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# Unmet Healthcare Needs among the Elderly Korean Population: Before and during the COVID-19 Pandemic

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**Abstract:** Unmet healthcare needs (UHN) are an important indicator in healthcare management and require sustainable healthcare systems. This cross-sectional descriptive study aimed to identify differences in UHN among the elderly Korean population before and during the first year of the COVID-19 pandemic. Data ($N$ = 3371) from the 8th Korea National Health and Nutrition Examination Survey (2019–2020), specifically focusing on adults aged 65 years and older, were analyzed. The overall prevalence of UHN decreased from 8.2% in 2019 to 7.6% in 2020, but there was no statistical significance ($p > 0.05$). The leading reasons for UHN were cost burden and mild symptoms in 2020 and cost burden in 2019 ($p < 0.05$). Compared to 2019, the cost burden in 2020 was lower in men than in women (odds ratio [OR] = 0.287, 95% confidence interval [CI]: 0.113–0.726, $p < 0.05$), and in the economically active group than in the non-economically active one as to mild symptoms (OR = 0.161, 95% CI: 0.054–0.478, $p < 0.05$) in multiple logistic regression analyses. In conclusion, these findings imply that sustainable healthcare policies and systems should be tailored to address the targeted population's healthcare needs, even beyond the COVID-19 era.

**Keywords:** COVID-19 pandemic; elderly population; healthcare system; telemedicine; unmet healthcare needs



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## 1. Introduction

Humans have a myriad of healthcare needs throughout their life, but the lack of timely access to healthcare services may result in a situation of unmet healthcare needs. Furthermore, although differences between countries may exist, the prevailing view is that all healthcare needs are not necessarily adequately covered by the healthcare system in reality [1–3].

Unmet healthcare needs can be defined as not receiving or delaying the necessary healthcare services despite the needs being perceived by the individual or judged by the medical professional [4–6]. Considered a measure of healthcare access, it is the difference between the healthcare services judged necessary and those that are actually received [1,3].

UHN is an important indicator of the healthcare system globally because it worsens simple health problems, incurs huge additional treatment costs, and can develop into irreparable health conditions [1,3,7–11]. The Organization for Economic Cooperation and Development (OECD) emphasizes the basic principle for all healthcare systems in each country, which is to provide high-quality healthcare to the entire population, regardless of the socio-economic conditions [12–14]. As such, many countries are regularly conducting follow-up surveys on factors that cause UHN among their citizens and formulating policies to reduce the incidence rate.

Most policies for reducing the prevalence of UHN are generally centered on vulnerable populations, including the elderly [4,7,9,15,16]. Previous studies on the elderly population

were mainly conducted to identify factors affecting UHN [4,5,17–20] and grasp the healthcare needs of older people with chronic diseases and disability [15,17,21]. Prior studies were also conducted on the determinants of inequality in UHN [21–23]. According to previous studies, UHN among the elderly is due to various factors, including socio-demographic or economic variables, such as sex, age, education, and income level [11,22–24]. In particular, most of the inequality was due to socioeconomic conditions, including gender, age, and income, that widened the disparities [21–24].

Besides, we speculate that the coronavirus disease (COVID-19) pandemic outbreak may have negatively affected access to healthcare services [3,25,26]. During the pandemic, social distancing and quarantine measures were enforced globally, and especially during the first wave of the pandemic, physical interaction was limited [8,25].

This led to changes in healthcare use across age-specific population groups, indefinite postponement of medical or treatment appointments, and an increase in vulnerability to access to necessary healthcare services in older adults [3,8,9,27]. A previous study reported that the healthcare needs of community-dwelling older adults, especially Asians, were not met during the COVID-19 pandemic and proposed that the needs of the elderly should be predicted for better preparedness [8]. Another study suggested that racial minorities are significantly more likely to be unmet on medication owing to COVID-19 [9]. Surprisingly, the role of primary care was limited by the centralization of the crisis in the hospital setting in the six European countries (Belgium, France, Italy, Poland, Spain and the United Kingdom) owing to the COVID-19 pandemic, but no specific action plan was provided [27]. Further, previous studies have also stressed the COVID-19-related factors that lead to inequality in healthcare access [3,8,25]. One study emphasized that the consequences of UHN results in high need and high cost among older adults, which in turn leads to increased UHN rates, creating a vicious cycle [10]. Hence, it can be inferred that the prevalence of UHN will be increased due to the COVID-19 pandemic, and it is judged that follow-up activities are needed to identify policies markers for UHN due to the COVID-19 pandemic outbreak [3,8,25,27–30]. Unfortunately, prior studies comparing the prevalence and reasons of UHN before and during COVID-19 are rare.

In this context, this study aimed to identify differences in the prevalence and reasons for UHN among the elderly Korean population, specifically focusing on adults aged 65 years and above before and during the first year of the COVID-19 pandemic. Thus, the research question was set as, "What are the differences in unmet healthcare needs (UHN) among the elderly Korean population before and during the first year of the COVID-19 pandemic?" The research hypotheses were as follows: First, the prevalence of UHN will be higher during the first year of the COVID-19 pandemic compared to before the pandemic. Second, the reasons for UHN will differ between before and during the first year of the COVID-19 pandemic. The findings of this study are expected to provide data for targeted support to address healthcare needs, which can be useful for vulnerable populations during crises such as the COVID-19 pandemic.

## 2. Materials and Methods

### *2.1. Study Design and Participants*

This cross-sectional descriptive study was a secondary data analysis of the first year (2019) and second year (2020) data extracted from a raw dataset of the 8th Korea National Health and Nutrition Examination Survey (KNHANES) conducted by the Korea Disease Control and Prevention Agency (KDCA) [31].

For the KNHANES, the target group was the citizens aged one or older living in Korea, and sample extraction was performed using a two-stage stratified cluster sample extraction method using survey ports and households as the first and second extraction units, respectively. The survey was stratified based on the first standard for stratification (city, housing type), the second standard for stratification (residential area ratio), and the intrinsic standard for stratification (householder education ratio) to extract 576 survey districts over a period of three years. In the sample survey, 25 sample households were

selected using the systematic extraction method among appropriate households, excluding facilities such as nursing homes, military and prison facilities, and foreign households. The survey included all household members aged one or older within the sample households. The number of survey districts was 192 per year, and 576 were extracted for 3 years in the 8th period (2019–20201). Despite the COVID-19 pandemic, the eighth 2nd year survey (2020) completed 180 health surveys (93.8% completion rate) out of 192 survey districts nationwide. The KNHANES calculates weights through design weight calculation, non-response adjustment, post-stratification, and extreme weight truncation. The design weight was calculated as the reciprocal of the extraction rate so that the extraction bias could be corrected during parameter estimation. The non-response adjustment weight was calculated as the reciprocal of the product of the response rate for the target household and subject, and the non-response bias was corrected [31].

The sampling framework of the KNHANES entailed the use of population and housing census data available at the time of the most recent sample design [32]. Through the KNHANES, data could be extracted to create a representative sample of target people aged $\geq$65 years who reside in the Republic of Korea. The total number of study participants was 3371 (including 1690 in 2019 and 1681 in 2020) subjects from Korea's aging population.

### 2.2. Measurement of Unmet Healthcare Needs

UHN of the 8th KNHANES was measured through interviews in a mobile examination vehicle by eight professional health survey investigators comprising nurses, nutritionists, and health science majors. Participants provided written informed consent. The interview items consisted of two open questions [32]. The first question was, "have you ever needed a medical (excluding dentistry) examination or treatment in the past year but not received it?". The response items were set as: "Yes or No, there was never a need for medical examination or treatment, or "I don't know (or no response)". The second question was, "what was the main reason for not receiving medical examination or treatment when you needed it?" The response items were: "insufficient time" (because "the hospital or medical institution did not work at the time convenient to me", "I couldn't leave the office", "I have no one to take care of my grandchildren for me"), mild symptoms (I think it will get better with time), economical problem (cost burden), distance and inconvenient transportation, dislike for long waiting time, difficulty in making a reservation, fear of care or examination, or others".

### 2.3. Data Analysis

Data analysis was extracted by the multi-stage stratification probability extraction method, which is a complex sample design method, and the analysis plan file was created by designating the complex sample design elements, such as hierarchy (layer variables), cluster (collection variables), and sample weight (weight variables) for representative samples. We analyzed the results of the elderly population aged 65 or older, which was the group of interest in this study, by making the entire data an analysis database, and by creating variables that distinguish the group of subjects aged 65 years old or older from the other groups (65 years old or older = 1, other groups = 0), and designating the group of senior citizens, which is the group of interest created as a parent group. The processing of missing data was carried out with valid values and only affected the dispersion of estimates, including those with effects in the variables analyzed.

Sampling weights to ensure the representativeness of the sample relative to the Korean population were available in the 8th KNHANES database [32]. The non-response adjustment weight was calculated as the reciprocal of the product of the response rate for the target household and subject, and the non-response bias was corrected [32]. The basic weights were corrected through a post-stratification process based on the estimated number of households and population for each year, such that the sum of household weights equals the total number of households in Korea, and the sum of individual weights by survey category equals the population in the corresponding age group in Korea [32]. The demographic

characteristics are expressed as frequency and percentage. The chi-square test was used to analyze the prevalence and reasons for UHN, which are expressed as a percentage. In addition, multiple logistic regression analysis was used to analyze the influencing factors for UHN, and findings are expressed as OR. The reasons for unmet healthcare needs were adjusted. Among the reasons for UHN, three variables (cost burden, mild symptoms, and insufficient time) were adjusted in the multiple logistic regression analysis. The remaining reasons for UHN, such as distance and inconvenient transportation, dislike of long waiting times, difficulty in making a reservation, fear of care or examination, and others, were excluded from the analysis because their prevalence was very low. Which could negatively affect the research results, so it was treated as a missing value. Missing values were treated as significant values and statistical significance was set at a *p*-value of 0.05. Composite sample analysis was performed using SPSS 28.0.1.

### *2.4. Ethical Considerations*

The raw data used in this study were approved by the KDCA's Institutional Review Board (IRB) and were downloaded from the KNHANES website by appropriate procedures [21]. As this study is a secondary data analysis, participants' informed consent is not required.

## 3. Results

The general characteristics of the participants are presented in Table 1. The total number of participants was 3371 (1690 men and 1681 women). Regarding marital status, the with-partner group had the highest number of participants, whereas the separated group had the lowest number. In terms of education level, the number of graduates of elementary school or lower was the highest, whereas the number of graduates of college or higher was the lowest. As for family income, the lower level had the highest number of participants, while the upper level had the smallest number. With regard to economic activity, the number of participants in the unemployed group was high. As for the type of national health insurance, the employee health insurance group had the highest number of participants, while the medical aid group had the lowest number. No statistically significant differences in demographic characteristics were observed between 2019 and 2020.

**Table 1.** General characteristics of the elderly Korean population aged ≥65 years (2019–2020).

| Variables | Year 2019 | Year 2020 | *p* Value |
|---|---|---|---|
| | N (% ± SE) | N (% ± SE) | |
| Sex | | | |
| Men | 723 (42.9 ± 1.3) | 724 (43.2 ± 1.4) | 0.866 |
| Women | 967 (57.1 ± 1.3) | 957 (56.8 ± 1.4) | |
| Total | 1690 (100.0 ± 0.0) | 1681 (100.0 ± 0.0) | |
| Age groups | | | |
| 65–69 | 522 (31.90 ± 1.5) | 491 (32.7 ± 1.7) | 0.972 |
| 70–74 | 464 (24.6 ± 1.2) | 492 (24.5 ± 1.1) | |
| 75–79 | 360 (22.8 ± 1.3) | 354 (22.3 ± 1.3) | |
| 80+ | 344 (20.7 ± 1.4) | 344 (20.4 ± 1.5) | |
| Total | 1690 (100.0 ± 0.0) | 1681 (100.0 ± 0.0) | |
| Marital status | | | |
| With partner | 1109 (66.3 ± 1.4) | 1113 (67.6 ± 1.4) | 0.776 |
| Separated | 19 (1.4 ± 0.4) | 19 (1.3 ± 0.4) | |
| Widowed | 482 (28.4 ± 1.3) | 460 (26.6 ± 1.3) | |
| Divorced | 65 (3.9 ± 0.5) | 78 (4.5 ± 0.6) | |
| Total | 1675 (100.0 ± 0.0) | 1670 (100.0 ± 0.0) | |

**Table 1.** *Cont.*

| Variables | Year 2019 | Year 2020 | *p* Value |
|---|---|---|---|
| | N (% ± SE) | N (% ± SE) | |
| Educational level | | | |
| ≤Elementary school | 839 (53.1 ± 1.5) | 704 (49.5 ± 16) | 0.258 |
| Middle school | 250 (16.5 ± 1.1) | 243 (18.1 ± 1.2) | |
| High school | 288 (19.7 ± 1.2) | 278 (21.4 ± 1.3) | |
| ≥College | 150 (10.7 ± 0.9) | 149 (11.1 ± 1.1) | |
| Total | 1527 (100.0 ± 0.0) | 1374 (100.0 ± 0.0) | |
| Family income level | | | |
| Low | 800 (46.1 ± 1.5) | 732 (41.8 ± 1.6) | 0.056 |
| Low-middle | 490 (28.6 ± 1.3) | 488 (29.0 ± 1.3) | |
| Middle-high | 251 (16.5 ± 1.1) | 278 (18.2 ± 1.2) | |
| High | 138 (8.8 ± 0.8) | 165 (11.1 ± 1.0) | |
| Total | 1679 (100.0 ± 0.0) | 1663 (100.0 ± 0.0) | |
| Economic activities | | | |
| Yes | 532 (35.2 ± 1.4) | 512 (36.8 ± 1.6) | 0.164 |
| No | 998 (64.8 ± 1.4) | 862 (63.2 ± 1.6) | |
| Total | 1530 (100.0 ± 0.0) | 1373 (100.0 ± 0.0) | |
| Types of national health insurance | | | |
| Local-subscriber health insurance | 503 (30.4 ± 1.6) | 552 (33.3 ± 1.6) | 0.057 |
| Employee health insurance | 1039 (61.0 ± 1.8) | 903 (57.7 ± 1.6) | |
| Medical aid | 147 (8.5 ± 0.9) | 165 (9.0 ± 1.2) | |
| Total | 1689 (100.0 ± 0.0) | 1680 (100.0 ± 0.0) | |

Abbreviations: *N*, number; SE, standard error.

The prevalence of UHN among the Korean elderly population aged 65 years or older is shown in Table 2. The prevalence of UHN was 7.6% in 2020 and 8.2% in 2019, for an overall prevalence of 7.9%, with no statistically significant difference ($p > 0.05$).

**Table 2.** Prevalence of UHN among the elderly Korean population aged ≥65 years (2019–2020).

| Variables | Year 2019 | | Year 2020 | | Total | | *p* Value |
|---|---|---|---|---|---|---|---|
| | Yes | No | Yes | No | Yes | No | |
| Overall UHN | 8.2 ± 0.8 | 91.8 ± 0.8 | 7.6 ± 0.8 | 92.4 ± 0.8 | 7.9 ± 0.5 | 92.1 ± 0.5 | 0.530 |
| Sex | | | | | | | |
| Men | 5.9 ± 1.1 | 94.1 ± 1.1 | 4.1 ± 1.3 | 95.9 ± 1.3 | 5.0 ± 0.7 | 95.0 ± 0.7 | 0.000 |
| Women | 9.8 ± 0.9 | 90.2 ± 0.9 | 9.6 ± 1.0 | 90.4 ± 1.0 | 9.7 ± 0.7 | 90.3 ± 0.7 | |
| Age groups | | | | | | | |
| 65–69 | 6.3 ± 1.1 | 93.7 ± 1.1 | 6.8 ± 1.3 | 93.2 ± 1.3 | 6.6 ± 0.8 | 93.4 ± 0.8 | |
| 70–74 | 9.1 ± 1.9 | 90.9 ± 1.9 | 6.1 ± 1.2 | 93.9 ± 1.2 | 7.7 ± 1.1 | 92.3 ± 1.1 | 0.184 |
| 75–79 | 8.9 ± 1.8 | 91.1 ± 1.8 | 9.5 ± 2.0 | 90.5 ± 2.0 | 9.2 ± 1.2 | 90.8 ± 1.2 | |
| 80+ | 9.7 ± 2.2 | 90.3 ± 2.2 | 8.9 ± 2.3 | 91.1 ± 2.3 | 9.3 ± 1.4 | 90.7 ± 1.4 | |
| Marital status | | | | | | | |
| With partner | 5.7 ± 0.7 | 94.3 ± 0.7 | 6.3 ± 0.9 | 93.7 ± 0.9 | 6.0 ± 0.6 | 94.0 ± 0.6 | |
| Separated | 13.8 ± 9.2 | 86.2 ± 9.2 | 12.0 ± 8.0 | 88.0 ± 8.0 | 13.0 ± 6.2 | 87.0 ± 6.2 | 0.013 |
| Widowed | 13.4 ± 2.0 | 86.6 ± 2.0 | 9.7 ± 1.7 | 90.3 ± 1.7 | 11.7 ± 1.3 | 88.3 ± 1.3 | |
| Divorced | 12.7 ± 5.0 | 87.3 ± 5.0 | 12.5 ± 4.1 | 87.5 ± 4.1 | 12.6 ± 3.2 | 87.4 ± 3.2 | |
| Educational level | | | | | | | |
| ≤Elementary school | 9.0 ± 1.0 | 91.0 ± 1.0 | 9.8 ± 1.3 | 90.2 ± 1.3 | 9.4 ± 0.8 | 90.6 ± 0.8 | 0.000 |
| Middle school | 10.3 ± 2.4 | 89.7 ± 2.4 | 5.1 ± 1.4 | 94.9 ± 1.4 | 7.6 ± 1.4 | 92.4 ± 1.4 | |
| High school | 6.3 ± 1.4 | 93.7 ± 1.4 | 4.7 ± 1.2 | 95.3 ± 1.2 | 5.5 ± 0.9 | 94.5 ± 0.9 | |
| ≥College | 4.9 ± 1.8 | 95.1 ± 1.8 | 5.6 ± 2.0 | 94.4 ± 2.0 | 5.3 ± 1.3 | 94.7 ± 1.3 | |

**Table 2.** *Cont.*

| Variables | Year 2019 | | Year 2020 | | Total | | *p* Value |
|---|---|---|---|---|---|---|---|
| | Yes | No | Yes | No | Yes | No | |
| Family income level | | | | | | | |
| Low | 11.0 ± 1.6 | 89.0 ± 1.6 | 9.5 ± 1.6 | 90.5 ± 1.6 | 10.3 ± 0.9 | 89.7 ± 0.9 | 0.001 |
| Low-middle | 7.1 ± 1.6 | 92.9 ± 1.6 | 7.7 ± 1.7 | 92.3 ± 1.7 | 7.4 ± 1.0 | 92.6 ± 1.0 | |
| Middle-high | 4.2 ± 1.4 | 95.8 ± 1.4 | 5.2 ± 1.6 | 94.8 ± 1.6 | 4.7 ± 1.1 | 95.3 ± 1.1 | |
| High | 6.0 ± 2.5 | 94.0 ± 2.5 | 4.2 ± 1.6 | 95.8 ± 1.6 | 5.0 ± 1.4 | 95.0 ± 1.4 | |
| Economic activities | | | | | | | |
| Yes | 7.3 ± 1.6 | 92.7 ± 1.6 | 6.0 ± 1.4 | 94.0 ± 1.4 | 6.7 ± 0.8 | 93.3 ± 0.8 | 0.101 |
| No | 8.8 ± 1.1 | 91.2 ± 1.1 | 8.2 ± 1.2 | 91.8 ± 1.2 | 8.5 ± 0.7 | 91.5 ± 0.7 | |
| Types of national health insurance | | | | | | | |
| Local-subscriber health insurance | 7.0 ± 1.4 | 93.0 ± 1.4 | 7.1 ± 1.6 | 92.9 ± 1.6 | 7.1 ± 1.0 | 92.9 ± 1.0 | 0.110 |
| Employee health insurance | 8.1 ± 1.2 | 91.9 ± 1.2 | 7.7 ± 1.2 | 92.3 ± 1.2 | 7.9 ± 0.7 | 92.1 ± 0.7 | |
| Medical aid | 14.6 ± 3.4 | 85.4 ± 3.4 | 8.3 ± 3.0 | 91.7 ± 3.0 | 11.6 ± 2.1 | 88.40 ± 2.1 | |

Abbreviations: SE, standard error, UHN, unmet healthcare needs. The prevalence of UHN presented in Table 2 is expressed as a percentage and a standard error.

The prevalence of UHN during 2019–2020 was significantly higher in the following groups: women, more than men; the compared groups, more than the cohabitation group; the elementary school graduate group or less, more than the college graduate group; and the lower family income level group, more than the upper levels group ($p < 0.05$). In contrast, the remaining variables showed no statistically significant difference: 80+ group, more than the three groups, the non-economically active group, more than economically active; and the medical aid group, more than an employee or local-subscriber health-insured group ($p > 0.05$).

The reasons for UHN among the Korean elderly population aged 65 years and older are shown in Table 3.

**Table 3.** Reasons for UHN among the elderly Korean population aged ≥65 years (2019–2020).

| Variables | Cost Burden | Mild Symptoms | Insufficient Time | *p* Value |
|---|---|---|---|---|
| | % ± SE | % ± SE | % ± SE | |
| Year | | | | |
| 2019 | 46.2 ± 5.3 | 30.8 ± 5.0 | 23.1 ± 4.8 | 0.007 |
| 2020 | 40.8 ± 6.0 | 40.8 ± 6.5 | 18.4 ± 5.8 | |
| Total | 43.9 ± 4.0 | 35.1 ± 4.0 | 21.1 ± 3.5 | |
| Sex | | | | |
| Men | 27.4 ± 6.7 | 38.5 ± 8.0 | 34.2 ± 8.3 | 0.015 |
| Women | 50.8 ± 5.0 | 33.6 ± 4.7 | 15.6 ± 3.1 | |
| Total | 43.9 ± 4.0 | 35.1 ± 4.0 | 21.1 ± 3.5 | |
| Age groups | | | | |
| 65–69 | 36.6 ± 6.9 | 29.8 ± 6.7 | 33.6 ± 7.7 | |
| 70–74 | 46.0 ± 8.5 | 29.7 ± 7.1 | 24.3 ± 8.8 | |
| 75–79 | 42.1 ± 8.4 | 46.3 ± 8.6 | 11.6 ± 5.1 | 0.142 |
| 80+ | 53.8 ± 9.5 | 37.3 ± 9.1 | 8.8 ± 4.7 | |
| Total | 43.9 ± 4.0 | 35.1 ± 4.0 | 21.1 ± 3.5 | |
| Marital status | | | | |
| With partner | 49.0 ± 5.8 | 32.4 ± 4.9 | 18.6 ± 4.7 | 0.480 |
| Separated | 40.6 ± 11.0 | 33.0 ± 10.5 | 26.4 ± 14.2 | |
| Widowed | 25.0 ± 7.6 | 50.4 ± 9.5 | 24.60 ± 8.6 | |
| Divorced | 49.1 ± 13.7 | 23.9 ± 10.3 | 27.0 ± 11.3 | |
| Total | 43.8 ± 4.0 | 34.80 ± 4.0 | 21.4 ± 3.6 | |

**Table 3.** *Cont.*

| Variables | Cost Burden | Mild Symptoms | Insufficient Time | *p* Value |
|---|---|---|---|---|
| | % ± SE | % ± SE | % ± SE | |
| Educational level | | | | |
| ≤Elementary school | 37.2 ± 5.2 | 34.4 ± 5.3 | 28.4 ± 5.5 | 0.100 |
| Middle school | 22.4 ± 21.7 | 47.9 ± 30.5 | 29.7 ± 26.3 | |
| High school | 50.7 ± 6.9 | 36.2 ± 6.3 | 13.1 ± 4.4 | |
| ≥College | 76.2 ± 11.2 | 12.0 ± 8.1 | 11.8 ± 8.3 | |
| Total | 44.7 ± 4.0 | 33.9 ± 4.0 | 21.5 ± 3.6 | |
| Family income level | | | | |
| Low | 60.2 ± 5.1 | 26.2 ± 4.5 | 13.6 ± 3.2 | 0.000 |
| Low-middle | 28.8 ± 7.8 | 35.5 ± 7.5 | 35.7 ± 10.1 | |
| Middle-high | 15.2 ± 8.4 | 65.6 ± 11.2 | 19.3 ± 8.7 | |
| High | 21.0 ± 12.3 | 50.9 ± 16.2 | 28.1 ± 14.2 | |
| Total | 44.2 ± 4.0 | 34.6 ± 4.0 | 21.20 ± 3.5 | |
| Economic activities | | | | |
| Yes | 45.6 ± 7.6 | 18.6 ± 5.8 | 35.8 ± 7.8 | 0.003 |
| No | 42.9 ± 5.3 | 43.3 ± 4.9 | 13.8 ± 3.3 | |
| Total | 43.8 ± 4.0 | 34.80 ± 4.0 | 21.4 ± 3.6 | |
| Types of national health insurance | | | | |
| Local-subscriber health insurance | 51.6 ± 7.4 | 31.4 ± 7.1 | 17.0 ± 4.6 | 0.077 |
| Employee health insurance | 38.9 ± 5.5 | 35.1 ± 5.2 | 26.0 ± 5.2 | |
| Medical aid | 52.8 ± 10.5 | 42.7 ± 10.4 | 4.5 ± 3.3 | |
| Total | 43.9 ± 4.0 | 35.1 ± 4.0 | 21.1 ± 3.5 | |

Abbreviations: *N*, number; SE, standard error, UHN, unmet healthcare needs. The remaining items are as follows (year 2019, % ± SE/year 2020, % ± SE): distance and inconvenient transportation (3.0 ± 1.4/4.5 ± 2.40, dislike of a long waiting time ((1.6 ± 1.2/2.8 ± 1.8), difficulty in making a reservation (0.5 ± 0.5/0 ± 0.0), fear of care or examination (6.8 ± 2.2/4.9 ± 2.1), and others (6.3 ± 2.0/17.6 ± 4.0). Variables such as sex, age group, marital status, education level, family income level, economic activity, and type of national health insurance, excluding the year variable, were analyzed by merging data from the last two years (2019–2020).

The leading reasons for UHN were cost burden and mild symptoms in 2020, cost burden in 2019, and cost burden in the two years, with statistically significant differences ($p < 0.05$).

The following reasons for UHN during 2019–2020 were significantly the highest ($p < 0.05$): mild symptoms in men (38.5%) and cost burden in women (50.8%); cost burden in low family income level group (60.2%), mild symptoms in the middle-high family income level group (65.6%) and the high family income level group (50.9%); and the cost burden in the economically active group (45.6%) and mild symptoms in the economic inactive group (43.3%).

The remaining groups showed no statistically significant difference ($p > 0.05$): cost burden in the 80+ group (53.8%), 70–74 years old group (46.0%), 75–79 years old group (42.1%), and 65–69 years old group (36.6%) and mild symptoms in the 75–79 years old group (46.3%); cost burden in the with partner group (49.0%), separated group (40.6%), and divorced group (50.4%) and mild symptoms in the widowed group (49.1%); cost burden in the elementary or below school graduate group (37.2%), high school graduate group (50.7%%), and college or over graduate group (76.2%) and mild symptoms in the middle school graduate group (47.9%); and cost burden in the local-subscriber health insured group (51.6%), the employee health insured group (38.9%), and the medical aid group (52.8%).

The ORs for the prevalence of UHN among the Korean elderly population aged 65 years and older are presented in Table 4.

**Table 4.** Multiple logistic regression for the prevalence of UHN among the elderly Korean population aged ≥65 years (2019–2020).

| Variables | B | SE | 95% CI | | t | *p* | OR | 95% CI | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Lower | Upper | | | | Lower | Upper |
| Intercept<br>Year 2020 * | −2.064 | 0.524 | −3.092 | −1.036 | −3.942 | 0.000 | 0.127 | 0.045 | 0.355 |
| Sex | | | | | | | | | |
| Men | −0.585 | 0.199 | −0.975 | −0.195 | −2.944 | 0.003 | 0.557 | 0.377 | 0.823 |
| Women | 0.000 [a] | . | . | . | . | . | 1 | . | . |
| Marital status | | | | | | | | | |
| With partner | −0.637 | 0.311 | −1.247 | −0.026 | −2.048 | 0.041 | 0.529 | 0.287 | 0.974 |
| Separated | 0.112 | 0.627 | −1.119 | 1.343 | 0.179 | 0.858 | 1.119 | 0.327 | 3.831 |
| Widowed | −0.287 | 0.319 | −0.914 | 0.340 | −0.898 | 0.370 | 0.751 | 0.401 | 1.406 |
| Divorced | 0.000 [a] | . | . | . | . | . | 1 | . | . |
| Educational level | | | | | | | | | |
| ≤Elementary school | 0.040 | 0.308 | −0.564 | 0.645 | 0.130 | 0.896 | 1.041 | 0.569 | 1.905 |
| Middle school | 0.018 | 0.350 | −0.67 | 0.706 | 0.052 | 0.958 | 1.019 | 0.512 | 2.027 |
| High school | −0.111 | 0.338 | −0.775 | 0.554 | −0.328 | 0.743 | 0.895 | 0.461 | 1.740 |
| ≥College | 0.000 [a] | . | . | . | . | . | 1 | . | . |
| Family income level | | | | | | | | | |
| Low | 0.516 | 0.333 | −0.137 | 1.169 | 1.551 | 0.121 | 1.675 | 0.872 | 3.220 |
| Low-middle | 0.315 | 0.340 | −0.351 | 0.982 | 0.929 | 0.353 | 1.371 | 0.704 | 2.671 |
| Middle-high | −0.148 | 0.395 | −0.924 | 0.627 | −0.375 | 0.708 | 0.862 | 0.397 | 1.872 |
| High | 0.000 [a] | . | . | . | . | . | 1 | . | . |

Abbreviations: [a] reference group; CI, confidence interval; OR: odds ratio; SE, standard error, UHN, unmet healthcare needs. *: The year 2019 was set as the reference category, and variables such as sex, education level, marital status, and family income level were simultaneously adjusted to analyze the OR for the prevalence of UHN in 2020.

According to the simultaneous adjustment of variables such as sex, education level, marital status, and family income level, the OR for UHN prevalence in 2020 compared to that in 2019 was lower in the following groups: men, more than women (OR 0.557, 95% CI 0.377–0.823, $p < 0.05$) and the cohabitation group, more than the divorced group (OR 0.529, 95% CI 0.287–0.974, $p < 0.05$). The remaining groups showed no statistically significant difference ($p > 0.05$).

The ORs for the prevalence of UHN reasons among the Korean elderly population aged 65 years and older are presented in Table 5.

**Table 5.** Multiple logistic regression for the reasons of UHN among the elderly Korean population aged ≥65 years (2019–2020).

| Variables | | | B | SE | 95% CI | | t | *p* | OR | 95% CI | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Lower | Upper | | | | Lower | Upper |
| Cost-burden ** | | Intercept<br>Year 2020 * | 1.395 | 0.403 | 0.601 | 2.188 | 3.457 | 0.001 | 4.034 | 1.824 | 8.920 |
| | Sex | Men | −1.249 | 0.472 | −2.177 | −0.320 | −2.646 | 0.009 | 0.287 | 0.113 | 0.726 |
| | | Women | 0.000 [a] | . | . | . | . | . | 1 | . | . |
| | Economic activities | Yes | −0.692 | 0.456 | −1.589 | 0.205 | −1.517 | 0.130 | 0.501 | 0.204 | 1.228 |
| | | No | 0.000 [a] | . | . | . | . | . | 1 | . | . |

**Table 5.** *Cont.*

| Variables | | B | SE | 95% CI | | t | *p* | OR | 95% CI | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lower | Upper | | | | Lower | Upper |
| Mild symptoms ** | Intercept Year 2020 * | 0.965 | 0.381 | 0.215 | 1.715 | 2.531 | 0.012 | 2.624 | 1.24 | 5.554 |
| Sex | Men | −0.211 | 0.485 | −1.165 | 0.743 | −0.434 | 0.664 | 0.81 | 0.312 | 2.103 |
| | Women | 0.000 [a] | . | . | . | . | . | 1 | . | . |
| Economic activities | Yes | −1.827 | 0.554 | −2.917 | −0.738 | −3.298 | 0.001 | 0.161 | 0.054 | 0.478 |
| | No | 0.000 [a] | . | . | . | . | . | 1 | . | . |

Abbreviations: [a] referent group; CI, confidence interval; OR: odds ratio; SE, standard error, UHN, unmet healthcare needs. *: The year 2019 was set as the reference category, and variables such as sex and economic activity were simultaneously adjusted to analyze the OR of the reasons for healthcare unmet needs in 2020. **: The referent category is 'insufficient time'.

According to the simultaneous adjustment of variables, such as cost burden and mild symptoms, the OR for the prevalence of UHN reasons in 2020 compared to that in 2019 was lower in the following groups: men, more than women regarding cost burden (OR 0.287, 95% CI 0.113–0.726, $p < 0.05$) and economically active group, more than the non-economically active group with regard to mild symptoms (OR 0.161, 95% CI 0.054–0.478, $p < 0.05$).

## 4. Discussion

The present findings show that the prevalence of UHN among Korean elderly people aged 65 years or older was 8.2% in 2019, which was one year before the COVID-19 pandemic, but decreased to 7.6% in 2020, which corresponds to the first 12 months of the COVID-19 pandemic. The overall UHN prevalence from 2019 to 2020 was 7.9%, with no statistically significant difference.

The prevalence of UHN in the present study is similar to 8.0% of the general population of the European Union in 2018 [33]. In contrast, it is lower than 32.5% of Turkey's elderly population aged 80 years or older in 2018 [4] and higher than 2.8% of Taiwan's elderly population in 2018 [17], 4.4% of the United States elderly population in 2019 [34], and 6.1% of the Malaysian elderly population in 2018–2020 [35]. As indicated, the prevalence of UHN varies from country to country, and that of the Korean elderly population has shown a tendency to decrease gradually in recent years. Despite no statistically significant difference, contrary to this study's hypothesis, surprisingly, the prevalence of UHN in the Korean elderly population aged 65 years or older decreased during the first 12 months of the COVID-19 pandemic compared to the same period in 2019. This trend may be estimated due to the increase in telemedicine in the healthcare system during the COVID-19 pandemic [36]. The Korean government temporarily allowed telephone consultations and remote prescriptions to prevent COVID-19 infection, and it increased nearly 150 times in two years after temporary telemedicine was allowed [37,38]. This can be seen as starting with the pilot telemedicine program for Korean expatriates conducted by the Korean government [39]. Regarding this, a prior study reported that almost half the expatriates living in developing countries reported unmet healthcare needs and further suggested that telemedicine is a potential solution to meet these needs, especially in developing countries [39]. In the midst of the COVID-19 pandemic, a scoping review, including 45 preceding studies on the use of telemedicine, reported that the United States had the most, followed by China and Italy [40]. Therefore, this is considered to be an appropriate healthcare system not only in quarantine situations for infection prevention but also for the elderly, in general, who have difficulty moving alone or suffer mobility difficulties. However, it implies that additional studies on the relationship between unmet healthcare and telemedicine are needed to support this view. Furthermore, it is worth emphasizing that the healthcare system constantly evolves over time according to the needs of the population [41]. As announced in the UN report, preserving the rights and dignity of the elderly is of utmost

importance [16]. To achieve that, implementing sustainable policies within the country or community is required. Additionally, further investigations are needed to develop care models and support services according to the needs of the elderly [15]. During the first wave of the COVID-19 pandemic, previous studies reporting the prevalence of UHN as a number were rare, making direct comparisons with our findings difficult. Nevertheless, our findings support a previous report that during the pandemic compared to the same period in 2019, continuous use of out-of-hours primary care service among the elderly population in the Netherlands reduced other health problems unrelated to COVID-19 and covered unmet treatment needs elsewhere in the healthcare system [42]. In contrast, our findings are inconsistent with previous studies reporting that the COVID-19 pandemic adversely affected access and delivery of healthcare services to meet the healthcare needs of the elderly population during the first wave of the COVID-19 pandemic [25,29,43]. A previous study reported that in six European countries (Belgium, France, Italy, Poland, Spain and the United Kingdom), the UHN of the older population was affected by the limited role of primary care due to crisis centralization in the hospital setting during the first wave of the COVID-19 pandemic [25].

Unlike the comparison of the overall UHN incidence rate, the subgroup analysis showed significant differences in variables, such as sex, marital status, education level, and family income level. The prevalence of UHN was significantly higher among women than among men, and with 2019 as the reference year, the OR for UHN prevalence in 2020 was 0.44 times significantly higher among women than among men. These findings are in tandem with previous reports indicating that the OR of UHN among the Korean elderly population aged 65 years or older was higher in women than in men based on the KNHANES' raw data analysis of 2007–2009 [44], 2013–2017 [45], and 2017 [5]. Our results are also similar to the studies conducted in Malaysia [35] and Canada during the COVID-19 pandemic [46] and inconsistent with those reported in Taiwan [17]. In addition, the higher prevalence of postponed and denied care for healthcare needs was similar to that between June and August 2020 in 26 European countries and Israel [25]. In contrast, no sex difference was observed in the rate of unmet healthcare needs among the elderly population living in the United States community [8]. As revealed above, women seem more vulnerable than men in most countries. According to a previous study, elderly Korean women have a longer life expectancy than men and are more likely to be affected by diseases [31]. Korean women are also economically disadvantaged due to their family care duties, which is fueled by the patriarchal Korean culture [5]. This implies the need for sustainable measures to meet essential medical and healthcare services for women.

According to the age variable, the findings of our study showed that the prevalence of UHN was higher with age, but there was no statistically significant difference. These results were similar to those of a prior study among the elderly Malaysians [35] and Canadians [45] and in contrast to those of the youngest group among the elderly living in the United States community [2]. In addition, the cost burden was the highest among the reasons for UHN, especially in the group over 80 years of age, at 53.8%, but there was no statistically significant difference. In Korea, the retirement age is generally 60 years and 65 years for civil servants. After retirement, some of the elderly run private businesses or work part-time. Additionally, even if national health insurance is available to the entire nation, medical expenses are bound to be a massive burden for the elderly. This is because the older one gets, the more likely they are to have health problems, leading to higher costs. For this reason, it is interpreted that variables, such as the prevalence of UHN and cost burden, did not differ among the elderly Korean population. These imply that further investigations are needed to identify the cause of differences between countries.

During the first wave of the COVID-19 pandemic, the OR for the UHN was 0.47 times significantly higher in the divorced group compared to the cohabitation group. Our findings are similar to those of a study conducted in Malaysia in 2018–2020 [35], Taiwan in 2017 [9], and Turkey in 2017 [4]. This can be attributed to the divorced group facing more financial difficulties than the cohabitation group. This suggests the need for the government or

relevant local government agencies to periodically evaluate the healthcare needs of older adults living alone and provide necessary healthcare services.

The prevalence of UHN according to the level of education was highest in the elementary or less group, with no significant difference in odds ratio. This finding contrasts the result of a Malaysian study in which UHN prevalence was highest in the primary or lower group [35] and is similar to that of a Taiwan study in which UHN prevalence was higher in the elementary or lower group than in the secondary or higher levels group [17]. However, another study in Turkey reported that the education level did not affect the prevalence of UHN [4]. In Korea, individuals with low levels of education are likely to engage in jobs that are physically demanding and are considered more active in health checkups. According to Korea's National Health Insurance, health checkups are offered once annually to office workers and twice a year to physical workers, presumably affecting the prevalence of UHN. To support this view, the need for further studies on the relationship between education level, job classification, and unmet healthcare are suggested.

The prevalence of UHN according to family income level was significantly highest in the lower-level group, but the OR was not significantly different in 2020 compared to 2019. This finding is consistent with previous results indicating that low-income level can be a vital risk factor for UHN [4,8,32,35,46,47]. This is likely because economic hardships are the main concern of the elderly due to low income following retirement, as money is used for day-to-day necessities rather than medical expenses. In particular, during the first wave of COVID-19, it was emphasized that barriers to healthcare access should be carefully monitored because postponed and denied healthcare could increase socioeconomic inequalities in healthcare among the elderly [29].

In addition, the prevalence of UHN was higher in the non-economically active group and the medical aid group than in the comparative groups, respectively, although not statistically significant. Our findings are different from the results of a previous study reporting a higher prevalence of UHN in the economically active group than in the comparative group among the Malaysian elderly population aged 60 years and above during 2018–2020 [35]. The prevalence of UHN was higher in older adults with both Medicare and Medical than in those with both Medicare and private insurance during the first wave of the COVID-19 pandemic in the USA [8]. In Taiwan, the UHN rate was higher for those working in the government and private sectors than for employees and for those receiving health and welfare benefits through the universal coverage system than those receiving pension, social security, or health insurance [17]. These differences may be affected by the presence or absence of economic activity and are presumed to be the reason for insurance coverage standards varying across countries. Fortunately, in Korea, medical aid is also provided to economically poor people; thus, all citizens benefit from health insurance coverage regardless of their economic activity status. Nevertheless, it is necessary to confirm the cause of the high UHN rate (11.6% vs. 7.9%) of the medical aid group compared to that of the entire Korean population [48].

In the two years before and after the COVID-19 pandemic, only the sex, family income level, and economic activity of the participants were significantly associated with the prevalence of UHN. However, family income level was substituted as an adjustment variable for odds ratio calculation because it was not statistically significant. Therefore, sex and economic activity were adjusted for the calculation of OR for the prevalence of UHN reasons.

The reasons for UHN among the elderly population aged 65 years and above are statistically significant according to the period before and after the outbreak of COVID-19, cost-burden before the outbreak of COVID-19, cost-burden and mild symptoms during the first wave of the COVID-19 pandemic, and cost-burden during the two periods. The cost burden is an important variable in failing to meet health and medical care needs. Unusually, in 2020, there was a higher rate of responding to mild symptoms as a problem that would get better over time compared to that in 2019 (28.6% vs. 25.2%). This reflects the psychological state of unwillingness to visit the hospital due to the COVID-19 pandemic.

Of the UHN reasons, women had the highest cost burden, and men had the highest rate of mild symptoms during 2019–2020, and with insufficient time variable set as the reference category, the cost burden was 0.72 times significantly higher in women than in men in 2020 compared to in 2019. This finding implies that cost burden is the most influencing factor for UHN among elderly Korean women aged 65 years or older and is consistent with that reported among the elderly population in Malaysia, in which women and those with poor financial status were more likely to experience UHN [24]. Contrary to our findings, the elderly men population in Taiwan was 0.65 times higher than that of women, suggesting that economically active women do not face unexpectedly high medical costs because they know that treatment costs are covered by universal coverage or social security schemes [9].

In the two years before and after the COVID-19 pandemic, the reasons for UHN according to family income level were highest in the lower income level group and mild symptoms in the middle-level or higher income level group. These results are consistent with those of a previous study in which poor groups were more vulnerable to UHN [35]. Our findings are also similar to those of a previous study among the elderly in the United States, in which those living in the zip code with the highest poverty rate had a higher rate of UHN than those living in the zip code with the lowest poverty rate [8]. Contrary to our research results, an earlier study reported that among 26 European countries and Israel, there were few countries in which inequality in healthcare needs, such as reservation, postponement, and refusal of medical treatment, was notable in the vulnerable groups, such as the elderly, during the first wave of the COVID-19 pandemic according to income level, with the exception of Poland, Italy, and Greece [29]. However, continuous research is needed on the above-middle-income groups that regard mild symptoms as a problem that is likely to improve over time.

Among the reasons for UHN, the economically active group had the highest cost burden, and the economically inactive population had the highest mild symptoms. Ironically, this suggests that the economically active group prioritized the cost burden over health, and the economically inactive group put health before cost. The odds ratio for the cost-bearing variable was not statistically significant, but the odds ratio for mild symptoms was 0.84 times higher in the economically inactive population than in the economically active population. This finding is similar to the results of a previous study on that the elderly population with economic activity in Malaysia was higher [35]. This finding can also be seen in the same context as a previous study that reported that socioeconomic factors (income and employment) and basic medical insurance subscriptions play important roles in healthcare choices among elderly people living in Shanghai, China [49]. These results imply that the economically inactive population cannot access necessary healthcare services due to the cost burden. Therefore, the healthcare needs of the economically inactive elderly population should be evaluated periodically [17,29,35]. Referring to the usefulness of telehealth services during the COVID-19 pandemic, the OECD introduced the Wellness Together application in Canada and underscored the need for basic policies to resolve the economic barriers to healthcare [13,14]. Furthermore, the COVID-19 pandemic served as an opportunity to clearly demonstrate the need for next-generation telemedicine [50,51]. Access to telemedicine is dependent on the patient's ability to obtain and use technology, which is typically dictated by age, educational background, socioeconomic status, and cognitive condition involving fear appeal and coping appeal [52,53]. Therefore, as emphasized in previous studies, our findings also suggest that healthcare systems are needed to address the healthcare needs of the elderly population by considering economic vulnerability, creating an atmosphere to express healthcare needs, developing age-friendly health systems, and ensuring continuous guarantee for equitable access to healthcare [7,9,29,43].

Taken together, these findings identified cost burden and mild symptoms as leading reasons for UHN among the Korean elderly population aged 65 years or older. However, these factors are likely influenced by a multitude of other factors, such as health literacy, cultural beliefs, and access to information owing to the complexity of UHN factors. In addition, factors such as changes in healthcare policies, availability of healthcare services,

public perception of healthcare during the pandemic, and related demographic shifts may all contribute to the observed trends. For these reasons, we propose follow-up studies driven by the need for a more comprehensive exploration of the underlying reasons for these primary factors are needed to provide a deeper understanding of the issue. Besides, this study did not address potential non-COVID-19 factors in economic fluctuations, policy changes, or healthcare system modifications unrelated to the pandemic could also contribute to shifts in UHN. Therefore, international longitudinal studies that screen out COVID-19 or non-COVID-19-related factors are needed.

It is only natural that the need for healthcare is gradually increasing due to the accelerated aging of the elderly population worldwide [49,54]. Ultimately, closing the gap in access to healthcare services is a priority, and this may be possible with support for healthcare policies for the elderly [49]. As everyone agrees, the top challenge to support policy for the elderly will be securing financial resources [49]. Fortunately, along with the COVID-19 pandemic, the use of healthcare robots in economic terms has rapidly increased based on ICT and Artificial Intelligence (AI) in the elderly healthcare field [54]. This may be an opportunity to increase access to healthcare systems and lower the prevalence of UHN as part of tailored healthcare policies for the elderly. However, since healthcare needs and systems vary across countries in individuals or populations, each country should continue to make efforts to introduce and settle a tailored healthcare system for the elderly by securing safety and efficiency through the order ability of public health services, understanding social and cultural backgrounds, the disclosure of conflicts of interest, addressing asymmetries in decision making, data development for risk assessment, and consideration of differences in gender needs [49,54–56].

The strengths of this study are as follows. First, we compared the data related to UHN before the COVID-19 pandemic and during the first wave of the COVID-19 pandemic in 2020. Thus, we were able to provide evidence-based data suggesting the need for systems to continuously meet the healthcare needs of the population after the COVID-19 pandemic. Second, this study introduced participants' socio-demographic and economic characteristics as independent variables and provided an opportunity to secure and share the latest data of UHN through comparison with international studies.

However, the study has some weaknesses. First, we did not identify diseases associated with UHN during the investigation. In particular, during the first wave of the COVID-19 pandemic, a follow-up investigation on the progress and impact of diseases that were not addressed would have been important. Therefore, we suggest the need for further research to identify major diseases associated with UHN and their reasons in the elderly population.

Second, those who could not be accessed by the mobile examination vehicle without surrounding help were excluded from the participants. In the future, such a study can be conducted as a non-face-to-face survey, suggesting the need to actively promote the development and application of elderly-friendly artificial intelligence-based telehealth.

Third, as shown at the bottom of Table 3, we also calculated odds ratios for 3 out of 8 response items (cost burden, mild symptoms, and insufficient time) to the UHN question. The response rates of the remaining response items other than those three were too low, so they were treated as missing values. Future studies with a larger sample size suggest calculating the odds ratio of all response items to the UHN question.

Fourth, this study utilizes a cross-sectional design, which limits the ability to determine changes over time accurately. Accordingly, we propose a follow-up study with a longitudinal study design to track UHN trends and assess the impact of the COVID-19 pandemic more comprehensively. Further investigations are also needed to explore potential causal factors underlying the observed changes in UHN over time through a more in-depth analysis.

Additionally, this study's results may be limited in its generalizability, as the study utilizes data from a nationally representative survey and may not be fully applicable to

other populations or countries. Furthermore, the study focuses specifically on the elderly Korean population, and the findings may not apply to other age groups or cultural contexts.

This study also lacks statistical significance. In science, the success of an experiment is often determined by a measure of statistical significance. However, more than 800 scientists and statisticians commented that judging research success or failure by statistical significance should end [57,58]. A special issue of The American Statistician, a professional magazine published on March 20 to accompany the paper, made the manifesto very clear in the preface to 'Statistical Significance—Don't Tell, Don't Use' [58]. This is because an experiment can be considered significant, that is, meaningful, even if, in reality, it makes no difference. The authors thought that there would be some restrictions on access to the healthcare system due to the COVID-19 pandemic and various accompanying circumstances. However, according to the findings of this study, this view has been reversed due to the Korean government's temporary permission for the telemedicine system. Therefore, even if statistical significance was not secured, it is significant that the prevalence of UHN in this study decreased in the year when the COVID-19 pandemic occurred than in the year immediately before the outbreak. Further, these data can be seen as emphasizing the need to change the direction of the healthcare system according to the circumstances of the times. Meanwhile, between before and during the first 12 months of the COVID-19 pandemic, there was no statistically significant difference in the prevalence of overall UHN among the elderly Korean population aged 65 years or older, but a significant statistical difference was shown between some variables in the subgroup analysis using sociodemographic and economic variables, and prevalence of UHN reasons. Even if there is no statistically significant difference in the overall UHN incidence comparison, based on the results showing a statistically significant difference in the subgroup and reasons for UHN analysis, this is considered to be meaningful in that it provided basic data to capture the direction of future research.

## 5. Conclusions

Despite the several limitations in this study, during the first wave of the COVID-19 pandemic, the prevalence of UHN decreased compared to before the outbreak of COVID-19, which can be attributed largely to the application of telemedicine owing to social distancing and quarantine measures to prevent infection. Additionally, the main influencing factors for UHN prevalence due to the COVID-19 pandemic were identified as women and cost burden. To support these findings, we suggest that further investigations through a longitudinal study design on the relationship between unmet healthcare and telemedicine due to the COVID-19 pandemic be conducted. In conclusion, the authors recommend that sustainable healthcare policies and systems be tailored to address the targeted population's healthcare needs, even beyond the COVID-19 era.

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## References


1. Wu, L.; Liu, Q.; Fu, R.; Ma, J. Unmet healthcare needs, health outcomes, and health inequalities among older people in China. *Front. Public Health* **2023**, *11*, 1082517. [CrossRef] [PubMed]
2. Eimontas, J.; Gegieckaitė, G.; Zamalijeva, O.; Pakalniškienė, V. Unmet healthcare needs predict depression symptoms among older adults. *Int. J. Environ. Res. Public Health* **2022**, *19*, 8892. [CrossRef] [PubMed]
3. Quintal, C.; Ramos, L.M.; Antunes, M.; Lourenço, Ó. Unmet healthcare needs among the population aged 50+ and their association with health outcomes during the COVID-19 pandemic. *Eur. J. Ageing* **2023**, *20*, 12. [CrossRef]
4. Simsek, H.; Erkoyun, E.; Akoz, A.; Ergor, A.; Ucku, R. Unmet health and social care needs and associated factors among older people aged ≥80 years in Izmir, Turkey. *East. Mediterr. Health J.* **2021**, *27*, 772–781. [CrossRef] [PubMed]
5. Jeon, C.H.; Kwak, J.W.; Kwak, M.H.; Kim, J.H.; Park, Y.S. Factors associated with unmet healthcare needs of the older korean population: The seventh korea national health and nutrition examination survey 2017. *Korean J. Health Promot.* **2019**, *19*, 84–90. [CrossRef]
6. Bennett, A.C.; Rankin, K.M.; Rosenberg, D. Does a medical home mediate racial disparities in unmet healthcare needs among children with special healthcare needs? *Matern. Child Health J.* **2012**, *16* (Suppl. S2), 330–338. [CrossRef] [PubMed]
7. Arnault, L.; Jusot, F.; Renaud, T. Economic vulnerability and unmet healthcare needs among the population aged 50+ years during the COVID-19 pandemic in Europe. *Eur. J. Ageing* **2022**, *19*, 811–825. [CrossRef]
8. Perry, L.; Scheerens, C.; Greene, M.; Shi, Y.; Onion, Z.; Bayudan, E.; Stern, R.J.; Gilissen, J.; Chodos, A.H. Unmet health-related needs of community-dwelling older adults during COVID-19 lockdown in a diverse urban cohort. *J. Am. Geriatr. Soc.* **2023**, *71*, 178–187. [CrossRef]
9. Tai-Seale, M.; Cheung, M.W.; Kwak, J.; Harris, V.; Madonis, S.; Russell, L.; Haley, E.; Agnihotri, P. Unmet needs for food, medicine, and mental health services among vulnerable older adults during the COVID-19 pandemic. *Health Serv. Res.* **2023**, *58*, 69–77. [CrossRef]
10. Beach, S.R.; Schulz, R.; Friedman, E.M.; Rodakowski, J.; Martsolf, R.G.; James, A.E. Adverse consequences of unmet needs for care in high-need/high-cost older adults. *J. Gerontol. B Psychol. Sci. Soc. Sci.* **2020**, *14*, 459–470. [CrossRef]
11. Njagi, P.; Arsenijevic, J.; Groot, W. Cost-related unmet need for healthcare services in Kenya. *BMC Health Serv. Res.* **2020**, *20*, 322. [CrossRef]
12. OECD. Eurofound Living, Working and COVID-19 Survey; Household Pulse Survey from the United States Census Bureau. Health at a Glance 2021: OECD Indicators, Unmet Needs for Health Care. Available online: http://www.oecd-ilibrary.org/sites/13aff239-en/index.html?itemId=/content/component/13aff239-en (accessed on 10 January 2023).
13. OECD. Health for Everyone? Social Inequalities in Health and Health Systems. In *OECD Health Policy Studies*; OECD Publishing: Paris, France, 2019. [CrossRef]
14. OECD. Realising the Potential of Primary Health Care. In *OECD Health Policy Studies*; OECD Publishing: Paris, France, 2020. [CrossRef]
15. Abdi, S.; Spann, A.; Borilovic, J.; de Witte, L.; Hawley, M. Understanding the care and support needs of older people: A scoping review and categorisation using the WHO international classification of functioning, disability and health framework (ICF). *BMC Geriatr.* **2019**, *22*, 195. [CrossRef] [PubMed]
16. United Nations. The Impact of COVID-19 on Older Persons. Available online: https://unsdg.un.org/sites/default/files/2020-05/Policy-brief-the-impactofCOVID-19onolderpersons.pdf (accessed on 22 July 2023).
17. Chongthawonsatid, S. Identification of unmet healthcare needs: A national survey in Thailand. *J. Prev. Med. Public Health* **2021**, *54*, 129–136. [CrossRef] [PubMed]
18. Vongmongkol, V.; Viriyathorn, S.; Wanwong, Y.; Wangbanjongkun, W.; Tangcharoensathien, V. Annual prevalence of unmet healthcare need in Thailand: Evidence from national household surveys between 2011 and 2019. *Int. J. Equity Health* **2021**, *20*, 244. [CrossRef] [PubMed]
19. Gao, Q.; Prina, M.; Wu, Y.T.; Mayston, R. Unmet healthcare needs among middle-aged and older adults in China. *Age Ageing* **2022**, *51*, afab235. [CrossRef]
20. Choi, J.A.; Kim, O.S. Factors influencing unmet healthcare needs among older Korean women. *Int. J. Environ. Res. Public Health* **2021**, *18*, 6862. [CrossRef]
21. Kim, S.; Jeon, B. Decomposing disability inequality in unmet healthcare needs and preventable hospitalizations: An analysis of the Korea health panel. *Int. J. Public Health* **2023**, *68*, 1605312. [CrossRef]
22. Kalánková, D.; Stolt, M.; Scott, P.A.; Papastavrou, E.; Suhonen, R. Unmet care needs of older people: A scoping review. *Nurs. Ethics* **2021**, *28*, 149–178. [CrossRef]
23. Hoebel, J.; Rommel, A.; Schröder, S.L.; Fuchs, J.; Nowossadeck, E.; Lampert, T. Socioeconomic inequalities in health and perceived unmet needs for healthcare among the elderly in Germany. *Int. J. Environ. Res. Public Health* **2017**, *14*, 1127. [CrossRef]
24. Zavras, D.; Zavras, A.I.; Kyriopoulos, I.I.; Kyriopoulos, J. Economic crisis, austerity and unmet healthcare needs: The case of Greece. *BMC Health Serv. Res.* **2016**, *16*, 309. [CrossRef]
25. Miralles, O.; Sanchez-Rodriguez, D.; Marco, E.; Annweiler, C.; Baztan, A.; Betancor, É.; Cambra, A.; Cesari, M.; Fontecha, B.J.; Gąsowski, J.; et al. Unmet needs, health policies, and actions during the COVID-19 pandemic: A report from six European countries. *Eur. Geriatr. Med.* **2021**, *12*, 193–204. [CrossRef] [PubMed]

26. Hwang, J.N.; Kim, S.J. How do perceptions of public health measures affect experience of unmet healthcare needs among older Korean adults during COVID-19 pandemic? *Prev. Med. Rep.* **2022**, *26*, 101735. [CrossRef] [PubMed]
27. Park, Y.T.; Lee, H.J.; Choi, H.; Lee, J. Changes in healthcare use by age groups of patients and locations of healthcare institutions after the COVID-19 pandemic in Korea: Analyzing healthcare big data. *Health Policy Technol.* **2023**, *12*, 100723. [CrossRef]
28. Steinman, M.A.; Perry, L.; Perissinotto, C.M. Meeting the care needs of older adults isolated at home during the COVID-19 pandemic. *JAMA Intern. Med.* **2020**, *180*, 819–820. [CrossRef]
29. González-Touya, M.; Stoyanova, A.; Urbanos-Garrido, R.M. COVID-19 and unmet healthcare needs of older people: Did inequity arise in europe? *Int. J. Environ. Res. Public Health* **2021**, *18*, 9177. [CrossRef] [PubMed]
30. Zhou, S.; Huang, T.; Li, A.; Wang, Z. Does universal health insurance coverage reduce unmet healthcare needs in China? Evidence from the National Health Service Survey. *Int. J. Equity Health* **2021**, *20*, 43. [CrossRef]
31. Korea Centers for Disease Control and Prevention Agency. Survey Data Downloads. Available online: https://knhanes.kdca.go.kr/knhanes/sub03/sub03_02_05.do (accessed on 20 April 2022).
32. Korea Centers for Disease Control and Prevention Agency. Guideline for Data Analysis. Available online: https://knhanes.kdca.go.kr/knhanes/sub03/sub03_06_02.do (accessed on 20 April 2022).
33. OECD. Unmet Need for Medical Examination Due to Financial, Geographic or Waiting time Reasons, 2018. Health at a Glance: Europe 2020: State of Health in the EU Cycle. Available online: https://www.oecd-ilibrary.org/ (accessed on 20 January 2023).
34. Centers for Disease Control for Prevention; National Center for Health Statistics. Unmet Need for Health Care. Available online: https://www.cdc.gov/nchs/hus/topics/unmet-need.htm (accessed on 10 January 2023).
35. Shah, S.A.; Safian, N.; Ahmad, S.; Nurumal, S.R.; Mohammad, Z.; Mansor, J.; Wan, I.W.; Shobugawa, Y.; Rosenberg, M. Unmet healthcare needs among elderly Malaysians. *J. Multidiscip. Healthc.* **2021**, *14*, 2931–2940. [CrossRef]
36. Yang, D.M.; Chang, T.J.; Hung, K.F.; Wang, M.L.; Cheng, Y.F.; Chiang, S.H.; Chen, M.F.; Liao, Y.T.; Lai, W.Q.; Liang, K.H. Smart healthcare: A prospective future medical approach for COVID-19. *J. Chin. Med. Assoc.* **2023**, *86*, 138–146. [CrossRef]
37. Kim, H.S.; Kim, B.; Lee, S.G.; Jang, S.Y.; Kim, T.H. COVID-19 case surge and telemedicine utilization in a tertiary hospital in Korea. *Telemed. J. e-Health* **2022**, *28*, 666–674. [CrossRef]
38. Hwang, I.C.; Jang, Y.M. Post-Pandemic Telemedicine Market Growth and Implications. Available online: https://www.kiri.or.kr/report/downloadFile.do?docId=167839 (accessed on 3 March 2023).
39. Kim, H.Y.; Kim, J.Y.; Park, H.Y.; Jun, J.H.; Koo, H.Y.; Cho, I.Y.; Han, J.; Pak, Y.; Baek, H.J.; Lee, J.Y.; et al. Health service utilization, unmet healthcare needs, and the potential of telemedicine services among Korean expatriates. *Glob. Health* **2018**, *14*, 120. [CrossRef]
40. Hincapié, M.A.; Gallego, J.C.; Gempeler, A.; Piñeros, J.A.; Nasner, D.; Escobar, M.F. Implementation and usefulness of telemedicine during the COVID-19 Pandemic: A scoping review. *J. Prim. Care Community Health* **2020**, *11*, 2150132720980612. [CrossRef]
41. Nath, S.; Mishra, B.R.; Padhy, S.K.; Ranjan, R. Meeting the unmet mental health needs during COVID-19: Where does telemedicine stands during these times in india? *Psychiatr. Danub.* **2020**, *32*, 594–595.
42. Ramerman, L.; Rijpkema, C.; Bos, N.; Flinterman, L.E.; Verheij, R.A. The use of out-of-hours primary care during the first year of the COVID-19 pandemic. *BMC Health Serv. Res.* **2022**, *22*, 679. [CrossRef]
43. Abekah-Carter, K.; Awuviry-Newton, K.; Oti, G.O.; Umar, A.R. The unmet needs of older people in Nsawam, Ghana. *Health Soc. Care Community* **2022**, *30*, e4311–e4320. [CrossRef] [PubMed]
44. Ahn, Y.H.; Kim, N.H.; Kim, C.B.; Ham, O.K. Factors affecting unmet healthcare needs of older people in Korea. *Int. Nurs. Rev.* **2013**, *60*, 510–519. [CrossRef]
45. Jung, B.; Ha, I.H. Determining the reasons for unmet healthcare needs in South Korea: A secondary data analysis. *Health Qual. Life Outcomes* **2021**, *19*, 99. [CrossRef] [PubMed]
46. Khattar, J.; Anderson, L.N.; De Rubeis, V.; de Groh, M.; Jiang, Y.; Jones, A.; Bast, N.E.; Kirkland, S.; Wolfson, C.; Griffith, L.E.; et al. Unmet health care needs during the COVID-19 pandemic among adults: A prospective cohort study in the Canadian Longitudinal Study on Aging. *CMAJ Open* **2023**, *11*, E140–E151. [CrossRef] [PubMed]
47. Hwang, B.D.; Choi, R. The prevalence and association factors of unmet medical needs by age group in the elderly. *Korean J. Health Serv. Manag.* **2015**, *9*, 81–93. [CrossRef]
48. National Health Insurance Service. Population Coverage. Available online: https://www.nhis.or.kr/english/wbheaa02400m01.do (accessed on 6 February 2023).
49. Yang, S.; Liu, L.; Wang, C.; Lo, K.; Wang, D. Elderly people's preferences for healthcare facilities in Shanghai: Gender features and influencing factor analysis. *BMC Public Health* **2023**, *23*, 356. [CrossRef]
50. Colbert, G.B.; Venegas-Vera, A.V.; Lerma, E.V. Utility of telemedicine in the COVID-19 era. *Rev. Cardiovasc. Med.* **2020**, *21*, 583–587. [CrossRef]
51. Gareev, I.; Gallyametdinov, A.; Beylerli, O.; Valitov, E.; Alyshov, A.; Pavlov, V.; Izmailov, A.; Zhao, S. The opportunities and challenges of telemedicine during COVID-19 pandemic. *Front. Biosci.* **2021**, *13*, 291–298. [CrossRef]
52. Ramirez, A.V.; Ojeaga, M.; Espinoza, V.; Hensler, B.; Honrubia, V. Telemedicine in minority and socioeconomically disadvantaged communities amidst COVID-19 pandemic. *Otolaryngol. Head Neck Surg.* **2021**, *164*, 91–92. [CrossRef]
53. Sun, Y.; Feng, Y.; Shen, X.; Guo, X. Fear appeal, coping appeal and mobile health technology persuasion: A two-stage scenario-based survey of the elderly. *Inf. Technol. People* **2023**, *36*, 362–386. [CrossRef]

54. Ma, B.; Yang, J.; Wong, F.K.Y.; Wong, A.K.C.; Ma, T.; Meng, J.; Zhao, Y.; Wang, Y.; Lu, Q. Artificial intelligence in elderly healthcare: A scoping review. *Ageing Res. Rev.* **2023**, *83*, 101808. [CrossRef]
55. Chen, S.C.; Liu, C.; Wang, Z.; McAdam, R.; Brennan, M.; Davey, S.; Cheng, T.Y. How geographical isolation and aging in place can be accommodated through connected health stakeholder management: Qualitative study with focus groups. *J. Med. Internet Res.* **2020**, *22*, e15976. [CrossRef]
56. Adejumo, O.A.; Adejumo, O.A. Prospects of telemedicine during and post COVID-19: Highlighting the environmental health implications. *Malawi Med. J.* **2020**, *32*, 235–238. [CrossRef]
57. Amrhein, V.; Greenland, S.; McShane, B. Scientists rise up against statistical significance. *Nature* **2019**, *567*, 305–307. [CrossRef]
58. Wasserstein, R.L.; Schirm, A.L.; Lazar, N.A. Moving to a world beyond "$p < 0.05$". *Am. Stat.* **2019**, *73* (Suppl. S1), 1–19. [CrossRef]