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Master's Thesis of Min Sung Kim

Factors Influencing Psychological Concerns about COVID-19 in South Korea

– Direct and Indirect Damage during the Early
Stages of Pandemic –

코로나19에 대한 심리적 염려에 영향을 미치는
요인: 직접적, 간접적 피해를 중심으로

August 2023

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Factors Influencing Psychological Concerns about COVID-19 in South Korea

– Direct and Indirect Damage during the
Early Stages of Pandemic –

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Abstract

Introduction: The coronavirus disease 2019 (COVID-19) pandemic has led to psychological concerns, the distribution of which across populations may differ depending on whether pandemic-related damage is direct or indirect. This study aims to investigate concerns associated with direct and indirect damage according to population characteristics, and identify relatively vulnerable groups that are particularly affected by concerns.

Method: This cross-sectional study used data from the 2020 Korea Community Health Survey, which collected data based on a complex sampling design. A total of 208,106 responses from individuals aged ≥ 19 were collected via in-person (one-on-one) interviews. The items related to COVID-19 concerns were measured by Likert scales ranging from 1 to 5 and categorized into two types: direct concerns, which pertained to infection or death, and indirect concerns, which pertained to criticism, vulnerability, and economic damage, through factor analysis. We compared the means and effect size of direct concerns, indirect concerns, and overall concerns using weighted mean, ANOVA, and multiple regression analysis.

Results: Exploratory and confirmatory factor analyses supported a two-factor structure for psychological concerns about COVID-19 (CFI = 0.99, TLI = 0.97, SRMR = 0.02, RMSEA = 0.06), which were divided into direct and indirect concerns. Mean scores were 3.62 for direct concerns and 4.07 for indirect concerns. Depending on the characteristics of the population group, there were groups that were more vulnerable to direct concerns and groups that were

more vulnerable to indirect concerns, respectively. Direct concerns were higher in females ($B = .26$); the elderly ($B = .15$); those diagnosed with hypertension or diabetes ($B = .04$; $B = .06$); those with few assistants during quarantine ($B = .15$); and those whose neighbors responded inappropriately to COVID-19 ($B = .07$). Indirect concerns were lower among the elderly ($B = -.04$), and higher among young; married ($B = .25$); pink- or blue-collar workers ($B = .08$; $B = .06$); and those who felt that the city responded inappropriately to COVID-19 ($B = .02$).

Conclusion: The prevalence of concerns regarding direct and indirect damage caused by the COVID-19 pandemic differed according to population characteristics. Some factors had a marked influence on direct and indirect concerns. Our findings could inform psychological interventions and policies for future pandemics. Customized interventions are needed to prevent negative psychological concerns and improve mental health.

Keyword : COVID-19, Pandemic, Psychological concern, Mental health, Korea

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Chapter 1. Introduction

1.1. Study background

Coronavirus disease 2019 (COVID-19) is caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), which was first detected in late December 2019 in Wuhan Province, China (H. Andaç, 2021). The World Health Organization (WHO) named this highly infectious disease as COVID-19 on February 11, 2020, and later declared a pandemic.

In response to the spread of COVID-19, almost all countries implemented policies to prevent or reduce the rapid spread of the virus, including social distancing, lockdown, and isolation of infected or at-risk persons. Although these policies can decrease the rate of infection, reduced contact with family, friends, and other social support systems leads to severe mental health issues (Zhou X et al., 2020). Most of the problems that occurred in the wake of COVID-19, such as social stigma (Park et al., 2021), economic damage due to declining income (Park, 2020), and anxiety caused by misinformation on social media (Gaurav V et al., 2022), worsen mental health. As such, COVID-19 severely affected mental health globally.

Besides, various characteristics have been reported in previous studies to be associated with the mental health effects of COVID-19. Lower socioeconomic status has been found to significantly increase the level of concern about COVID-19, particularly among individuals working in agriculture, forestry, fishing, and manual labor jobs as well as those with lower income and education levels (Kim et al., 2022). In addition, the presence of assistants during COVID-19-related quarantine has been reported to moderate the relationship between subjective health and psychological concerns about COVID-19 (Kim et al., 2022).

Other studies have found that changes in daily life due to COVID-19, such as restricted outdoor activities (Williams, S. et al., 2020), and difficulties accessing hospital care during the pandemic (Serafini R et al., 2021; Lee et al., 2021), are associated with increased negative emotions. People with poor subjective health level (Moon et al., 2021), chronic diseases like diabetes, hypertension, and cardiovascular disease (Kohler, H. et al., 2021), and perception of bad governmental response to the pandemic have significantly increased fear of COVID-19 (Arcadio A. et al., 2022).

Gender, age, and marital status have been found to influence perception of health risks related to novel viruses, with women, older individuals, and those who

are married showing particularly high levels (Commodari, E. et al., 2020), indicating a higher vulnerability to direct damage from COVID-19. Other studies have suggested that mass media including social media platforms, play key role in shaping health risk perception (Motta Zanin G. et al., 2020; Diana T et al., 2021).

As COVID-19 spread from densely populated metropolitan areas to adjacent regions over time, larger cities with higher population densities also became hotspots for COVID-19 (Lee et al., 2021). Considering that regional hatred through social media had spread significantly during the large-scale regional infections centered around Daegu and Gyeongbuk in South Korea (Kim et al., 2022), the region where an individual resides could have a significant impact on their mental health.

To assess mental health effects of COVID-19, psychological symptoms such as concern, worry, and fear have served as important indicators. Among them, especially concern has been well documented to reflect mental health. In a Canadian cohort, COVID-19-related concerns were risk factors for anxiety disorder and predicted the severity thereof (Tarek B et al., 2021). Greater concern over COVID-19 was strongly associated with mental disorders such as adjustment disorder, anxiety, and posttraumatic stress disorder (PTSD) (Makhashvili N et al., 2020). Also, concern was the earliest indicator of psychological disorders associated with COVID-19, including generalized anxiety, stress, and PTSD-like symptoms (Mullins RJ et al., 2022).

Accordingly, many studies on concerns have been conducted, and some of them tried to subdivide concerns into each cause, such as reduced social contact, childcare, and job security (Czymara C et al., 2021). However, the distribution of direct and indirect concerns across populations is unclear. Understanding these types of concerns is important as they provide valuable insights into the degree and likelihood of both direct damage caused by the disease itself and indirect damage associated with social aspects resulting from COVID-19.

The need for prevention strategies and interventions targeting mental health is increasing, but policies may not be effectively implemented due to limited financial and human resources. Preventive policies to reduce the spread of disease and clinical studies for treatment can decrease direct concerns but not indirect concerns. Some people are more vulnerable to direct or indirect damage. Therefore, it is necessary to determine the priority of interventions by analyzing direct and indirect concerns, which differ across populations.

We assumed that the factors mentioned above are characteristics of vulnerable groups who may be more susceptible to direct or indirect damage from COVID-19, and therefore, we purposed to analyze the impact of direct and indirect concerns on

those factors.

Based on our findings, determining the psychological impact of direct and indirect damage caused by COVID-19 will enable establishment of response strategies and a system to modulate controllable risk factors. This study will thus help to minimize the psychological damage caused by COVID-19 and future infectious diseases.

1.2. Purpose of research

This study aims to evaluate differences in the distribution of concerns about direct and indirect damage across populations, analyze factors influencing concerns, and identify relatively vulnerable groups. For this purpose, we performed several validation processes to confirm the appropriateness of dividing psychological concerns into direct and indirect categories.

Chapter 2. Methods

2.1. Study population and procedures

This cross-sectional study used data from the Korea Community Health Survey (KCHS) conducted by Korea Disease Control and Prevention Agency from August 16 to October 31, 2020. This survey collected data through in-person(face-to-face) interviews with adults aged ≥ 19 years. The KCHS used resident population data from the Ministry of Public Administration and Security and housing data from the Ministry of Land, Infrastructure, and Transport, which are representative of the Korean population.

Data from 2020, when COVID-19 was not under control, were analyzed based on evidence that concern is an early indicator of the psychological effects of the pandemic (Mullins RJ et al., 2022). Of the total of 229,269 responses, 208,106 without missing values were used in the analysis.

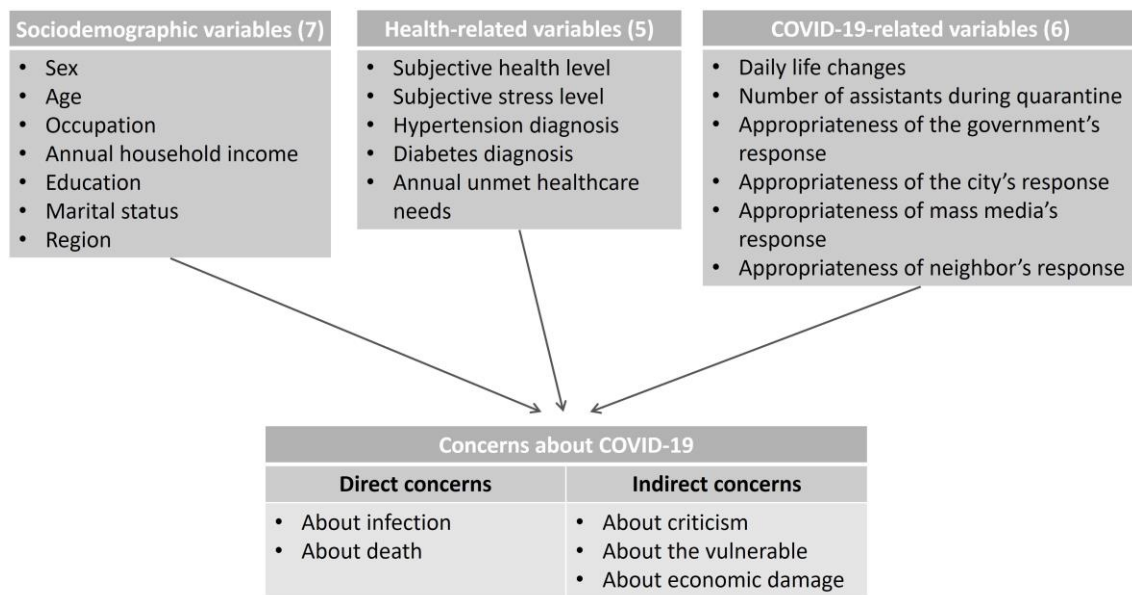


Figure 1. Variables in the study.

2.2. Measures

1) Dependent variable

Psychological concerns about COVID-19 were measured by five items. ‘Concerns about infection’ was measured by the question “I’m concerned that I’ll get infected with COVID-19”, ‘Concerns about death’ by “I’m concerned that I’ll die if I get infected with COVID-19”, ‘Concerns about criticism’ by “I’m concerned that if I get infected with COVID-19, I’ll be criticized by others around me”, ‘Concerns about the vulnerable’ by “I’m concerned that vulnerable people in my family (the elderly, infants, and patients) may get infected with COVID-19”, and ‘Concerns about economic damage’ by “I’m concerned that the COVID-19 pandemic will cause economic damage (including loss of a job or difficulty in getting a job)”.

Each item was measured on a 5-point Likert scale (1 point for ‘strongly disagree’, 2 points for ‘somewhat disagree’, 3 points for ‘not sure’, 4 points for ‘somewhat agree’, and 5 points for ‘strongly agree’).

We classified the items into direct and indirect concern categories. Concerns about infection and death are direct concerns because they arise from the direct damage caused by COVID-19. Concerns about criticism, the vulnerable, and economic damage are indirect concerns because they relate to consequences that emerged in the aftermath of the pandemic. The direct, indirect, and overall concerns scores were calculated by summing the scores of individual items in each category and dividing by the total number of items, resulting in a range of 1 to 5. Higher scores indicate higher levels of concern. Validation processes of measurement method are presented in the Result.

2) Independent variables

Independent variables were divided into three main categories: sociodemographic variables, health-related variables, and COVID-19-related variables. The sociodemographic variables were sex, age, occupation, annual household income, education, marital status, and region. Health-related variables were subjective health level, subjective stress level, hypertension diagnosis, diabetes diagnosis, and annual unmet healthcare needs. COVID-19-related variables included daily life changes associated with COVID-19, the number of assistants during quarantine due to COVID-19, and the appropriateness of the COVID-19 response of the government, city, mass media, and neighbors. The selection criteria for each variable included in each category were based on the scientific findings of previous studies described previously.

The detailed categories for each sociodemographic variable are as follows. The original variables for age and annual household income were continuous variables, but in this study, age was categorized into three groups (19–39, 40–59, and ≥ 60) and income was categorized using quantiles (≤ 1800 , ≤ 3600 , ≤ 6000 , and > 6000). For occupation, managers, professionals, and clerical workers were classified as white collar, service and sales workers as pink collar, agricultural, forestry, and fishery workers, technicians, machine operators and assemblers, elementary workers, and military personnel as blue collar. For education, those who responded with the elementary school and village (house) school, or middle school were combined as ‘middle or low’, and those who responded with 2-, 3-, or 4-year colleges or graduate schools were combined as ‘college or over’. For region, Seoul, Gyeonggi Province, and Incheon were classified as the metropolitan area, and the rest were classified according to administrative regions as Jeolla Province, Gyeongsang Province, Chungcheong Province, Gangwon Province, and Jeju Island.

In health-related variables, subjective health and subjective stress were measured on a 5-point and 4-point Likert scale, respectively, but were reclassified into categories of good and poor, high and low. Annual unmet healthcare needs were categorized as ‘yes’, ‘no,’ and ‘not applicable (no need for medical care)’. In COVID-19 related variables, the changes in daily life related to COVID-19 were originally measured on a scale of 0 to 100 with 10-point intervals (0 represents complete suspension of daily life and 100 represents no change at all), and were reclassified into three categories based on the distribution: 0–40 points (severe), 50–60 points (moderate), and 70–100 points (mild or none). The number of assistants, which refers to the number of individuals for urgent help during COVID-19 quarantine, excluding family members living together, was categorized as 0, 1–2, 3–5, and 6 or more people. Variables indicating the appropriateness of COVID-19 response were classified as good, moderate, and poor.

2.3. Statistical analysis

The validation processes conducted to confirm the appropriateness of measuring concerns about COVID-19 as direct concerns and indirect concerns were as follows: exploratory factor analysis, confirmatory factor analysis, and the item-total correlation analysis. A detailed description of each analysis was provided in the Result.

The KCHS is based on a complex sampling design, which requires

consideration of weights, stratification variables, and cluster variables. To prevent overestimation of significance, we used normalized weights by dividing each individual raw weight by its mean (Peng, S. S., 2000; Thomas, S. L. & Heck, R. H., 2001; Debbie L., 2005), and the final mean value of all individual weights was adjusted to 1.

In the descriptive analysis, the number of respondents was presented as an unweighted value, but the proportion was presented considering weights. The weighted mean of direct and indirect concerns was calculated for each variable. ANOVA was performed using weights to assess the significance of differences in the mean concern values for each variable. Multiple regression analysis was conducted to verify whether there was a difference in effect size between direct and indirect concerns for each variable. To evaluate the importance of the independent variables in the multiple regression model, all possible sub-models were created and the average increase in R^2 value when one independent variable was added was calculated, as described previously (Kabacoff R., 2015). All statistical analyses were performed using R software (ver. 4.2.2; R Development Core Team, Vienna, Austria) with `svydesign`, `svytable`, `svymean`, `svyvar`, and `svyglm` packages.

Chapter 3. Results

3.1. Validation of measurement method

1) Exploratory factor analysis

The structure of the concerns model was investigated by EFA. For the five items, the overall Kaiser–Meyer–Olkin value was 0.79, and Bartlett’ s sphericity test was significant ($\chi^2 = 257957.5$, $df = 10$, $p < 0.001$). The five items were subjected to maximum–likelihood and varimax rotation. The number of factors was determined based on the Kaiser–Guttman criterion (eigenvalue > 1 rule), Scree test, parallel analysis (PA), and comparison data (CD) analysis. The Kaiser–Guttman criterion supported a one–factor solution (eigenvalue = 2.63), and this was confirmed by the Scree test. However, PA using 1,000 random datasets and a 95% cutoff suggested a two–factor solution, as did the CD analysis. Combining PA and CD with a descriptive measure is recommended to confirm the number of factors (Goretzko D. et al., 2021), so we ultimately used a two–factor solution.

Statistically meaningful loadings were assessed by poor (0.32), fair (0.45), good (0.55), very good (0.63), and excellent (0.71) (Tabachnick B. et al., 2013; Yıldırım M. et al., 2022). The range of factor loading values was applied from fair to excellent level, according to which we classified the direct and indirect concerns (Table 1).

Table 1. Results of exploratory factor analysis of concerns about COVID–19

| Item | Factor loading | |
|--------------------------------|-----------------|-------------------|
| | Direct concerns | Indirect concerns |
| Concerns about infection | 0.74 | 0.33 |
| Concerns about death | 0.67 | 0.29 |
| Concerns about criticism | 0.44 | 0.48 |
| Concerns about the vulnerable | 0.23 | 0.53 |
| Concerns about economic damage | 0.25 | 0.63 |
| SS loadings | 1.30 | 1.10 |
| Variance (%) | 0.26 | 0.22 |
| Cumulative (%) | 0.26 | 0.48 |

2) Confirmatory factor analysis

CFA using the maximum likelihood estimation was conducted to confirm the suitability of the two–factor model of concerns about COVID–19 based on the EFA results.

The result of CFA was evaluated using the Tucker–Lewis index (TLI) and

comparative fit index (CFI) with cut-offs of ≥ 0.90 and ≥ 0.95 for adequate and good data model fits, respectively. Standardized root mean square residual (SRMR) and root mean square error of approximation (RMSEA) values of ≤ 0.10 , ≤ 0.08 , and ≤ 0.05 denote acceptable, adequate, and good data-model fits, respectively (Yıldırım M. et al., 2022; Kline, Rex B., 2016; Li-tze Hu. et al., 1999).

The model had a satisfactory fit to the data ($\chi^2 = 2913.71$ [df = 4], $p < 0.001$, CFI = 0.99, TLI = 0.97, RMSEA = 0.06, SRMR = 0.02). Although the p -value in the chi-squared test was < 0.001 , this test has limitations as a measure of model fit because it is sensitive to sample size; larger samples are associated with smaller p -values (Babyak MA. Et al., 2010; Alavi M. et al., 2020), so we referred to other indices more.

Standardized factor loading values ranged from 0.72 to 0.81 for direct concerns and 0.54 to 0.70 for indirect concerns. Loading values were all significant ($p < 0.001$) (Figure 2).

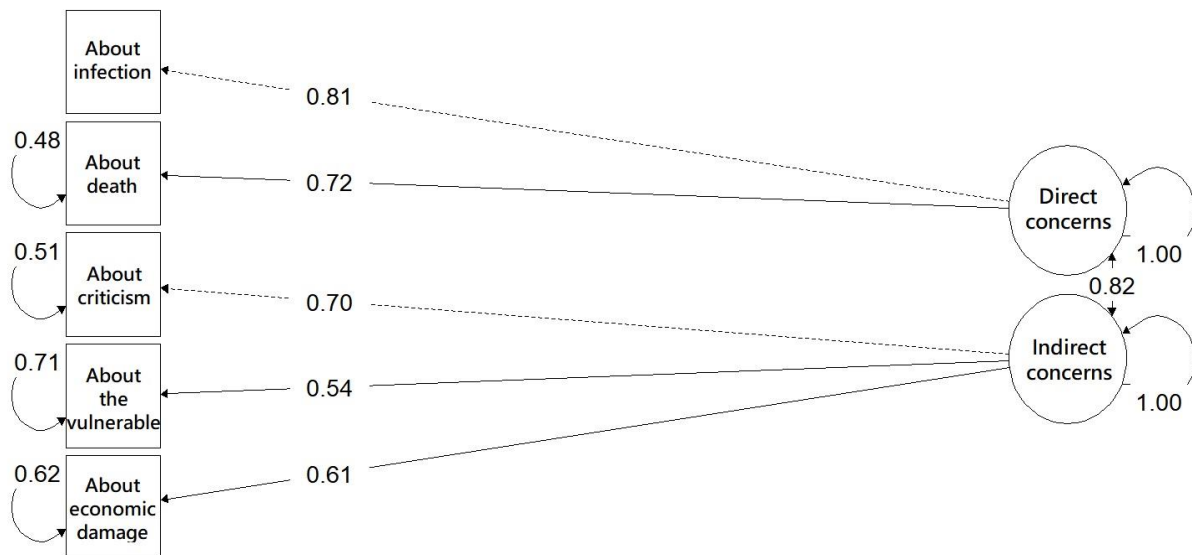


Figure 2. CFA factor loadings.

3) Item-total correlation test

Table 2 show the results of the item-total correlation test, which was conducted to verify that each item in the direct and indirect concerns categories was representative of its class. If the corrected item-total correlation (C-ITC) is < 0.30 , the item makes a small contribution, while if it is > 0.80 , it is highly likely to be a duplicate item (Um et al., 2005). To verify the reliability of the items, internal consistency was assessed based on Cronbach's alpha.

There were no inappropriate items for direct concerns- the C-ITCs of all sub-

items were > 0.7 . Regarding indirect concerns, the C-ITC values of the items were not as high as those of direct concerns, but were all > 0.5 . Also, Cronbach's alpha values obtained after omitting individual items were similar to that with all items included, so no items needed to be deleted (Table 2). Therefore, it was appropriate to classify concerns about COVID-19 into direct and indirect concerns.

Table 2. Sub-categories of direct and indirect concerns

| Direct concerns | Mean | SD | Corrected item-total correlation | Cronbach's α If item is deleted |
|-----------------------|------|-------|----------------------------------|---|
| About infection | 3.94 | 1.000 | 0.730 | 0.943 |
| About death | 3.30 | 1.192 | 0.771 | 0.930 |
| Total | 3.62 | 0.977 | Cronbach's $\alpha = 0.9105$ | |
| Indirect concerns | Mean | SD | Corrected item-total correlation | Cronbach's α If item is deleted |
| About criticism | 4.01 | 1.005 | 0.556 | 0.820 |
| About the vulnerable | 4.08 | 1.193 | 0.568 | 0.830 |
| About economic damage | 4.12 | 1.009 | 0.582 | 0.808 |
| Total | 4.07 | 0.822 | Cronbach's $\alpha = 0.8244$ | |

3.2. Dependent variables and mean concern scores

Table 3-1, 3-2, and 3-3 show the descriptive statistics of sociodemographic, health-related, and COVID-19-related variables, respectively, and the mean values for overall, direct, and indirect concerns. The differences in mean values were all significant ($p < 0.001$).

For sociodemographic variables (Table 3-1), females had higher mean values for concerns in all categories than males. As age increased, the mean values for concerns in all categories increased. For occupation, the mean values of overall and direct concerns were highest for the unemployed and lowest for white-collar workers. And, the mean values of indirect concerns were higher for pink- and blue-collar workers than for the unemployed. As annual household income increased, the mean values of concerns in all categories decreased. Mean values of concerns in all categories are lower with a higher level of education. Single persons had the lowest mean values of concerns in all categories. By region, mean values of indirect concerns were higher among people residing in Chungcheong and Gangwon provinces, while mean value of direct concerns was lower among residents of Jeju Island.

Regarding health-related variables (Table 3-2), respondents with poor subjective health and those with high subjective stress levels had higher mean values for concerns in all categories. Respondents diagnosed with hypertension and diabetes had higher mean values for concerns in all categories than those who did not. Regarding annual unmet healthcare needs, respondents who did not need healthcare services had the lowest mean values for concerns in all categories, and those had unmet healthcare needs had higher mean values for overall and indirect concerns than those who did not.

For COVID-19-related variables (Table 3-3), the greater the changes in daily life, the higher the mean values for concerns in all categories. Moreover, the greater the number of assistants during quarantine, the lower the mean values for concerns in all categories. Respondents who felt that the government's response to COVID-19 was good had the highest mean values for concerns in all categories. Respondents who believed that the responses of their cities and neighbors to COVID-19 were fair and good had the lowest and highest mean values for concerns in all categories, respectively. Finally, the more appropriate the mass media's response to COVID-19 was considered to be, the higher the mean values for concerns in all categories.

Table 3–1. Mean concern scores according to sociodemographic variables

| Sociodemographic variables | N [†] (%) | Overall concern scores | | Direct concern scores | | Indirect concern scores | |
|--------------------------------|--------------------|------------------------|----------------------|-----------------------|----------------------|-------------------------|----------------------|
| | | Mean±SD | P value _i | Mean±SD | P value _i | Mean±SD | P value _i |
| Sex | | | | | | | |
| Male | 94,397 (49.52) | 3.69±0.78 | | 3.36±0.96 | | 3.90±0.84 | |
| Female | 113,709 (50.48) | 3.91±0.74 | <0.001 | 3.67±0.91 | <0.001 | 4.07±0.80 | <0.001 |
| Age (y) | | | | | | | |
| 19–39 | 47,148 (33.29) | 3.67±0.76 | | 3.34±0.92 | | 3.89±0.84 | |
| 40–59 | 73,126 (39.05) | 3.78±0.74 | | 3.49±0.91 | | 3.98±0.81 | |
| ≥60 | 87,832 (27.66) | 3.98±0.78 | <0.001 | 3.78±0.98 | <0.001 | 4.11±0.82 | <0.001 |
| Occupation | | | | | | | |
| White collar | 39,551 (26.06) | 3.69±0.73 | | 3.37±0.88 | | 3.91±0.81 | |
| Pink collar | 26,548 (13.69) | 3.82±0.75 | | 3.49±0.94 | | 4.03±0.81 | |
| Blue collar | 60,688 (22.36) | 3.82±0.77 | | 3.51±0.97 | | 4.02±0.82 | |
| Unemployed | 81,319 (37.89) | 3.86±0.79 | <0.001 | 3.63±0.97 | <0.001 | 4.00±0.84 | <0.001 |
| Annual household Income | | | | | | | |
| ≤1800 | 59,468 (18.38) | 3.92±0.81 | | 3.71±1.01 | | 4.07±0.84 | |
| ≤3600 | 57,026 (26.39) | 3.83±0.77 | | 3.55±0.96 | | 4.02±0.82 | |
| ≤6000 | 53,163 (30.10) | 3.78±0.75 | | 3.47±0.92 | | 3.98±0.81 | |
| >6000 | 38,449 (25.12) | 3.70±0.75 | <0.001 | 3.40±0.91 | <0.001 | 3.90±0.82 | <0.001 |
| Education | | | | | | | |
| Middle or low | 68,955 (19.31) | 4.05±0.77 | | 3.85±0.98 | | 4.18±0.80 | |
| High | 60,367 (29.58) | 3.83±0.77 | | 3.55±0.95 | | 4.01±0.83 | |
| College or over | 78,784 (51.12) | 3.69±0.75 | <0.001 | 3.37±0.90 | <0.001 | 3.90±0.82 | <0.001 |
| Marital status | | | | | | | |
| Married | 130,923 (60.74) | 3.86±0.74 | | 3.58±0.93 | | 4.05±0.79 | |
| Separated, divorced, widowed | 40,627 (14.43) | 3.91±0.80 | | 3.70±0.99 | | 4.05±0.85 | |
| Single | 36,556 (24.83) | 3.58±0.77 | <0.001 | 3.26±0.92 | <0.001 | 3.79±0.86 | <0.001 |
| Region | | | | | | | |
| Metropolitan area | 64,646 (48.60) | 3.77±0.76 | | 3.48±0.93 | | 3.96±0.82 | |
| Jeolla Province | 34,417 (10.19) | 3.85±0.79 | | 3.63±0.98 | | 3.99±0.85 | |
| Gyeongsang Province | 60,697 (25.81) | 3.79±0.77 | | 3.49±0.96 | | 4.00±0.82 | |
| Chungcheong Province | 29,075 (10.94) | 3.90±0.78 | | 3.63±0.96 | | 4.08±0.82 | |
| Gangwon Province | 15,394 (3.26) | 3.90±0.78 | | 3.61±1.00 | | 4.10±0.81 | |
| Jeju island | 3,877 (1.20) | 3.65±0.80 | <0.001 | 3.28±0.94 | <0.001 | 3.90±0.88 | <0.001 |

ⁱ p-values: *p<0.5, **p<0.01, ***p<0.001; [†]Unweighted; [‡]Weighted

Unit of annual household income: 10,000 KRW

Range of mean scores: 1–5, Higher scores indicate higher levels of concern.

Table 3–2. Mean concern scores according to health–related variables

| Health–related variables | N [†] (%) | Overall concern scores | | Direct concern scores | | Indirect concern scores | |
|--------------------------------------|--------------------|------------------------|----------------------|-----------------------|----------------------|-------------------------|----------------------|
| | | Mean±SD | P value _i | Mean±SD | P value _i | Mean±SD | P value _i |
| Subjective health level | | | | | | | |
| Good | 180,339 (90.62) | 3.77±0.76 | | 3.48±0.94 | | 3.97±0.83 | |
| Poor | 27,767 (9.38) | 4.04±0.78 | <0.001 | 3.86±1.00 | <0.001 | 4.15±0.81 | <0.001 |
| Subjective stress level | | | | | | | |
| High | 45,814 (25.42) | 3.91±0.73 | | 3.60±0.95 | | 4.11±0.78 | |
| Low | 162,292 (74.58) | 3.76±0.78 | <0.001 | 3.49±0.95 | <0.001 | 3.94±0.84 | <0.001 |
| Hypertension diagnosis | | | | | | | |
| Yes | 57,998 (20.91) | 3.93±0.78 | | 3.71±0.97 | | 4.08±0.82 | |
| No | 150,108 (79.09) | 3.76±0.76 | <0.001 | 3.47±0.94 | <0.001 | 3.96±0.83 | <0.001 |
| Diabetes diagnosis | | | | | | | |
| Yes | 24,325 (8.96) | 3.96±0.78 | | 3.75±0.99 | | 4.09±0.82 | |
| No | 183,781 (91.04) | 3.78±0.77 | <0.001 | 3.49±0.94 | <0.001 | 3.98±0.83 | <0.001 |
| Annual unmet healthcare needs | | | | | | | |
| Yes | 10,497 (4.78) | 3.86±0.73 | | 3.54±0.96 | | 4.08±0.79 | |
| No | 181,264 (86.02) | 3.82±0.77 | | 3.54±0.95 | | 4.00±0.82 | |
| N/A | 16,345 (9.20) | 3.61±0.79 | <0.001 | 3.28±0.94 | <0.001 | 3.82±0.88 | <0.001 |

ⁱ p–values: *p<0.5, **p<0.01, ***p<0.001; [†]Unweighted; [‡]Weighted

Range of mean scores: 1–5, Higher scores indicate higher levels of concern.

Table 3–3. Mean concern scores according to COVID–19–related variables

| COVID–19 related variables | N [†] (%) [‡] | Overall concern scores | | Direct concern scores | | Indirect concern scores | |
|--|---------------------------------|------------------------|----------------------|-----------------------|----------------------|-------------------------|----------------------|
| | | Mean±SD | P value _i | Mean±SD | P value _i | Mean±SD | P value _i |
| Daily life change | | | | | | | |
| Severe | 58,117 (30.53) | 3.94±0.73 | | 3.65±0.94 | | 4.13±0.77 | |
| Moderate | 78,571 (38.49) | 3.81±0.74 | | 3.53±0.91 | | 4.00±0.80 | |
| Mild or none | 71,418 (30.98) | 3.64±0.82 | <0.001 | 3.37±0.99 | <0.001 | 3.83±0.88 | <0.001 |
| Numbers of assistants during quarantine | | | | | | | |
| None | 35,931 (15.60) | 3.90±0.79 | | 3.65±0.99 | | 4.07±0.84 | |
| 1–2 | 91,778 (44.87) | 3.84±0.75 | | 3.57±0.92 | | 4.02±0.80 | |
| 3–5 | 59,298 (29.39) | 3.73±0.76 | | 3.43±0.94 | | 3.94±0.82 | |
| ≥ 6 | 21,099 (10.14) | 3.66±0.83 | <0.001 | 3.33±1.01 | <0.001 | 3.87±0.89 | <0.001 |
| Appropriateness of the government' s response | | | | | | | |
| Good | 152,677 (71.64) | 3.83±0.75 | | 3.55±0.94 | | 4.01±0.81 | |
| Fair | 41,140 (21.03) | 3.72±0.78 | | 3.44±0.95 | | 3.91±0.85 | |
| Poor | 14,289 (7.33) | 3.73±0.85 | <0.001 | 3.40±1.07 | <0.001 | 3.96±0.89 | <0.001 |
| Appropriateness of the city' s response | | | | | | | |
| Good | 148,320 (67.69) | 3.83±0.76 | | 3.56±0.94 | | 4.01±0.81 | |
| Fair | 48,259 (25.78) | 3.72±0.77 | | 3.43±0.94 | | 3.92±0.84 | |
| Poor | 11,527 (6.53) | 3.77±0.84 | <0.001 | 3.44±1.06 | <0.001 | 3.99±0.88 | <0.001 |
| Appropriateness of mass media' s response | | | | | | | |
| Good | 138,524 (61.55) | 3.86±0.76 | | 3.59±0.95 | | 4.04±0.81 | |
| Fair | 53,272 (29.04) | 3.72±0.76 | | 3.42±0.92 | | 3.91±0.83 | |
| Poor | 16,310 (9.41) | 3.67±0.81 | <0.001 | 3.31±1.02 | <0.001 | 3.90±0.87 | <0.001 |
| Appropriateness of neighbor' s response | | | | | | | |
| Good | 152,865 (71.20) | 3.83±0.77 | | 3.54±0.95 | | 4.02±0.82 | |
| Fair | 47,903 (24.91) | 3.72±0.76 | | 3.44±0.93 | | 3.90±0.83 | |
| Poor | 7,338 (3.89) | 3.80±0.83 | <0.001 | 3.50±1.03 | <0.001 | 3.99±0.89 | <0.001 |

ⁱp–values: *p<0.5, **p<0.01, ***p<0.001; [†]Unweighted; [‡]Weighted

Range of mean scores: 1–5, Higher scores indicate higher levels of concern.

3.3. Factors influencing direct and indirect concerns about COVID-19

Three multiple regression models were used to analyze each category of concerns. We included sociodemographic variables in model 1; health-related variables in model 2; and COVID-19-related variables in model 3. Before the analysis, multicollinearity between independent variables was analyzed. The variance inflation factor (VIF) values ranged from 1.01 to 1.36 in all models, thus ruling out multicollinearity. The Durbin-Watson values of all models ranged from 1.43 to 1.56, indicating no serious autocorrelation. The multiple regression model results are shown in Table 4.

In model 1, we included sex, age, occupation, annual household income, education, marital status, and region. Females had higher concerns in all categories than males, especially direct concerns ($B = .26$). Regarding age, compared with the early adulthood group (19–39 years), overall and indirect concerns were lower in the middle adulthood group (40–59 years) ($B = -.04$, and $-.07$, respectively). In the elderly group (≥ 60 years), overall and direct concerns increased more than in the early adulthood group ($B = .04$, and $.15$, respectively), whereas indirect concerns decreased ($B = -.04$). Regarding occupation, direct concerns tended to decrease in all workers compared to the unemployed, whereas indirect concerns increased in all workers, especially in pink- and blue-collar ones ($B = .08$, and $.06$, respectively). Regarding annual household income, compared with the lowest income group ($\leq 1,800$, unit = 10,000 KRW), concerns in all categories decreased as income increased, except for the second income quantile (≤ 3600). A lower level of education was associated with greater concerns in all categories. Regarding marital status, concerns in all categories decreased in single people, and married people showed a greater increase in concerns than those who were separated, divorced, or widowed. Compared to metropolitan areas, direct concerns increased among those residing in Chungcheong province ($B = .11$), while indirect concerns increased among those residing both Chungcheong and Gangwon provinces ($B = .09$). On the other hand, residents of Jeju Island had lower direct concerns than those in metropolitan areas ($B = -.22$).

Model 2 further included subjective health level, subjective stress level, hypertension, diabetes, and annual unmet healthcare needs. Direct concerns increased especially in respondents with poor subjective health ($B = .16$), and indirect concerns increased especially in those with high subjective stress levels ($B = .18$). Respondents with hypertension and diabetes had greater concerns in all categories than those without those conditions, especially direct concerns ($B = .04$, and $.06$, respectively). Compared to respondents who did not need healthcare services, those who did had higher concerns in all

categories. Among them, respondents with unmet healthcare needs had greater indirect concerns than those without ($B = .13$), and vice versa for direct concerns ($B = .13$).

Model 3 additionally included daily life changes related to COVID-19, the number of assistants during COVID-19 quarantine, and the appropriateness of the COVID-19 response of the government, city, mass media, and neighbors. The more severe the changes in daily life related to COVID-19, the greater the concerns in all categories. Compared to respondents with ≥ 6 assistants during COVID-19 quarantine, those with fewer assistants had greater concerns, although there was no difference in concerns between those with 1–2 versus 0 assistants. Furthermore, the less appropriate the perceived response of the government and mass media to COVID-19, the lower the level of concerns of the respondents. The indirect concerns of respondents who believed that their city's response to COVID-19 was poor were greater compared to those who believed it was good ($B = .02$). Direct concerns increased among respondents who believed that their neighbors' response to COVID-19 was poor compared to those who believed it was good ($B = .07$).

Table 4. Results of multiple regression analysis of concerns about COVID-19

| Independent variables (Ref) | Overall concerns | | | Direct concerns | | | Indirect concerns | | |
|------------------------------------|------------------|---------------|---------------|-----------------|---------------|---------------|-------------------|---------------|---------------|
| | Model 1 | Model 2 | Model 3 | Model 1 | Model 2 | Model 3 | Model 1 | Model 2 | Model 3 |
| Sex (Male) | | | | | | | | | |
| Female | 0.19(.00)*** | 0.19(.00)*** | 0.16(.00)*** | 0.26(.00)*** | 0.26(.00)*** | 0.23(.00)*** | 0.15(.00)*** | 0.14(.00)*** | 0.12(.00)*** |
| Age(y) (19–39) | | | | | | | | | |
| 40–59 | –0.04(.00)*** | –0.04(.00)*** | –0.04(.00)*** | 0.02(.01)** | 0.01(.01) | 0.01(.01) | –0.07(.01)*** | –0.07(.01)*** | –0.07(.01)*** |
| ≥60 | 0.04(.01)*** | 0.04(.01)*** | 0.04(.01)*** | 0.15(.01)*** | 0.13(.01)*** | 0.14(.01)*** | –0.04(.01)*** | –0.02(.01)** | –0.02(.01)** |
| Occupation (Unemployed) | | | | | | | | | |
| White collar | –0.01(.00)** | –0.02(.00)*** | 0.00(.00) | –0.06(.01)*** | –0.06(.01)*** | –0.04(.01)*** | 0.02(.01)** | 0.01(.01) | 0.02(.01)*** |
| Pink collar | 0.03(.01)*** | 0.03(.01)*** | 0.04(.01)*** | –0.05(.01)*** | –0.04(.01)*** | –0.03(.01)*** | 0.08(.01)*** | 0.08(.01)*** | 0.08(.01)*** |
| Blue collar | 0.02(.00)*** | 0.03(.00)*** | 0.04(.00)*** | –0.03(.01)*** | –0.02(.01)** | –0.01(.01) | 0.06(.01)*** | 0.06(.01)*** | 0.07(.01)*** |
| Income (≤1800) | | | | | | | | | |
| ≤3600 | 0.00(.01) | 0.02(.01)** | 0.02(.01)*** | –0.01(.01) | 0.01(.01) | 0.01(.01)* | 0.01(.01) | 0.02(.01)*** | 0.02(.01)*** |
| ≤6000 | –0.03(.01)*** | –0.01(.01) | –0.01(.01) | –0.04(.01)*** | –0.01(.01) | –0.01(.01) | –0.02(.01)*** | –0.01(.01) | 0.00(.01) |
| >6000 | –0.08(.01)*** | –0.06(.01)*** | –0.05(.01)*** | –0.07(.01)*** | –0.04(.01)*** | –0.03(.01)*** | –0.09(.01)*** | –0.07(.01)*** | –0.06(.01)*** |
| Education (College or over) | | | | | | | | | |
| High | 0.07(.00)*** | 0.06(.00)*** | 0.06(.00)*** | 0.09(.01)*** | 0.08(.01)*** | 0.08(.01)*** | 0.05(.00)*** | 0.05(.00)*** | 0.05(.00)*** |
| Middle or low | 0.19(.01)*** | 0.17(.01)*** | 0.17(.01)*** | 0.21(.01)*** | 0.18(.01)*** | 0.18(.01)*** | 0.17(.01)*** | 0.16(.01)*** | 0.16(.01)*** |
| Marital status (Single) | | | | | | | | | |
| Separated, divorced, and widowed | 0.14(.01)*** | 0.12(.01)*** | 0.11(.01)*** | 0.13(.01)*** | 0.11(.01)*** | 0.10(.01)*** | 0.15(.01)*** | 0.13(.01)*** | 0.11(.01)*** |
| Married | 0.23(.01)*** | 0.22(.00)*** | 0.20(.00)*** | 0.20(.01)*** | 0.18(.01)*** | 0.17(.01)*** | 0.25(.01)*** | 0.24(.01)*** | 0.22(.01)*** |
| Region (Metropolitan area) | | | | | | | | | |
| Jeolla Province | 0.03(.01)*** | 0.04(.01)*** | 0.04(.01)*** | 0.10(.01)*** | 0.10(.01)*** | 0.09(.01)*** | –0.01(.01) | 0.00(.01) | 0.00(.01) |
| Gyeongsang Province | –0.01(.00)* | 0.00(.00) | 0.02(.00)*** | –0.04(.00)*** | –0.03(.00)*** | –0.01(.00) | 0.01(.00)* | 0.02(.00)*** | 0.04(.00)*** |
| Chungcheong Province | 0.10(.01)*** | 0.10(.01)*** | 0.11(.01)*** | 0.11(.01)*** | 0.12(.01)*** | 0.13(.01)*** | 0.09(.01)*** | 0.10(.01)*** | 0.11(.01)*** |
| Gangwon Province | 0.08(.01)*** | 0.09(.01)*** | 0.09(.01)*** | 0.07(.01)*** | 0.07(.01)*** | 0.08(.01)*** | 0.09(.01)*** | 0.10(.01)*** | 0.11(.01)*** |
| Jeju Island | –0.14(.02)*** | –0.14(.01)*** | –0.15(.01)*** | –0.22(.02)*** | –0.22(.02)*** | –0.24(.02)*** | –0.08(.02)*** | –0.08(.02)*** | –0.09(.02)*** |
| Subjective health (Good) | | | | | | | | | |
| Poor | | 0.09(.01)*** | 0.09(.01)*** | | 0.16(.01)*** | 0.15(.01)*** | | 0.05(.01)*** | 0.05(.01)*** |
| Subjective stress (Low) | | | | | | | | | |
| High | | 0.16(.00)*** | 0.15(.00)*** | | 0.14(.00)*** | 0.13(.00)*** | | 0.18(.00)*** | 0.16(.00)*** |
| Hypertension (No) | | | | | | | | | |
| Yes | | 0.02(.00)*** | 0.03(.00)*** | | 0.04(.01)*** | 0.04(.01)*** | | 0.01(.00)* | 0.01(.00)** |

*p < 0.5, **p < 0.01, ***p < 0.001. Standard errors are presented in parentheses. Unit of annual household income: 10,000 KRW

Table 4. Results of multiple regression analysis of concerns about COVID-19 (continued)

| Independent variables (Ref) | Overall concerns | | | Direct concerns | | | Indirect concerns | | |
|---|------------------|--------------|---------------|-----------------|--------------|---------------|-------------------|--------------|---------------|
| | Model 1 | Model 2 | Model 3 | Model 1 | Model 2 | Model 3 | Model 1 | Model 2 | Model 3 |
| Diabetes (No) | | | | | | | | | |
| Yes | | 0.03(.01)*** | 0.04(.01)*** | | 0.06(.01)*** | 0.07(.01)*** | | 0.01(.01)* | 0.02(.01)** |
| Unmet healthcare needs (N/A) | | | | | | | | | |
| No | | 0.12(.01)*** | 0.10(.01)*** | | 0.13(.01)*** | 0.12(.01)*** | | 0.10(.01)*** | 0.09(.01)*** |
| Yes | | 0.11(.01)*** | 0.10(.01)*** | | 0.09(.01)*** | 0.07(.01)*** | | 0.13(.01)*** | 0.11(.01)*** |
| Daily life changes (Mild or none) | | | | | | | | | |
| Moderate | | | 0.16(.00)*** | | | 0.16(.00)*** | | | 0.17(.00)*** |
| Severe | | | 0.28(.00)*** | | | 0.27(.01)*** | | | 0.29(.00)*** |
| Numbers of assistants during quarantine (≥ 6) | | | | | | | | | |
| 3–5 | | | 0.06(.01)*** | | | 0.06(.01)*** | | | 0.05(.01)*** |
| 1–2 | | | 0.13(.01)*** | | | 0.15(.01)*** | | | 0.11(.01)*** |
| None | | | 0.13(.01)*** | | | 0.15(.01)*** | | | 0.11(.01)*** |
| Appropriateness of the government's response (Good) | | | | | | | | | |
| Fair | | | -0.03(.01)*** | | | -0.02(.01)*** | | | -0.03(.01)*** |
| Poor | | | -0.04(.01)*** | | | -0.05(.01)*** | | | -0.03(.01)*** |
| Appropriateness of the city's response (Good) | | | | | | | | | |
| Fair | | | -0.04(.01)*** | | | -0.04(.01)*** | | | -0.03(.01)*** |
| Poor | | | 0.01(.01) | | | -0.01(.01) | | | 0.02(.01)* |
| Appropriateness of media's response (Good) | | | | | | | | | |
| Fair | | | -0.08(.00)*** | | | -0.10(.01)*** | | | -0.07(.00)*** |
| Poor | | | -0.16(.01)*** | | | -0.22(.01)*** | | | -0.12(.01)*** |
| Appropriateness of neighbor's response (Good) | | | | | | | | | |
| Fair | | | -0.04(.00)*** | | | -0.01(.01) | | | -0.06(.00)*** |
| Poor | | | 0.03(.01)*** | | | 0.07(.01)*** | | | 0.01(.01) |

*p < 0.5, **p < 0.01, ***p < 0.001. Standard errors are presented in parentheses.

3.4. Relative importance of factors influencing concerns about COVID–19

Among the factors influencing overall concerns, daily life change was the most important, followed by education level, sex, and marital status (Figure 3).

Among the factors influencing direct concerns, sex, daily life change, and education level were the most important. Importance decreased in the order of age, appropriateness of the COVID–19 response of mass media, marital status, and subjective health level (Figure 4).

Among the factors influencing indirect concerns, daily life change, marital status, and educational level were the most important. Importance decreased in the order of sex, region, and subjective stress level (Figure 5).

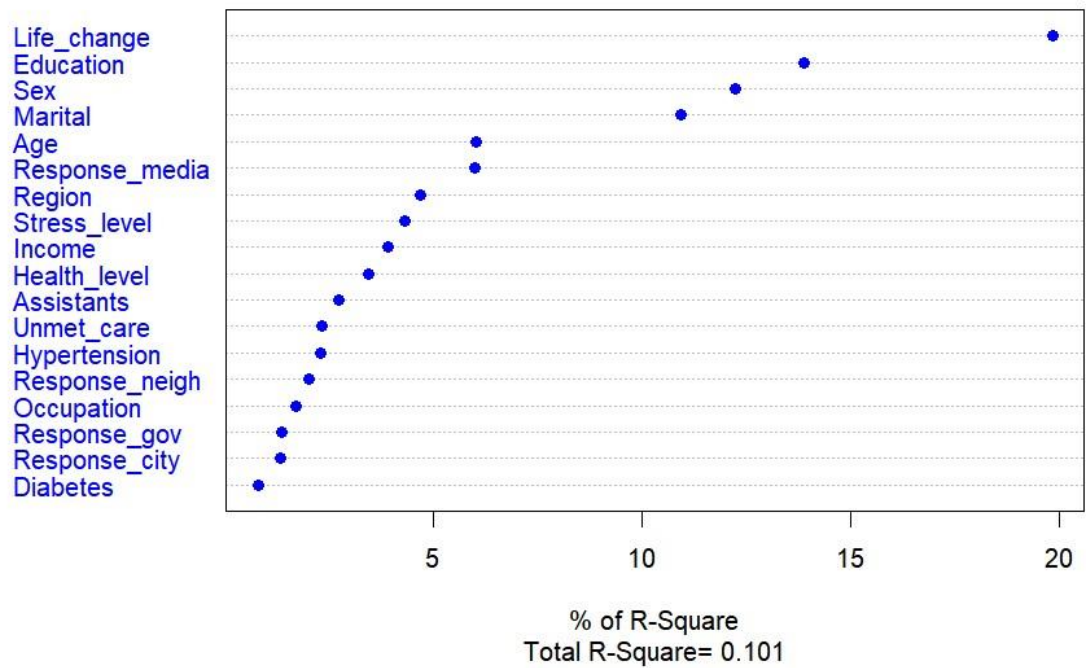


Figure 3. Predictors of overall concerns.

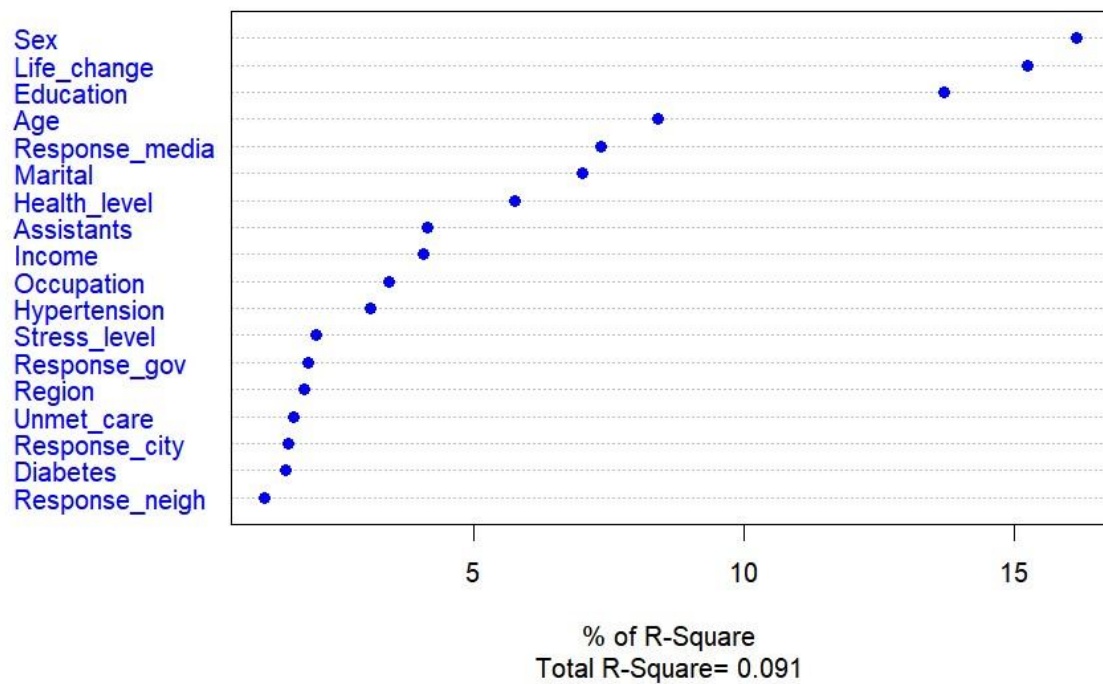


Figure 4. Predictors of direct concerns.

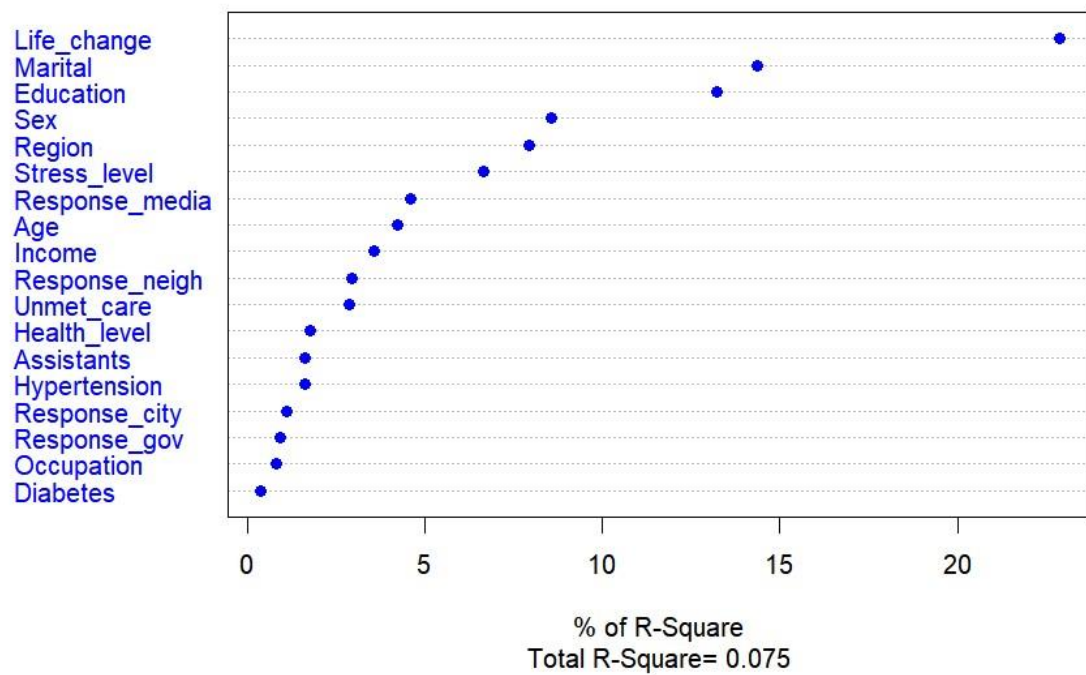


Figure 5. Predictors of indirect concerns.

Chapter 4. Discussion

4.1. Discussion

Concern is an important indicator of the mental health effects of COVID-19; it serves acts as a predictor of mental disorders and acted as a proxy of mental health in the early stages of COVID-19 (Makhashvili N. et al., 2020; Tarek B. et al., 2021; Mullins RJ. Et al., 2022). Many studies have evaluated factors related to psychological concerns, but few have compared the impacts of the direct and indirect damage caused by COVID-19 on such concerns. Accordingly, we aimed to compare the impacts of direct and indirect damage from the pandemic on psychological concerns and identify relatively vulnerable groups. Psychological concerns about COVID-19 were divided into direct and indirect categories, and the distribution of concerns differs across populations. The key findings of this study are described in more detail below.

Some of our findings are consistent with previous reports. Direct and indirect concerns were greater in respondents with low incomes and education levels, and in those who reported major changes in their daily life. Concerns increased as income and education level decreased, because disadvantaged socioeconomic status is a risk factor for mental health problems such as anxiety and worry (Zhou X. et al., 2020; Farrell L. et al., 2009; Buckner J. et al., 1997). We evaluated the magnitude of changes in daily life relative to the pre-pandemic period, so our findings are consistent with reports that the changes brought by lockdown and social distancing negatively affected mental health (Gan Y. et al., 2022; Pieh C. et al., 2021; Rossi R. et al., 2020; Park., 2020).

Direct concerns were especially prevalent among females, respondents with poor subjective health, those with hypertension or diabetes, those with few assistants during quarantine, and those who believed that their neighbor's response to COVID-19 was inappropriate. Direct concerns were more prevalent among females, consistent with a report that females have more negative expectations and greater levels of fear about health-related outcomes of COVID-19 than males (Alsharawy A. et al., 2021). Concerns were greater among respondents with hypertension or diabetes, especially direct concerns. Indeed, patients with chronic diseases in a previous study also had more concerns about COVID-19 (Anita LK et al., 2020). Direct concerns were greater among our respondents who had fewer than two assistants during the COVID-19 quarantine. In college students, psychological concerns were less serious when they could ask someone for help during the COVID-19 pandemic (Szkody E. et al., 2021). Direct concerns were greater

among our respondents who believed that their neighbor's response to COVID-19 was inappropriate, likely because contact with neighbors or co-workers who are not appropriately responding to COVID-19 can increase the risk of infection.

Indirect concerns were greater among our married respondents, those who felt their city's response to COVID-19 was inappropriate and residents of Chungcheong and Gangwon provinces. Concerns were more prevalent among married respondents, particularly indirect concerns, which may be because they tended to have young children vulnerable to disease. The previous study also suggested that the COVID-19 worry scores were elevated in married and cohabiting individuals (Samuels J. et al., 2021). Because the city is responsible for policies related to indirect damage from the pandemic, including the COVID-19 Emergency Relief Fund and support schemes for small business owners, an inappropriate response therefrom would likely have heightened indirect concerns. In mid-August 2020, there was a significant increase in confirmed COVID-19 cases in Gangwon and Chungcheong provinces of Korea, primarily attributed to the use of sports facilities, religious venues, and urban rallies, which led to an escalation in the social distancing policy (KRIHS, 2022). Given that this period coincides with the data collection period of this study, it is likely to have influenced the concerns of residents.

There were some intriguing findings in this study in relation to occupation and unmet healthcare needs. Direct concerns were greater among the unemployed respondents, while indirect concerns were greater among those with jobs. This can be attributed to negative effects of the pandemic on workers' economic activity. In addition, the indirect concerns of pink- and blue-collar workers were particularly high, probably because they are more likely to be employed as non-regular workers than white-collar workers, and because non-regular workers were more likely to experience involuntary unemployment and a decline in income than regular workers during the pandemic (Hwang, 2020). Among our respondents who needed healthcare services over the past year, direct concerns were greater in those who did not experience unmet healthcare needs, while indirect concerns were greater in respondents who experienced unmet healthcare needs. In another Korean study, unmet healthcare needs were lower in individuals who feared that COVID-19 could be fatal (Lee, 2022), indicating that those with few direct concerns may be more likely to have unmet healthcare needs.

Unexpectedly, direct and indirect concerns were greater among our respondents who believed that the responses of the government and mass media to COVID-19 were appropriate. In the early stages of the pandemic, the

Korean government implemented mandatory quarantine and social distancing, and prohibited large-scale gatherings. And the quarantine system was highly valued and was termed “K-quarantine” in March 2020 (Yang et al., 2021). Because most of the government’s responses were aimed at reducing social contact, psychological concerns would likely have increased even among people who believed that the policies were appropriate. Under the assumption that the respondents who believed that the mass media responded appropriately to COVID-19 have more access to the media, our finding is consistent with a report of a bi-directional association between consumption of media related to COVID-19 and worry (Bounoua N. et al., 2021). Media consumption could be a maladaptive coping strategy that increases worry.

The psychological concerns arising from the COVID-19 pandemic, as revealed in this study, present certain distinctions compared to the psychological impact of previous infectious diseases. A study conducted among the general population in Hong Kong during the SARS outbreak reported that individuals with lower education levels, older age, and females experienced higher levels of worries, anxiety, and fear related to SARS (Lau et al., 2006). However, in the case of COVID-19, there is a difference in that younger adults experienced more psychological concerns about the indirect damage of the pandemic. In a Korean study analyzing the psychological impact of MERS, it was found that trust in the government and health authorities did not significantly influence fear and emotional distress related to MERS (Lee et al., 2016). But in the case of COVID-19, individuals who perceived the government’s response as appropriate exhibited higher levels of worry.

This study presented new results that were not previously addressed. First, Psychological concerns about COVID-19 can be classified as direct and indirect concerns. We performed EFA, CFA, and C-ITC to confirm the validity of this classification. Although EFA has been controversial because of its complexity, few other statistical methods are suitable for such classification (Goretzko D. et al., 2021).

Second, significant differences in direct and indirect concerns were found between age groups, providing valuable insights. Overall concern was higher among the elderly than those in early adulthood, consistent with an analysis of data from Daegu City collected in 2020 (Kim et al., 2021). Moreover, direct concerns increased significantly among our elderly respondents compared to those in early adulthood, whereas indirect concerns were greater in the latter group. This may be because younger people tend to be more engaged in social and economic activities, and would thus be concerned about the impacts of COVID-19 and quarantine on such activities. Previous studies also suggested that younger age is associated with increased economic fear (Levy I. et al.,

2021), while the elderly are more concerned about COVID-19-related infections and deaths (Kim et al., 2022). Therefore, younger and older persons are vulnerable to different types of damage.

Third, by assessing the relative importance of variables associated with direct and indirect concerns, we identified problems that should be prioritized by policymakers. Daily life changes related to COVID-19 were strongly related to overall, direct, and indirect concerns; strict policies such as social distancing and lockdown have a major psychological impact. Daily life changes were particularly strongly associated with indirect concerns, likely because of their association with decreases in income (Lee, 2020) and social contact (Dahlberg L., 2021), for example. The perceived appropriateness of the mass media response to COVID-19 was an important variable in our study; the mass media exerts a major influence during public health crises. Previous researches reported that when the news is biased and misleading, poor physical and mental health outcomes can result (Tasnin S. et al., 2020; Motta M. et al., 2020; Su Z. et al., 2021).

Our findings have several practical implications. First, individual interventions are needed because different groups are vulnerable to different types of damage. For example, persons living alone and those with small social networks are more vulnerable to direct damage, so supportive policies during quarantine are more required. Policymakers should focus on the elderly and people in early adulthood with regard to direct and indirect damage, respectively, and the importance of mental health interventions for younger people should not be underestimated. Furthermore, although this study did not include adolescents under the age of 19, given that they experienced substantial psychological problems due to lifestyle changes related to school closure during the pandemic (Esposito, S. et al., 2021; Commodari, E. et al., 2020), it is necessary for future research to focus on mental health crisis management for adolescents or even younger age groups.

Second, the relative importance of variables influencing concerns should be considered. For example, sex and marital status had a major influence on direct and indirect concerns, respectively. Married women, who may be raising young children, appear to be particularly vulnerable to psychological damage from COVID-19. In other studies, it has been also reported that the health-related quality of life of pregnant women was compromised during the pandemic (Biviá-Roig, G. et al., 2020). So, policymakers should pay more attention to them and consider measures such as providing psychological support services tailored to their needs. Because policies that interfere with daily life influence both direct and indirect concerns, they should be applied with caution, and their necessity should be continuously reevaluated. In

addition, the mass media's response to COVID-19 has a major impact on direct and indirect concerns; the media must provide accurate information during pandemic, and proper regulation of unreliable and inappropriate news is needed.

4.2. Limitations

Our study had several limitations. First, a trend of change over time or causal relationships could not be confirmed because of the cross-sectional design. Therefore, follow-up studies using longitudinal data are needed. Second, we evaluated psychological concerns in the early stages of the COVID-19 pandemic using 2020 Community Health Survey data, which precluded evaluation of the long-term effects of the COVID-19 pandemic. Third, psychological concerns may have exerted positive effects, such as encouraging activities preventing the rapid spread of COVID-19. However, we treated the concerns only as potential risk factors for poor mental health, thereby limiting the interpretability of the findings. Fourth, some antecedents of indirect concerns may have been disregarded, which could reduce the generalizability of our findings.

Despite these limitations, our study is meaningful because it assessed the associations of the direct and indirect damage caused by the COVID-19 pandemic with psychological concerns in the early stages of COVID-19. We evaluated the vulnerability of various groups to different types of damage, which is important because it provides a basis for the need for individualized interventions for future pandemics and public health crises. Previous studies suggested that major COVID-19-related worries include serious illness, infecting others, death, medical services, economic recession, unemployed, and reduced social contact (Blix I. et al., 2021), and major COVID-19-related concerns include reduced social contact, childcare, family, everyday life, paid work, and the economy (Czymara C. et al., 2021). Because the causes of psychological concerns presented in this study are similar to those of previous studies, there seems to be no serious problem in generalizing our results.

4.3. Conclusion

Evaluating direct and indirect concerns is important and meaningful. In this study, concerns caused by direct and indirect damages of the pandemic differed according to population characteristics. The relative importance of factors influencing direct and indirect concerns was similar for daily life

changes and appropriateness of the COVID–19 response of mass media, and differed for sex and marital status. Our findings can be used to prioritize psychological interventions and policies for future pandemics. Tailored interventions to improve mental health and prevent negative psychological concerns are needed.

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국문초록

연구배경: 코로나19 팬데믹이라는 공중보건 위기상황은 심리적인 염려를 일으키며 정신건강에 부정적인 영향을 끼쳐왔는데, 염려를 느끼는 원인이 팬데믹으로 인한 직접적 피해인지, 간접적 피해인지는 인구집단에 따라 차이가 있다. 여성, 노인, 기혼자들은 신종 바이러스에 대한 건강 위험 인식이 높다고 밝혀졌는데, 이는 이들이 코로나19의 직접적 피해로 인한 염려에 취약할 수 있음을 나타낸다. 또한, 코로나19 초기에 감염이 대구와 경북 지역을 중심으로 이루어졌고, 이로 인한 지역적 혐오가 소셜 미디어를 통해 퍼졌다는 점에서, 거주 지역에 따라 코로나19의 간접적 피해에 해당하는 주위 비난으로 인한 염려 수준이 상이할 수 있다. 이처럼, 인구 집단의 특성에 따라 직접 염려와 간접 염려에 대한 개입의 우선순위가 각각 다를 수 있으며, 이는 재정적 및 인적 자원이 제한되는 상황에서 효과적인 정책 결정에 중요하다. 그러나 현재까지 코로나19로 인한 직접 피해와 간접 피해로 인한 염려의 분포를 조사한 연구는 미비하였다. 따라서 본 연구에서는, 코로나19 감염과, 감염으로 인한 사망에 대한 염려를 직접 염려로 분류하였고, 팬데믹 여파로 발생한 문제들 중 감염으로 인한 주위의 비난, 어린이와 노인 등의 취약계층, 소득감소 등 경제적 피해에 대한 염려를 간접 염려로 분류하였으며, 요인분석을 통해 분류의 적절성을 확인하고자 하였다. 이를 바탕으로, 본 연구는 코로나19로 인한 직접적 피해 및 간접적 피해와 관련된 염려를 인구 특성에 따라 조사하고, 각 피해로 인한 염려에 특히 영향을 많이 받는, 상대적으로 취약한 집단의 특성을 확인하는 것을 목표로 하였다.

연구방법: 본 연구에서 이용한 자료는 2020년 한국 지역사회건강조사 결과로, 2020년 8월 16일부터 10월 31일까지 표본추출을 통해 선정한 가구의 만 19세 이상 성인 가구원들을 대상으로 1:1 인터뷰를 통해 시행되었다. 전체 응답자 229,269명 중 결측값을 제외한 총 208,106개의 응답을 분석하였다. 종속변수로는 코로나 19에 대한 염려로, 총 5가지 항목을 각각 5점 리커트 척도를 사용하여 측정하였다. 이 중 감염 또는 사망과 관련된 염려를 직접 염려로, 주위 비난, 취약계층, 경제적 피해와 관련된 염려를 간접 염려로 분류하기 위해, 탐색적, 확인적 요인분석과 문항 총점 상관분석을 시행하였다. 총 염려, 직접 염려, 간접 염려의 점수는 각 분류 내의 항목 점수를 합산한 뒤 항목의 수로 나누어 1부터 5까지의 범위로 나타내었다. 독립변수로는 인구사회학적 변수, 건강관련 변수, 코로나19 관련 변수를 사용하였으며, 선행 연구에서 코로나19 관련 정신건강

영향에 유의한 연관성이 있다고 보고된 변수들을 포함하였다. 가중평균, 분산분석 및 다중회귀분석을 사용하여 총 염려, 직접 염려, 간접 염려의 평균과 효과 크기를 비교하였다.

연구결과: 탐색적 및 확인적 요인분석은 코로나 19에 대한 심리적 염려에 대해 두 가지 요인 구조를 지지하였다. 본 연구에서는 이를 직접 염려와 간접 염려로 구분하였다 ($CFI = 0.99$, $TLI = 0.97$, $SRMR = 0.02$, $RMSEA = 0.06$). 직접 염려의 전체 평균은 3.62였고, 간접 염려의 전체 평균은 4.07이었다. 인구집단의 특성에 따라 직접적 염려에 취약한 집단과 간접적 염려에 취약한 집단이 각각 다르게 나타났다. 직접 염려는 여성 ($B = .26$), 노인 ($B = .15$), 고혈압 또는 당뇨병 진단자 ($B = .04$, $B = .06$), 격리 중 도움을 줄 수 있는 사람이 적은 사람들 ($B = .15$) 및 코로나 19에 대한 이웃의 대응이 부적절하다고 느끼는 사람들 ($B = .07$)에서 더 높았다. 간접 염려는 노인들이 더 낮았으며 ($B = -.04$), 청년층, 기혼자들 ($B = .25$), 핑크 또는 블루 칼라 노동자들 ($B = .08$, $B = .06$) 및 코로나 19에 대한 시 대응이 부적절하다고 느끼는 사람들 ($B = .02$) 사이에서 더 높았다.

결론: 코로나 19 팬데믹으로 인한 직접적 및 간접적 피해에 대한 염려의 분포는 인구집단의 특성에 따라 다르게 나타났다. 일부 요인들은 각각 직접 및 간접 염려에 특히 큰 영향을 미쳤다. 본 연구의 결과를 바탕으로, 부정적인 심리적 염려를 예방하고 정신건강의 증진을 위한 집단 별 맞춤형 중재의 필요성이 제기되며, 향후에 발생할 수 있는 팬데믹을 대비한 심리적 중재 및 정책 수립을 위한 기초자료로 활용될 수 있기를 기대한다.