
Self-rated health status							<.0001
Good	55,895	43.8	53,819	96.3	2,076	3.7	
Moderate	57,370	45.0	54,050	94.2	3,320	5.8	
Bad	14,255	11.2	12,831	90.0	1,424	10.0	
Exercise per a week							0.0012
No	108,771	85.3	103,046	94.7	5,725	5.3	
Yes	18,749	14.7	17,654	94.2	1,095	5.8	
Hypertension Diagnosis							<.0001
No	94,730	74.3	89,462	94.4	5,268	5.6	
Yes	32,790	25.7	31,238	95.3	1,552	4.7	
Diabetes Diagnosis							<.0001
No	113,742	89.2	107,497	94.5	6,245	5.5	
Yes	13,778	10.8	13,203	95.8	575	4.2	

* UMN: Unmet Medical needs
* P-value was calculated using chi-square test.

Table 2 presents the results of the analysis on the association between changes in employment due to COVID-19 and UMN. The analysis shows that ‘Negative change than before’ group had a 1.552 times higher rate of UMN compared to the ‘Unchanged from before’ group, however, the ‘Positive change than before’ group was not statistically significant.

Table 2. Association between changes in the working condition due to COVID-19 and UMN

Variables	UMN	
	AOR	95% CI
Changes in the working condition due to COVID-19		
Positive change than before	1.060	(0.882 - 1.274)
Unchanged from before	1.000 (ref.)	-
Negative change than before	1.552	(1.457 - 1.653)
Age		
19-29	1.916	(1.622 - 2.263)
30-39	1.973	(1.693 - 2.300)
40-49	1.969	(1.708 - 2.270)
50-59	1.774	(1.553 - 2.026)
60-69	1.278	(1.138 - 1.437)
≥ 70	1.000 (ref.)	-

Table 2. Cont.

Variables	UMN	
	AOR	95% CI
Sex		
Female	1.448	(1.331 - 1.574)
Male	1.000 (ref.)	-
Marital status		
Married	1.000 (ref.)	-
Single (including separated, divorce)	0.988	(0.919 - 1.062)
Educational level		
Under elementary school	1.298	(1.143 - 1.474)
Middle school	1.235	(1.090 - 1.399)
High school	1.188	(1.103 - 1.279)
Over the college	1.000 (ref.)	-
Residential region		
Urban area- large city	0.811	(0.755 - 0.871)
Urban area- small city	0.915	(0.846 - 0.989)
Rural area	1.000 (ref.)	-
Income level		
Low	1.587	(1.415 - 1.779)
Middle to low	1.231	(1.112 - 1.363)
Middle to high	1.146	(1.049 - 1.252)
High	1.000 (ref.)	-
Type of occupation		
White Collar	1.000 (ref.)	-
Blue Collar	1.087	(1.006 - 1.174)
Smoking status		
Smoker	1.285	(1.179 - 1.400)
Non-smoker	1.000 (ref.)	
Drinking status		
Drinker	1.123	(1.026 - 1.229)
Non-drinker	1.000 (ref.)	-
Self-rated health status		
Good	1.000 (ref.)	-
Moderate	1.664	(1.551 - 1.786)
Bad	3.309	(3.024 - 3.621)
Exercise per a week		
No	1.000 (ref.)	-
Yes	1.145	(1.054 - 1.244)
Hypertension Diagnosis		
No	1.352	(1.245 - 1.469)
Yes	1.000 (ref.)	-
Diabetes Diagnosis		
No	1.494	(1.342 - 1.664)
Yes	1.000 (ref.)	-

* UMN: Unmet Medical Need

Table 3 presents the results of stratified analysis on the association between changes in working condition due to COVID-19 and UMN, stratified by sex, age, income level, and type of occupation. In terms of Sex, among women, the 'Positive change than before' and 'Negative change than before' group had 1.493 times and 1.739 times higher rates of UMN, respectively, compared to the 'Unchanged from before' group. In contrast, among men, only the 'Negative change than before' group had a higher rate of UMN (AOR: 1.621, 95% CI: 1.477-1.778).

Second, in terms of age, among under 50 years old, both the group with positive change group (AOR: 1.550, 95% CI: 1.258-1.911) and the negative change group (AOR: 1.572, 95% CI: 1.438-1.719) had higher rates of UMN. However, among individuals aged 50 and above, only the negative change group had a higher rate of UMN (AOR: 1.519, 95% CI: 1.393-1.657).

Third, in terms of income level, among high income, both the group with positive change group (AOR: 1.561, 95% CI: 1.291-1.887) and the negative change group (AOR: 1.545, 95% CI: 1.438-1.660) had higher rates of UMN. However, among low income, only the negative change group had a higher rate of UMN (AOR: 1.557, 95% CI: 1.389-1.745).

Fourth, in terms of type of occupation, among blue collar group, both the group with positive change group (AOR: 1.814, 95% CI: 1.447-2.276) and the negative change group (AOR: 1.631, 95% CI: 1.473-1.806) had higher rates of UMN. However, among white collar group, only the negative change group had a higher rate of UMN (AOR: 1.460, 95% CI: 1.330-1.603).

Table 3. Stratified analysis by sex, age, income level and type of occupation

Variables	UMN			
	AOR	95% CI	AOR	95% CI
Changes in the working condition due to COVID-19	Female		Male	
Positive change than before	1.493	(1.372 - 1.624)	1.167	(0.867 - 1.570)
Unchanged from before	1.000 (ref.)	-	1.000 (ref.)	-
Negative change than before	1.739	(1.395 - 2.169)	1.621	(1.477 - 1.778)
Changes in the working condition due to COVID-19	Under 49 years		Over 50 years	
Positive change than before	1.550	(1.258 - 1.911)	1.314	(0.966 - 1.788)
Unchanged from before	1.000 (ref.)	-	1.000 (ref.)	-
Negative change than before	1.572	(1.438 - 1.719)	1.519	(1.393 - 1.657)
Changes in the working condition due to COVID-19	High income		Low income	
Positive change than before	1.561	(1.291 - 1.887)	1.051	(0.694 - 1.592)
Unchanged from before	1.000 (ref.)	-	1.000 (ref.)	-
Negative change than before	1.545	(1.438 - 1.660)	1.557	(1.389 - 1.745)
Changes in the working condition due to COVID-19	Blue collar		White collar	
Positive change than before	1.814	(1.447 - 2.276)	1.055	(0.795 - 1.399)
Unchanged from before	1.000 (ref.)	-	1.000 (ref.)	-
Negative change than before	1.631	(1.473 - 1.806)	1.460	(1.330 - 1.603)

* All covariates were controlled

4. Discussion

This study aimed to provide effective policy data for improving healthcare accessibility and preventing health deterioration among vulnerable worker populations by analyzing the association between changes in working condition due to COVID-19 and UMN. We utilized data from the 2021 KCHS conducted among Korean adults aged 19 and above, aiming to contribute as foundational information for policy-making efforts.

The summarized research findings are as follows. First, compared to those with unchanged working condition, negative change than before group had a higher rate of UMN. Second, Female, under 49 years and blue collar groups had a strong association between positive/negative changes in the working condition due to COVID-19 and UMN. Third, in the high-income group, the rate of UMN was high regardless of changes in the working condition, whereas in the low-income group, the rate was higher among 'Worse than before'.

Changes in working condition can be influenced by various factors beyond just income fluctuations, including stress, depression, and feelings of isolation (Bunce and West, 1994; Byun, & Lee, 2018). Therefore, both positive and negative changes in working conditions may lead to deteriorating health among workers due to the need to adapt to new working conditions. Indeed, a previous study conducted in Sweden found that individuals who experienced positive or negative changes in employment had a 1.73 times higher mortality rate, a 1.98 times higher suicide rate, and a 1.47 times higher mortality rate due to health deterioration compared to those who maintained employment stability (Lundin et al., 2010). According to the "Coping Theory," abrupt changes in working condition may lead to increased health-deteriorating behaviors (such as heavy drinking, smoking, and physical inactivity) compared to maintaining the current situation (Muntaner et al., 2010), thereby increasing the need for visits to healthcare institutions.

However, according to a previous study conducted in Korea (Hwang, 2022), workers experienced significant income disparities due to changes in employment during the COVID-19 period. Specifically, while the income levels of groups with improved or unchanged working conditions improved, certain types of working conditions continued to exhibit persistent inequality and income disparities. Therefore, it can be inferred that the main economic difference between groups experiencing positive and negative changes in working conditions is the income level. As mentioned earlier, changes in working conditions not only contribute to health deterioration but also income disparities can reduce accessibility to healthcare facilities for improving health outcomes. According to a previous study analyzing the association between job position and UMN over a five-year period among 4,083 Korean workers (Choi, 2018), the main factor contributing to experiencing UMN between the group maintaining job positions and the group experiencing job insecurity was reported to be economic burden. The rate of experiencing UMN due to economic burden in the group experiencing job insecurity was 2.14 times higher compared to the group maintaining job positions. Furthermore, according to previous European studies, it was analyzed that during the COVID-19 period, groups with higher economic vulnerability experienced a sharp increase in UMN due to job insecurity, leading them to postpone or forgo visits to healthcare facilities (Arnault, Jusot, & Renaud, 2022). Therefore, the finding in this study that the Negative change than before group had a higher rate of UMN compared to

the Unchanged from before group.

Meanwhile, according to the analysis, ‘females,’ ‘under 49 years,’ ‘high income,’ and ‘blue-collar’ groups showed a higher rate of UMN in both positive and negative working condition change groups compared to the group with no change. This phenomenon can be explained through the following previous research findings.

According to a previous study analyzing factors contributing to UMN during the COVID-19 period (Kim, You, & Shon, 2021), it was reported that female showed higher levels of psychological distress compared to men during the pandemic, leading to ‘avoidance behavior.’ This behavior involved intentionally avoiding hospital visits due to anxiety about infection, resulting in a higher rate of UMN among women. Additionally, the finding that women generally experience higher rates of UMN regardless of working condition or changes aligns with previous research (Choi, 2018).

Furthermore, among young age groups (Kim, You, & Shon 2021; Woo et al., 2020), they typically have a higher level of subjective health awareness compared to older age groups, which may lead to a lower perception of the need for medical visits. Hence, the likelihood of UMN due to the pandemic was relatively low. However, economic factors such as job insecurity were identified as contributors to UMN. Even if there were improvements in working conditions, the low flexibility in job tasks among younger age groups could lead to outcomes similar to those observed in this study.

Meanwhile, high income groups are classified as having a higher rate of UMN according to various statistical findings. According to the results of the 2021 Korea National Health and Nutrition Examination Survey (Korea Disease Control and Prevention Agency, 2021), while the overall rate of UMN in South Korea is 6.7%, the rate among high-income groups is analyzed to be 8.7%, which aligns with various previous studies (Woo et al., 2020; Jung & Ha 2021; Kim et al., 2015). Initially, for low-income groups, the accessibility to healthcare facilities is reported to be high due to healthcare coverage systems, resulting in a higher utilization of medical services. However, for high-income groups, it is suggested that despite economic factors not being a barrier, a lack of time may exacerbate the rate of UMN regardless of working conditions (Lee et al., 2015). However, unlike high-income individuals, low-income individuals are more likely to forgo healthcare services when their working condition worsens, leading to a decline in income. Therefore, as indicated by the results of this study, there is a significant association between the group with a deteriorated working condition and the rate of unmet medical needs (Kim & Huh, 2011).

The blue-collar group consists of non-office occupations and is classified as having lower job stability due to technological changes (Hopkin & Sarkar 2016; Min et al., 2019). As a result, compared to white-collar workers who generally face fewer spatial and temporal constraints, the UMN rate among blue-collar workers is significantly higher (Hopkin & Sarkar 2016; Min et al., 2019). This high rate can be attributed not only to their occupation-related constraints but also to the limited accessibility to healthcare facilities due to spatial and temporal limitations, irrespective of working condition. Additionally, type of occupation is a variable closely related to income level, highlighting the need for future research on policies to improve healthcare services for blue-collar and low-income groups.

Therefore, based on the findings of this study, it is expected that by identifying groups with

reduced healthcare accessibility due to changes in the job market, which have been identified as a major social issue during the pandemic, and further providing policy evidence to address UMN that can prevent severe illnesses and deaths through appropriate access to medical services, it will be possible to reduce healthcare disparities.

This study has several limitations. First, it is a cross-sectional study, so it is difficult to establish causality between changes in working condition due to COVID-19 and experiences of UMN. Second, while working condition changes were classified into three types, using more specific indicators to assess working condition changes in the future would be important.

Conflicts Interest

No author has any other conflict of interest to declare.

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