



Original Article/Research

# The impact of the COVID-19 pandemic on satisfaction with healthcare services in Türkiye

Zeynep B. Uğur<sup>a,\*</sup>, Aysenur Durak<sup>b</sup><sup>a</sup> Department of Economics, Faculty of Political Sciences, Social Sciences University of Ankara, C421 Ulus, Ankara, Türkiye<sup>b</sup> Department of Economics, Faculty of Managerial Sciences, Abdullah Gul University, Kayseri, Türkiye

## ARTICLE INFO

**Keywords:**  
 COVID-19  
 Healthcare services  
 Satisfaction with healthcare services

## ABSTRACT

**Objectives:** This study aims at evaluating whether the healthcare system in Turkey performed well or not from the perspective of patients during the COVID-19 pandemic.

**Methods:** For this purpose, we compare the satisfaction with healthcare services pre-pandemic and during the pandemic. We utilize the Life Satisfaction Survey conducted by Turkish Statistical Institute (TurkStat) between 2013 and 2021 and employ probit regression method.

**Results:** The research results do not show any change in satisfaction with healthcare services in the pandemic years of 2020 and 2021. In addition, the satisfaction with healthcare services of people with health conditions, those without health insurance, and those whose premiums are covered by the state (green card holders) did not decrease during the pandemic period. The analysis results reveal that the satisfaction of people over 65 years old and those having health conditions with healthcare services increased during the pandemic period.

**Conclusion:** When the findings are evaluated as a whole, we can conclude that Turkey performed well from the users' perspective during the pandemic.

**Public interest summary:** This study analyzes the impact of the pandemic on satisfaction with healthcare services in Turkey. To do this, we utilize Life Satisfaction Survey between 2013 and 2021. The regression results indicate that satisfaction with healthcare services has not changed during the pandemic. Moreover, we report an increase in satisfaction scores for elderly and those with health conditions in the pandemic years. We also find satisfaction of people without health insurance, and those whose premiums are covered by the state (green card holders) does not change. Our analysis points Turkey did well in managing pandemic period in terms of healthcare services satisfaction.

## Introduction

The COVID-19 pandemic has shaken the capacity of healthcare systems worldwide. Hospitals in many countries have struggled to adapt to such an influx of patients [1]. Additionally, healthcare personnel dealing with COVID patients are also affected and, in some cases, lost their lives [2]. There has been a prioritization of allocating resources to COVID-19 patients. As a result, many non-urgent medical procedures and surgeries have been postponed or canceled, leading to delays in the treatment of other patients [3,4]. These policies may leave non-COVID patients feeling neglected and reduce their satisfaction with healthcare services.

The implementation of infection control measures, such as social distancing requirements and personal protective equipment mandates, has altered the patient-physician interaction, potentially diminishing

the quality of care and communication [5,6]. Furthermore, disruptions in healthcare delivery channels, including closures of clinics and reduced availability of in-person visits, have posed challenges for individuals seeking timely medical attention for non-COVID-related conditions [7]. Collectively, these factors may contribute to a sense of frustration and dissatisfaction with healthcare services during the COVID-19 pandemic.

There are relatively fewer studies examining the satisfaction with healthcare services during the pandemic. During the pandemic, overall there is partial or full satisfaction with healthcare services in Europe [8]. According to data from the SHARE-COVID survey, elderly and high income people report higher satisfaction whereas, those with pre-existing issues reported lower satisfaction [8]. In another study conducted in China, the authors investigate the level of patient satisfaction with

\* Corresponding author.

E-mail address: [zeynep.ugur@asbu.edu.tr](mailto:zeynep.ugur@asbu.edu.tr) (Z.B. Uğur).<https://doi.org/10.1016/j.hlpt.2024.100888>

Available online 10 July 2024

2211-8837/© 2024 Fellowship of Postgraduate Medicine. Published by Elsevier Ltd. All rights are reserved, including those for text and data mining, AI training, and similar technologies.

primary healthcare services of 315 participants [9]. The analysis results also show that there is no significant relationship between age, health insurance variables, and patient satisfaction. The studies on satisfaction with healthcare services during the pandemic in Turkey shows somewhat conflicting results with limited geographical coverage. Also, they are not based on nationally representative datasets [10–12]

This research investigates (1) the impact of the COVID-19 pandemic on healthcare service satisfaction, (2) the effects on the satisfaction of the elderly and those with health conditions, and (3) whether the effects differ based on the type of health insurance in Turkey.

### Measures to contain the pandemic in Turkey

The first COVID-19 case in Turkey was reported on March 11, 2020 [13]. Following the impact of the virus in countries like Italy and Spain, Turkey implemented strict measures. Initially, international flights from China, Iran, and South Korea were suspended, later extended to all countries [14]. Arrivals from abroad were advised to self-quarantine, but mandatory isolation in student dormitories became necessary due to non-compliance. Restrictions on public gatherings were imposed on March 13, 2020, followed by limitations on domestic travel on March 15. Schools were suspended until September 2020, and mosques were closed for communal prayers [15]. Remote work was authorized for civil servants on March 22, and many corporations adopted work-from-home policies [16]. Public transportation operated at 50 % capacity from March 24 onwards [17].

A significant restriction during the pandemic was the continuous curfew imposed on individuals aged 65 and over and those with chronic illnesses. On March 21, 2020, the Ministry of Interior issued a circular to all 81 provinces, prohibiting individuals in these groups from leaving their homes, walking in open spaces, or using public transportation [18]. Approximately two months later, a new circular allowed limited outdoor activity for these individuals on May 10, 2020, between 11:00 and 15:00, under strict social distancing and mask-wearing rules [19]. Further relaxation occurred on May 20, 2020, permitting travel for those aged 65 and over with travel permits and a minimum 30-day stay at destinations [20]. Until June 1st, weekend, national, and religious holiday curfews were in effect. Measures to gradually reopen society were announced on June 1, 2020, emphasizing social distancing and mask-wearing. Notably, these directives did not specify protocols for hospital visits, likely to deter misuse of exemptions. Throughout this period, the Coronavirus Scientific Advisory Board provided ongoing recommendations to the government, contributing to decision-making processes until the pandemic's decline in impact by 2022.

The important measure taken within the scope of the pandemic was the nationwide vaccination campaign started on January 14, 2021 [21] 68 % of people in Turkey got at least one dose of vaccine (see Fig. A.1). On March 2, 2021, the Ministry of Interior issued a circular titled "Controlled Normalization Process" [22]. Provinces were categorized into four risk groups (low, medium, high, very high) to determine pandemic control measures. With the surge in the number of cases on April 26, 2021, the Ministry of Interior sent a circular on full lockdown measures to the governorates of all 81 provinces [23]. In line with this circular, a curfew was implemented between April 29 and May 17, 2021. The early commencement and widespread implementation of vaccination efforts, coupled with strict pandemic measures, contributed to vanishing the impact of the pandemic by 2022.

### Main characteristics of the Turkish healthcare system

We also provide some background information on Turkey's healthcare system. Significant reforms have been implemented since 2003 through the "Health Transformation Program" (HTP, henceforth) to enhance quality in the healthcare system. Before the reforms, there were significant inequalities in access to healthcare services in Turkey due to a fragmented healthcare system [24]. The Social Insurance and General

Health Insurance Law Number 5510 has been enacted on 31 May 2006 to achieve universal coverage for all citizens [25] Nationwide satisfaction with healthcare services increased as a result of these reforms [26]. Yet, some citizens remain uninsured. When the pandemic started in 2020, there are three categories regarding healthcare access: insured individuals, those whose premiums are paid by the government (Green Card holders), and uninsured individuals who must cover their healthcare expenses out-of-pocket.

Although health inputs have increased in more disadvantaged regions through these reforms, there are still some inequalities in indicators related to the quality of healthcare services [27]. Furthermore, large-scale public hospitals known as "city hospitals" have been opened since 2017. Despite debates about their efficiency [28], city hospitals contributed to increasing the hospital bed capacity during the pandemic.

Fig. 1 depicts the changes in the supply of healthcare inputs and public healthcare expenditures obtained from Ministry of Health, the Health Statistics Yearbooks between 2013 and 2021 [29]. The total number of physicians, nurses and midwives per 1000 people represents the healthcare workers and hospital beds per 1000 people and public healthcare expenditure per capita are presented as an indicator of capital in the healthcare system. Over the years analyzed, all four healthcare input categories show a slight increasing trend. After the abrupt increase observed in the public healthcare expenditure per capita, the most notable increase is observed in the number of nurses and midwives. It can be stated that, at least in terms of inputs, the healthcare system did not experience unfavorable conditions during the pandemic period.

### Methodology

To assess the effects of the pandemic on satisfaction with healthcare services, we used pooled cross-sectional dataset. We initially compare the years before the pandemic (2013–2019) with the pandemic years (2020–2021). The following regression models have been employed:

$$HSS_i = \alpha_0 + \alpha_1 COV_t + \beta X_i + u_i \quad (1)$$

$$HSS_i = \alpha_0 + \alpha_1 COV_t + \alpha_2 Elder_i + \alpha_3 COV_t * Elder_i + \beta X_i + u_i \quad (2)$$

$$HSS_i = \alpha_0 + \alpha_1 COV_t + \alpha_2 HC_i + \alpha_3 COV_t * HC_i + \beta X_i + u_i \quad (3)$$

$$HSS_i = \alpha_0 + \alpha_1 COV_t + \alpha_2 Noins_i + \alpha_3 GHI_i + \alpha_4 COV_t * Noins_i + \alpha_5 COV_t * GHI_i + \beta X_i + u_i \quad (4)$$

$HSS_i$  represents the healthcare satisfaction score. The variable  $COV_t$  takes the value of 1 for the years 2020 and 2021, while it is 0 for other years. The vector  $X_i$ , present in all models, represents the background variables, including age, gender, marital status, the latest completed education level, and total household income.

To specifically determine the impact of the pandemic on the satisfaction of healthcare services among the elderly,  $Elder_i$  has been created, taking the value of 1 for individuals aged 65 and above, and 0 for individuals younger than 65. This variable and its interaction term with the  $COV_t$  variable has been added to Model 2.

To determine whether the satisfaction of healthcare services for those with health problem is different during the pandemic, a variable named  $HC_i$  has been created. This variable takes the value of 1 for individuals who reported having health conditions and 0 for others. This variable and its interaction term with the  $COV_t$  variable has been added in the third model.

Model 4 measures the satisfaction of individuals with healthcare services during the pandemic based on their insurance status. For this purpose, variables named  $Noinsurance_i$  and  $GHI_i$  have been added.  $Noinsurance_i$  takes the value of 1 for individuals without health insurance, while  $GHI_i$  takes the value of 1 for those whose premiums are covered by the government under the general health insurance (GHI), and 0 for other types



Fig. 1. Healthcare Inputs over time in Turkey.

of insurance. "GHI" and "Noins" are two independent variables. Interaction terms of these variables with the  $COV_t$  variable have also been added in model 4.

The dependent variable, the  $HSS_i$  variable, takes only 5 values. Therefore, regression models have been estimated using ordered probit models.

#### Data

In this study, the Life Satisfaction Survey (LSS) obtained from TurkStat has been utilized. The LSS is conducted by the TurkStat through the stratified random sampling method from the non-institutionalized adult population (18 years and older) in Turkey. The individual-level microdata of the LSS for the years 2013–2021 were used in this study. In 2013, the survey was conducted with 196,203 observations to provide estimates at the provincial level, while in 2021, it involved 10,073 individuals. In total, there are 271,548 observations between the years 2013 and 2021 [30] which results in a pooled cross-sectional dataset.

In this survey, the following question measures individuals' satisfaction with healthcare services: "Are you satisfied with healthcare services?" There are five response categories: 1 (Not satisfied at all), 2 (Not satisfied), 3 (Neither satisfied nor unsatisfied), 4 (Satisfied), and 5 (Very satisfied). For ease of interpretation, we recoded the responses so that 5 represents 'Very satisfied' and 1 represents 'Not satisfied at all'.

In the survey, participants were asked questions about significant changes in their lives in the last year. One of these questions is about whether the individual has experienced a major health problem in the last year. The question is posed as follows: "In the last year, I experienced a serious health problem." This question is utilized to determine people who had a health condition in the survey year.

In addition, information regarding participants health insurance coverage is also available in the survey. That question is worded as follows: "When you get sick, how do you generally cover your treatment, medication, and other expenses?". Individuals who answered "Green card (covered by the state)" in the responses from 2013 to 2017 survey years were defined to take value 1 for  $GHI_i$  variable and 0 otherwise. For survey years from 2018 to 2021, individuals who answered the same question with the option "General Health Insurance (GHI)" were defined as taking value 1 for  $GHI_i$  variable and 0 otherwise. This is because, before the full transition of all different social security institutions under one umbrella, there was a separate category of green card holders. In this

system, those with green cards did not pay any premiums, and their premiums were covered by the state. With the completion of the transition to GHI, it would be correct to argue that the group whose premiums are covered by the state corresponds to those with green cards. Similarly, in response to the same question, individuals who answered "Paying on their own," "No health insurance," and "Other" from 2013 to 2017 were defined as  $Noins_i$ , and those who answered "Social Security Institution (SSI)," "Private Health Insurance," and "Private fund" were defined as  $Insured_i$ . From 2018 to 2021, individuals who answered "Paying on their own" and "Other" were defined as  $Noins_i$ , and those who answered "SGK-SSK (4A)," "SGK-BAĞ-KUR (4B)," "SGK-Retirement Fund (4C)," "Bank Fund," and "Private Health Insurance" were defined as  $Insured_i$ .

Additionally, participants were asked to evaluate their health with the following question: "Are you satisfied with your health?" using a scale from 1 (Very satisfied) 2 (Satisfied) 3 (Neither satisfied, nor unsatisfied) 4 (Not Satisfied) to 5 (Not satisfied at all). The answers are reverse coded so that higher value represents better health assessment.

To understand where there are bottlenecks in healthcare service utilization, participants in the survey were asked a series of questions related to whether there were problems in various subcategories. The first of these questions is about whether they experienced any issues in their last healthcare service usage. Subsequently, questions were asked about whether they had problems with making appointments, the cleanliness of healthcare institutions, the behavior of doctors and nurses, the inadequacy of healthcare personnel, high examination fees, drug prices, waiting in line for examination, and whether they had issues with the co-payment for the examination. The response categories are "Yes," "No," and "Don't know." Those who chose the "Don't know" option were excluded as missing observations from the analysis.

As part of the survey, participants' gender, age, highest level of education completed (categories: primary school or below, secondary education or equivalent, high school or equivalent, university and above), employment status (categories: employed, unemployed, student, retired, housewife, unable to work, and other), and total household income measured in 5 categories were collected.

The analysis results reflect the assessment of those who declared that they used healthcare services in the survey year.

#### Results

In Fig. 2, satisfaction with healthcare services from 2013 to 2021 is

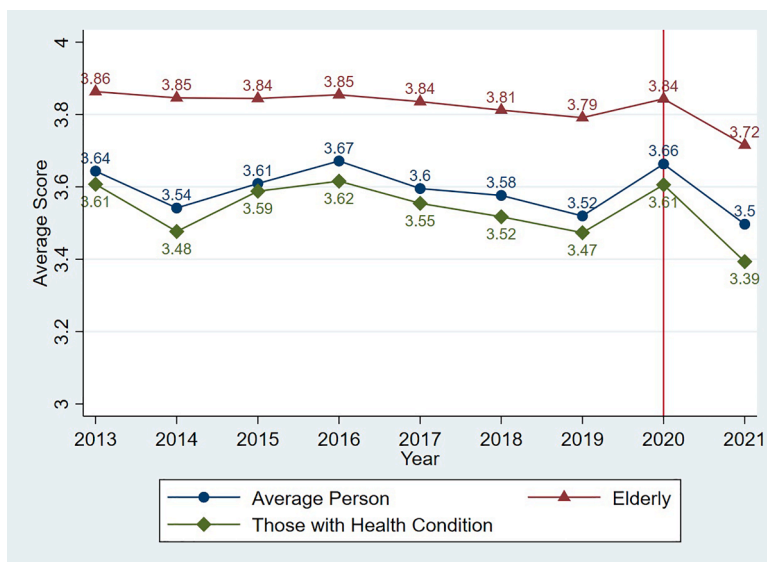


Fig. 2. Average satisfaction score with healthcare services.

depicted. The blue line represents the average satisfaction scores, consistently above 3.5 out of 5, indicating overall satisfaction. The red line reflects satisfaction among those aged 65 and older, consistently above the average. Despite the pandemic in 2020 and 2021, satisfaction levels remained relatively stable and did not drop below pre-pandemic averages. The green line represents satisfaction among individuals with health problems, consistently below the average. In 2020, satisfaction increased slightly, but decreased in 2021, returning to levels similar to 2019, around 3.4.

Fig. 3 shows satisfaction with healthcare services by insurance status over the years. Overall, satisfaction is above three, indicating general contentment. Uninsured individuals consistently report lower satisfaction. Government-sponsored insurance holders maintain steady satisfaction levels, while insured individuals reach peak satisfaction in 2020 before returning to pre-pandemic levels in 2021. Surprisingly, uninsured individuals experience increased satisfaction in 2020, remaining elevated in 2021. In summary, there's no increase in dissatisfaction during the pandemic based on insurance status, with satisfaction notably rising in 2020 for both insured and uninsured individuals.

Regression analysis results are presented in Table 1. According to Table 1, the relationship between individuals' subjective health status and satisfaction with health problems is positive and statistically significant for all models ( $p < 0.01$ ). In other words, individuals who are satisfied with their health are more likely to be satisfied with health services. According to Model 1, the coefficient of the pandemic variable covering 2020 and 2021 is negative but close to zero and it is not statistically significant. This indicates that there is no significant change in satisfaction with health services during the pandemic period.

Model 2 measures the satisfaction of the elderly with healthcare services during the pandemic. While the elderly variable alone is negative and statistically insignificant, the interaction term with the pandemic variable is positive and statistically significant ( $p < 0.01$ ). This reveals that the elderly had increased satisfaction with healthcare services during the pandemic.

Model 3 specifically measures the satisfaction with health services during the pandemic for individuals with health conditions. The health condition variable is statistically insignificant and negative. The interaction term between the health problem variable and the pandemic

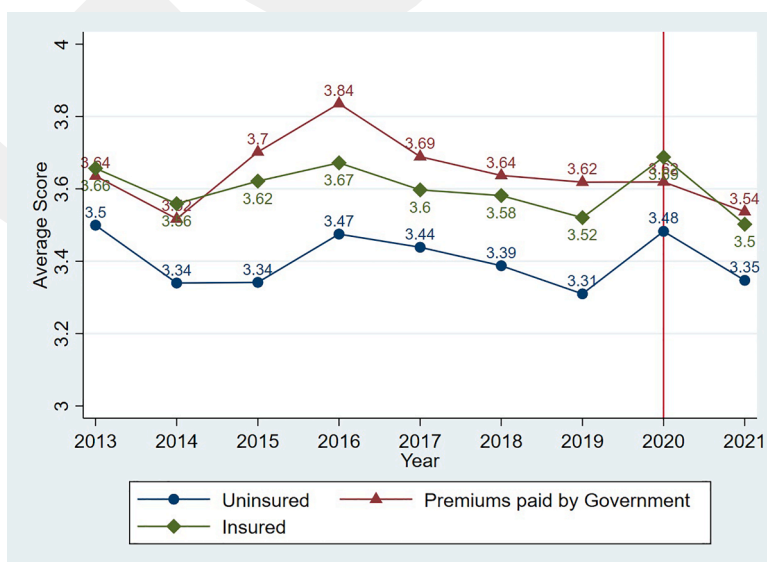


Fig. 3. Average satisfaction with healthcare services by insurance status.

**Table 1**  
Regression results for satisfaction with healthcare services.

	(1)	(2)	(3)	(4)
Pandemic	-0.009 (0.01)	0.003 (0.01)	0.003 (0.01)	-0.003 (0.01)
Elderly		-0.037 (0.03)		
Pandemic × Elderly		0.090*** (0.03)		
Health Condition			-0.065** (0.03)	
Pandemic × Health Condition			0.061** (0.03)	
Premiums paid by Government				-0.068* (0.03)
No insurance				-0.164*** (0.04)
Pandemic × Premiums paid by government				0.038 (0.04)
Pandemic × No insurance				-0.028 (0.04)
Subjective Health Score	0.242*** (0.00)	0.242*** (0.00)	0.241*** (0.00)	0.240*** (0.00)
<b>Pseudo R-squared</b>	0.0334	0.0335	0.0335	0.0342
<b>N</b>	194889	194889	194889	194889

**Notes:** Robust standard errors are provided in parentheses, \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

All models control for age, gender, household income in five categories, marital status (categories: never married, unmarried, widowed, and divorced), education (categories: primary school or below, secondary education or equivalent, high school or equivalent, and university and above).

variable is positive and statistically significant ( $p < 0.05$ ). These results indicate that those who have health problems had significantly higher satisfaction with healthcare services during the pandemic compared to those who do not have health conditions.

In Model 4, the satisfaction with healthcare services is explained as a function of the pandemic and individuals' different insurance statuses. Those whose premiums are covered by the government (green card holders) variable is negative and statistically significant ( $p < 0.10$ ), indicating that individuals covered by the green card are less satisfied with health services. The interaction term of green card holding with the pandemic variable is negative and statistically insignificant. Therefore, there is no significant difference in satisfaction with health services during the pandemic for green card holders compared to insured individuals. Similarly, the uninsured variable is negative and statistically

significant ( $p < 0.05$ ). However, the interaction term between the uninsured variable and the pandemic variable is positive but statistically insignificant. This result indicates that being uninsured during the pandemic does not have a significant difference in satisfaction with health services compared to insured individuals.

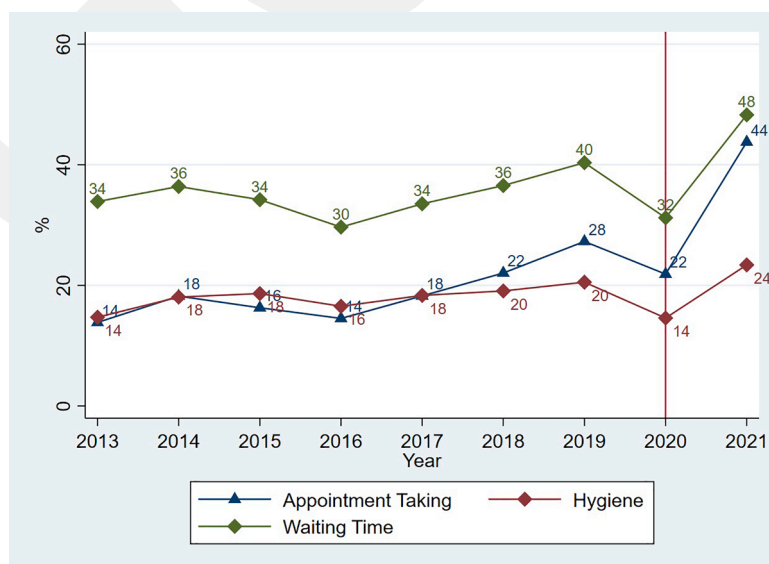
Because the dataset has a considerably long years of observation, it is worth exploring the time trend. That is, people could adapt to healthcare services and their (dis)satisfaction with healthcare services can be related to adaptation. In the literature, there is evidence for strong adaptation [31,32]. When we include time-trend, as shown in Appendix Table A.1, the main results stay almost the same. The only result that changes is that the overall impact of the pandemic on satisfaction with healthcare services becomes statistically significantly positive (see Appendix Table A.1).

Evaluating satisfaction with the healthcare system solely based on satisfaction with healthcare services may overlook underlying issues. Therefore, it's crucial to assess reported problems to grasp the service quality during the pandemic. This section explores changes over time in healthcare service-related issues.

Fig. 4 presents the rates of reported issues in organizational matters related to healthcare services over the years, including appointment scheduling, waiting times, and cleanliness. These three issues moved in parallel, with reported problems increasing from 2016 to 2019 and peaking in 2019. Sharp declines occur with the onset of the pandemic in 2020, reaching the lowest reported rates for waiting times and appointment scheduling since 2013. However, in 2021, there are notable increases across all three categories, reaching their highest levels in comparison to previous years.

Fig. 5 displays rates of reported issues concerning physician behavior, healthcare staff inadequacy, and nurse behavior in healthcare services over the years. The rate of reported staff inadequacy remains notably higher than other categories, reaching 48 % during the pandemic compared to 40 % in 2019. Rates for issues related to doctor and nurse behaviors remained consistent until 2021, where they reached their highest levels over the years.

Fig. 6 illustrates rates of reported issues in financial matters, including visiting fees, co-payments, and medication/drug prices over the years. Financial issues are more prevalent than organizational and personnel-related issues. For instance, the rate of reported issues with co-payments decreased from approximately 64 % in 2019 to around 54 % during the pandemic, before rising to around 66 % in 2021. Similarly, rates of reported issues with medication prices decreased from around



**Fig. 4.** Issues in organizational matters.

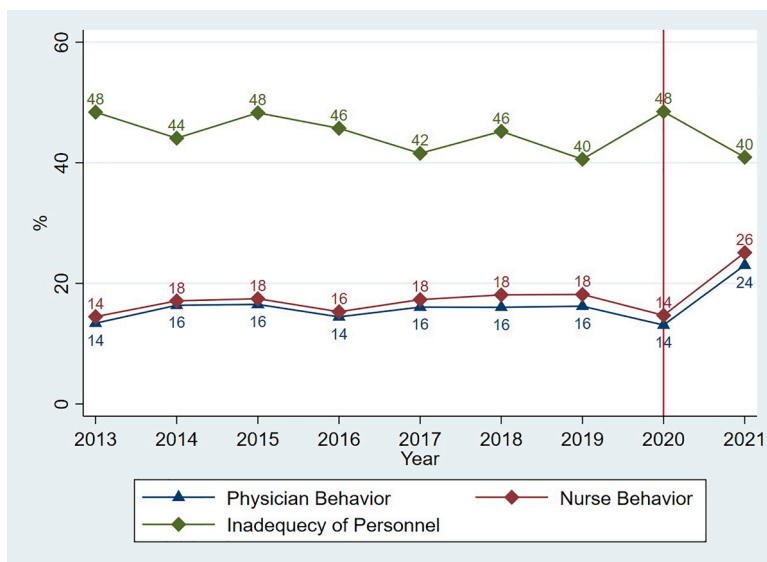


Fig. 5. Issues related to healthcare personnel.

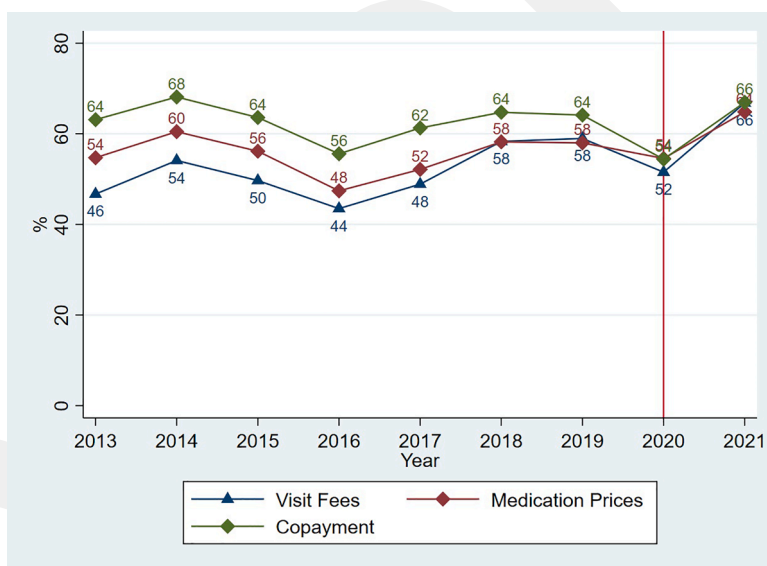


Fig. 6. Issues in financial matters.

58 % in the pre-pandemic period to around 54 % during the pandemic, before reaching their highest level in 2021 at 64 %. The rate of reported issues with examination fees also followed a similar pattern, reaching its highest level in 2021 at 66 %.

When these results are considered as a whole, there was a considerable fall in reporting issues in both organizational and personnel-related matters in 2020, but the fall was replaced by a considerable rise in 2021, especially in financial matters.

We also checked the missing values in the dataset (see Appendix Table A.2). The dataset does not have any missing values for control variables that we used in regression model. With regards to satisfaction with healthcare services, there are only 198 missing observations which corresponds to 0.1 % of the data. To check whether data is missing completely at random (MCAR) or not, we run Little’s MCAR test. For that purpose, we utilized subjective health assessment as it is fully observable in the dataset. The Chi-square test statistic is 0.62 with a p-value of 0.43. The test results suggest not rejecting data missing completely at random. However, for all other problems regarding healthcare system, the chi-square test results suggest rejection of data

missing completely at random. Because there is a significant negative correlation between missingness indicator and subjective health for many healthcare issues indicators, we set the missing values to 0. To check for sensitivity of results, we prepared the same figures while the missing values are treated as 0. (see Appendix Figs. A.3–A.5). The results stay broadly the same. That is, generally there is a drop in issues reported in the first year of the pandemic and the issues jump in 2021.

**Discussion and conclusion**

This study examines the impact of the pandemic on satisfaction with healthcare services in Turkey. Overall findings suggest that COVID-19 did not have a significant impact on the average individual’s satisfaction with healthcare services in Turkey. That is, the pandemic period did not cause a significant remarkable drop on satisfaction with healthcare services in Turkey. The study also investigated healthcare service satisfaction for individuals aged 65 and over, those with health problems, and different types of insurance. According to regression results, individuals aged 65 and over are largely satisfied with healthcare

services during the pandemic. The satisfaction of individuals with health problems during the pandemic is positive and statistically significant. Furthermore, the impact of the pandemic on the satisfaction of uninsured and green cardholder individuals with healthcare services is statistically insignificant.

Our results are consistent with the results regarding satisfaction with healthcare service in the literature [9,8]. In other words, these studies also did not find lower satisfaction with healthcare service utilization during the pandemic. Additionally, the public healthcare services providing the backbone of the healthcare system while at the same time having a large coverage of health insurance have eased the burden and ensured preparedness against the pandemic [33]. Moreover, the selfless efforts of healthcare professionals have played a crucial role in overcoming the pandemic before it turns into a major disaster [34]. One can also look at Appendix Fig. A.1 which documents that Turkey has the least COVID-19 related death rate among many developed countries which is a corroborating fact. All of these indicate that Turkey has managed the pandemic process well in terms of healthcare services.

The lack of a decrease in satisfaction with the healthcare system in Turkey is similar to China's experiences according to the findings of Li et al. [9]. In China, significant restrictions were imposed from the beginning of the pandemic to prevent the healthcare system from being stressed [35].

Previous studies show that, the healthcare facilities' cleanliness and hygiene, physical examination by the doctor, and the distance of the hospital are the factors influencing satisfaction with the healthcare system [36]. Medical staff's service attitude, and hospital convenience are also factors affecting patient satisfaction [37].

However, despite the statistical absence of a decrease in satisfaction during the pandemic, there has been a significant increase in problems encountered in healthcare service utilization since 2021. Especially, the rates of individuals reporting problems such as making appointments, waiting in line, hygiene, nurse and doctor behaviors, medication prices, and visit fees reached their highest levels in 2021 compared to all years. The importance of use of technology to reduce waiting times has already been identified in previous research [38]. Moreover, it has been shown that these problems have impact on satisfaction with healthcare services [39]. The rapid increase in reported problems related to the healthcare system from 2021 onwards should not be overlooked to maintain the satisfaction with healthcare services in the coming years.

While we have identified the COVID-19 pandemic as an exogenous, it is important to acknowledge that other factors may also influence these outcomes. The pandemic's unprecedented nature and extensive impact on healthcare systems make it a primary factor during the period studied. However, we cannot entirely rule out the possibility of other concurrent influences, such as changes in healthcare policies, economic conditions, or individual health events. Therefore, the link between the pandemic and healthcare satisfaction should not be interpreted as strictly causal.

## Funding

None.

## Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Ethical approval

Not required.

## Informed consent

As we used secondary data, obtaining informed consent was not necessary.

## Acknowledgment

We would like to thank Prof. Dr. Havva Şahin for her insightful comments.

## Data availability

Authors declare that the data utilized in this research are not proprietary and are available for scrutiny and replication by interested parties from Turkish Statistical Institute with written permission.

## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.hlpt.2024.100888.

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