The impact of the covid-19 outbreak on unmet health care needs in istanbul

Yagmur Tokatlioglu [*], Seher Nur Sulku

Ankara Haci Bayram Veli University Department of Econometrics, Ankara, Turkey

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ABSTRACT

Background & aim: COVID-19 pandemic caused significant barriers to maintain health services. Our study determines the frequency and significant determinants of unmet health needs in Istanbul both in 2019, a pre-pandemic year, and in 2021, a pandemic year and compares the results COVID-19 era to a prior to pandemic year.

Methods: As our study is the first questing Istanbul experience, we estimate the frequencies and determinants of unmet healthcare need among +15 population using TurkStat's Income and Living Conditions Survey Data via Generalized Linear Models (GLMs).

Results: We found that the most prominent barriers were late appointment dates and financial difficulty both before and during the pandemic. According to our findings, women and those having any chronic disease become significantly more likely to have unmet health needs during the pandemic compared to pre-pandemic period. Indeed, the ones belonging to the lowest income group and having lower level perceived health were disadvantaged with higher change of unmet needs both prior to and during the pandemic. Furthermore, the frequency of the Istanbulers who had unmet healthcare needs increased more than 1.5 time during the COVID-19 pandemic.

Conclusions: As unmet healthcare needs due to COVID-19 jeopardizing the healthcare systems, it is important to comprehend the causes of unmet healthcare demands during infectious disease outbreaks in order to prioritize the right policies and protection strategies for the most vulnerable ones.

1. Introduction

The severe acute respiratory syndrome Coronavirus-2 (SARS-CoV-2), a novel coronavirus called as COVID-19, was first identified as a result of reported cluster of cases of pneumonia in Wuhan in December 2019 (WHO, 2020). The rapid spreading of COVID-19 makes it one of the worst pandemic in history (Murray and Lauerman, 2020). For more than two years, the COVID-19 pandemic has stretched health systems, restricting their ability to provide care for all people when needed (WHO, 2022). During the pandemic countries' capacity to maintain vital health services has been adversely affected, health authorities have called for reduction of hospital admissions except for urgent reasons in the provision of health (WHO, 2022). COVID-19 pandemic caused significant barriers to diagnosis, follow-up and treatment of chronic diseases like heart disease, diabetes, cancer, and respiratory disease (Fekadu et al., 2021; IQVIA, 2020; Kulle et al., 2021). Beside on the demand side, as COVID-19 was highly contagious, fear of infection of oneself and vulnerable persons was reducing the demand and further rising the unmet needs (IQVIA, 2020; Dubey et al., 2020; Ahorsu et al., 2022; Bostan, 2020; Soares et al., 2021). Furthermore, access to healthcare has also been hampered by curfews, quarantining, travel restrictions and lost or reduced income in all over the world as well as in Türkiye (OECD, 2020; Islam et al., 2022; Singh et al., 2021; Sulku, Cosar and Tokatlioglu, 2021). Consequently, unmet healthcare needs led to backlogs in almost all countries that threaten health outcomes, as medical care delay or avoidance worsen response to treatment might upsurge morbidity risk and reduce survival even for remediable or preventable health conditions, and yield economic and social costs (Basar, Dikmen and Ozturk, 2021; Soares et al., 2021; Sulku et al., 2023a).

As burdens of unmet needs jeopardize both health systems and health outcomes not only in short run but also in medium and long run understanding determinants of unmet needs is important to apply wise strategies and policies to address it. In this study we aim to determine

Table 1

The codes and description of the variables used in the 2019 and 2021 data of Income and Living Conditions Survey, Türkiye.

Name	Codes &	Description in Survey	Labels	Coding in our analysis
Dependent Variable				
Unmet needs	FS050	Unmet need for medical examination or treatment during the last 12 months	1- Yes, at least one occasion 2- No, not at all 3- No, not needed	=1, Yes, at least one occasion =0, No
Explanatory Variables				
Income groups	HG110	Total disposable household income (X)	0.0.999999.99	Quintile of household income in 2019*; in 2021**
1st 20% income group				X < 36,899 TL; X < 43,000 TL
2nd 20% income group				[36,899–52,540); [43,000–62,743)
3rd 20% income group				[52,540–71,104); [62,743–86,246)
4th 20% income group				[71,104–104,506); [86,246–122,815)
5th 20% income group				X ≥ 104,506 TL; X ≥ 122,815 TL
Age ≥ 55	FK070	Age (as of 2018 or 2020, December)	−1.0.114	=1, If individual's age is 55 and above =0, If individual's age under 55
Female	FK090	Gender	1- Male 2- Female	=1, Female =0, Male
Married	FB100	Marital status	1- Married 2- Never married 3- Widowed 4- Divorced	=1, Married =0, Not Married
Education level	FE030	Highest education level attained	0- Illiterate 1- Literate but not a graduate 2- Primary school 3- Primary education 4- Secondary and vocational secondary school 5- High school 6- Vocational or technical high school 7- 2 or 3 year higher education 8- Faculty 9- Master 10- Doctorate	=1, If individual's education level is secondary level and above =0, If individual's education level is under secondary level
Good health	FS010	General health status	1- Very good 2- Good 3- Fair 4- Bad 5- Very bad	=1, If individual's health status is "very good or "good" =0, If individual's health status is "fair", "bad" or "very bad".
Chronic disease	FS020	Suffer from any a chronic (long-standing) illness or condition (Diabetes, hypertension, asthma, renal	1- Yes 2- No	=0, If individual has not chronic disease =1, If individual has chronic disease

Table 1 (*continued*)

Name	Codes &	Description in Survey	Labels	Coding in our analysis
		failure, rheumatic diseases, etc.)		
Employee	FI120	Employment status in the main job	1- Regular employee 2- Casual employee 3- Employer 4- Self-employed 5-Unpaid family worker	=0, If individual is a employer, self-employed or unpaid family worker =1, If individual is a regular or casual employee
Informal	FI190	Registration status to social security institutions in the main job	1- Registered 2- Not registered	=0, If individual is registered =1, If individual is not registered

Notes: *: US $/TL Exchange rate in 2019 is 5.67. **: US $/TL Exchange rate in 2021 is 8.89.

factors of unmet needs in Istanbul, the metropole of Türkiye (Unsal and Sulku, 2020) and Europe's biggest city (Statista, 2022), during the COVID-19 pandemic in 2021 and compare them to pre-pandemic period of 2019. Currently, there is a limited number of studies to identify determinants of people's decision to avoid and/or delay healthcare during the COVID-19 pandemic and according to our research all of them focus on developed countries experiences such as the USA (Czeisler et al., 2020; Burch, 2022), the Netherlands (Splinter et al., 2021), Portugal (Soares et al., 2021), South Korea (Lee and You, 2021), Australia (Czeisler et al., 2021; Islam et al., 2022), Italy (Lazzerini et al., 2020) and the UK (Solanke et al., 2022). Indeed, all these studies, except Islam et al., 2022, have characterized healthcare avoidance or unmet health-care needs during the pandemic but not the comparison as factors before and during like our study.

Furthermore, although previous disease outbreaks had tendency to be connected to poor environments, the epicenters of the COVID-19 were the wealthiest metropolises (Masahisa and Nobuaki, 2020). In literature there is a consensus that population density of the cities provoked the spread of the pandemic (Barak et al 2021). But also large cities have the socioeconomic institutions and infrastructure to fight more aggressively against COVID-19 (Uchicago, 2020). While concerns focus on the future of the cities in the context of pandemics, it is important to examine the unmet needs during the COVID-19 era in metropolises. In literature there is only one study considering a metropole city experience, Splinter et al. (2021) Rotterdam case, others study country-wise experiences.

At this point our study contributes literature examining Istanbul, a regional trade hub, a world city (Alvarez and Yarcan, 2010) and a focal center of the national/international population movements (Biehl, 2014, Gökhan, 2008), that constitutes 18.71% of the total population of Türkiye and the first region/subregions of both NUTS1 and NUTS2. Istanbul was the pandemic epicenter of Türkiye as 4 out of 10 cases with positive COVID-19 test were in this province (Kam, 2020). Our study determines the frequency and significant determinants of unmet health needs in Istanbul both in 2019 and in 2021, and compares the results of pandemic year with respect to a pre-pandemic year. For this aim, we analyze both 2019 and 2021 data of Income and Living Conditions Survey (SILC) published by Turkish Statistical Institute (TurkStat) via Generalized Linear Models (GLMs).

2. Methods

2.1. Data source

In our study, we used Turkish Statistical Institute (TurkStat)'s 2019

Table 2
Summary statistics for variables used in the 2019 and 2021 data of Income and Living Conditions Survey, Istanbul.

Dependent Variable	2019 (n = 1,746)		2021 (n = 1,512)	
	Frequency	Percent (%)	Frequency	Percent (%)
Unmet needs	161	9.22	221	14.62
Explanatory Variables				
1st 20% income group	104	5.96	134	8.86
2nd 20% income group	242	13.86	223	14.75
3rd 20% income group	321	18.38	275	18.19
4th 20% income group	423	24.23	344	22.75
5th 20% income group	656	37.57	536	35.45
Age ≥ 55	449	25.72	398	26.32
Female	896	51.32	782	51.72
Married	1,015	58.13	878	58.07
Education level ≥ Secondary school	1,115	63.86	993	65.67
Good health	1,207	69.13	982	64.95
Chronic disease	698	39.98	561	37.1
Employee*	717	84.35	602	86.74
Informal*	165	19.41	116	16.71

*, Only the people who are in job market are considered here. This variables contains 850 and 694 observations in 2019 and 2021 samples respectively.

and 2021 SILC Data with official permission. TurkStat is a governmental institution collects Turkish populations' data with respect to personal Data Protection Laws and shares the anonymized data with researchers according to agreement and official permission. The micro data were prepared by TurkStat in accordance with the Regulation named "Regulation of Procedure and Principles of Data Confidentiality and Confident Data Security in Official Statistics" which was issued by the Article 13 of Statistics Law of Türkiye No. 5429 and entered into force with the date of June 20, 2006, following that of its publication in the Official Journal No: 26204.

Nationally representative and cross-sectional surveys data sets cover issues about housing, economic situation, social exclusion, real estate ownership, education, demography, health status, labor status, income status. SILC has been started to carry out within the scope of harmonization with the European Union (EU) since 2006. Thus, it is possible to compare with EU countries in terms of comparable income distribution,

relative poverty based on income, living conditions and social exclusion. The 2019 and 2021 surveys were respectively carried out during the March-July 2019 and March-July 2021. The design of the SILC is two-stage stratified cluster sampling. Complex survey design has not been provided by TurkStat, and indeed complex survey design weights were not shared. Up to 2014, the estimation level of SILC in Türkiye was rural/urban at NUTS1; but since 2014, surveys conducted at NUTS2 level. Moreover, the 2019 SILC data contains 63,258 participants aged at least 15 years old and 24,924 households; and the 2021 SILC data contains 66,176 participants aged at least 15 years old and 26,289 households. As we only considered Istanbul, Türkiye 5,299 and 4,450 participant remained in 2019 and 2021 SILC data sets respectively.

2.2. Variables

The variables in our GLM models have been chosen following to literature. Indeed, we also introduced the variables taking into account the specific conditions in Türkiye. Finally, we paid attention to the statistical significance of the variables and breakpoints. First, as well defined in Allin et al., 2010, unmet health need is a comprehensive concept covering both unperceived and perceived needs: Unperceived need cannot be studied empirically since not documented; Perceived needs would be unmet when s/he either prefers not to seek or demand health service, or delays or avoids due to barriers or demands but healthcare providers could not provide appropriate healthcare services or individual's expectations have not been fulfilled. Among these barriers cost, transportation and long waiting times are the most prominent ones (Byrne, 2008; Eurostat, 2023). Furthermore, in literature there is evidence that unmet need is correlated to demographic factors like gender (Kannan and Veazie, 2015; Taber et al., 2015), marital status (Tadiri et al., 2021), age (Quintal et al., 2023), education (Gertz et al., 2022), employment status (Lee et al., 2014, Zhao et al., 2014; Kannan and Veazie, 2014), and income (Allin et al., 2010, Shi and Stevens, 2004), personal factors like fear of treatment, having chronic conditions (Ronksley et al., 2012, Larkey et al., 2001; Garg et al., 2017), having no time to spare (Lee et al., 2014) and perceived health (Hardin et al., 2021), administrative factors like being uninsured (Byrne, 2008) and provider issues like equitable access (Basar et al., 2021).

According to data availability we have defined our variables. Table 1
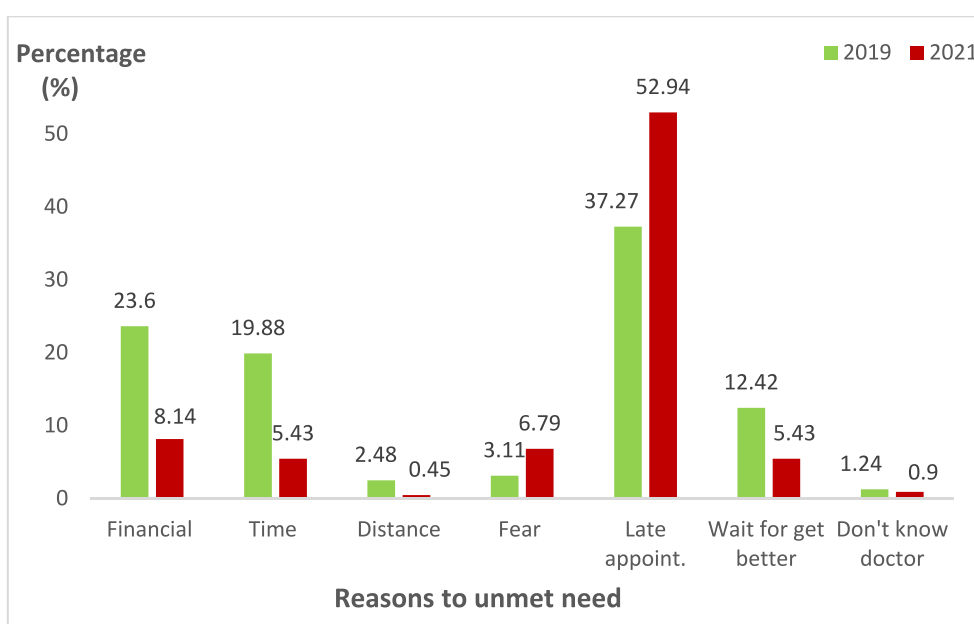
Fig. 1. Comparison of reasons to unmet need for medical examination or treatment for 2019 and 2021 in Istanbul (%).Source: Our calculation using TurkStat micro data of 2019 and 2021 Income and Living Conditions Survey.

Table 3

GLMs results: Probit parameter estimation for unmet health care needs in Istanbul 2019 and 2021.

Variables	2019				2021			
	Coef.	*p-value*	95% Confidence Intervals		Coef.	*p-value*	95% Confidence Intervals	
	(1)	(2)	(3)		(4)	(5)	(6)	
Income (reference: Lowest 20% income group)								
2	−0.006	0.985	[-0.607	0.596]	−0.079	0.766	[-0.597	0.44]
3	−0.456	0.143	[-1.068	0.155]	−0.136	0.576	[-0.613	0.341]
4	−0.364	0.223	[-0.95	0.221]	−0.357	0.133	[-0.822	0.108]
5	−0.598**	0.047	[-1.187	−0.009]	−0.511**	0.027	[-0.963	−0.059]
Age ≥ 55	−0.368	0.164	[-0.886	0.15]	0.107	0.632	[-0.33	0.543]
Female	0.073	0.610	[-0.206	0.351]	0.296**	0.019	[0.048	0.544]
Married	−0.253*	0.067	[-0.525	0.018]	−0.17	0.188	[-0.423	0.083]
Education level ≥ Secondary school	−0.292*	0.056	[-0.591	0.007]	0.042	0.789	[-0.267	0.352]
Good health	−0.725***	0.000	[-1.09	−0.359]	−0.540***	0.001	[-0.848	−0.233]
Chronic disease	−0.204	0.255	[-0.555	0.147]	0.359**	0.019	[0.059	0.658]
Employee	−0.035	0.852	[-0.402	0.333]	−0.182	0.306	[-0.531	0.167]
Informal	0.293*	0.074	[-0.028	0.615]	0.178	0.294	[-0.154	0.509]
Constant	−0.042	0.913	[-0.79	0.706]	−0.311	0.339	[-0.95	0.327]
	Log likelihood = -227.855				Log likelihood = -280.745			
	(1/df)Deviance = 0.544				(1/df)Deviance = 0.825			
	(1/df)Pearson = 1.033				(1/df)Pearson = 1.020			
	PseudoR^2 = 0.1179				PseudoR^2 = 0.1037			
	AIC = 0.567				AIC = 0.847			
	BIC = -5190.053				BIC = -3893.933			

* significant at 10%, ** significant at 5%, *** significant at 1%

Table A1

Comparison of AIC and BIC values for family distribution and link function selection for GLMs, 2019 and 2021.

Link	Family	Obs	ll(model)	df	AIC	BIC
2019						
Probit	Binomial	850	−227.855	13	481.7099	543.398
Logit	Binomial	850	−227.9149	13	481.8298	543.5178
Complementary log–log	Binomial	850	−228.1979	13	482.3958	544.0839
Probit	Poisson	850	−234.9475	13	495.8949	557.583
Logit	Poisson	850	−235.0049	13	496.0098	557.6979
Complementary log–log	Poisson	850	−235.3109	13	496.6219	558.3099
2021						
Probit	Binomial	694	−280.7454	13	587.4909	646.543
Logit	Binomial	694	−280.7925	13	587.5849	646.637
Complementary log–log	Binomial	694	−280.6846	13	587.3692	646.4213
Probit	Poisson	694	−297.5321	13	621.0643	680.1164
Logit	Poisson	694	−297.7237	13	621.4474	680.4996
Complementary log–log	Poisson	694	−297.9361	13	621.8721	680.9242

Table A2

Pregibon's goodness-of-link test for link function selection for GLMs, 2019 and 2021.

Avoid	Coefficient	Standart Error	*p-value*	95% Confidence Interval	
2019					
$\widehat{Y}_i$	0.925	0.512	0.071	[-0.077	1.928]
$\widehat{Y}_i^2$	*−0.033*	*0.218*	*0.880*	*[-0.460*	*0.394]*
Constant	−0.034	0.287	0.906	[-0.597	0.529]
2021					
$\widehat{Y}_i$	1.031	0.419	0.014	[0.209	1.852]
$\widehat{Y}_i^2$	*0.019*	*0.247*	*0.938*	*[-0.464*	*0.502]*
Constant	0.008	0.168	0.962	[-0.322	0.338]

presents the codes and description of the variables used in the SILC survey and coding in our analysis. The dependent variable named as "Unmet needs" which takes one if the individual reported that s/he had unmet need for medical examination or treatment during the last 12 months. We generated our dependent variable via question coded FS050 in SILC, in part 'persons aged 15 and above', was asking "Unmet need for medical examination or treatment during the last 12 months" and

respondents cited one of these options: "Yes, at least one occasion", "No, not at all", and "No, not needed". Here dependent variable takes 1 if the answer is yes, and takes 0 otherwise. We excluded those who cited "No, not needed" to question and who did not answer the question from the data set, this excluded data constitutes 14.86% of our sample. Since the scope of the study is individuals who need health care, we did not include those who cited "No, not needed".[1]

2.3. Statistical analysis

Our study aims to examine unmet health care needs behaviors in medical examination or treatment between the pre and post outbreak periods in Istanbul by using the 2019 and 2021 SILC Micro Data Sets. First link function and family distribution of the GLMs[2] were identified. According to Akaike Information Criterion and Bayesian Information Criterion, binomial distribution and probit models fit the data than other combinations. Moreover, we applied Pregibon's (1980) goodness-of-link

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[1] The detailed information about variable selections is provided in the supplementary material.

[2] The detailed information regarding the GLMs model is presented in the supplementary material.

Table A3

Probit parameter estimation with interaction terms for unmet health care needs in Istanbul 2019 and 2021.

Variables	2019				2021			
	Coef.	*p-value*	95% Confidence Intervals		Coef.	*p-value*	95% Confidence Intervals	
Income (reference: Lowest 20% income group)								
2	−0.2884	0.4290	[-1.0033	0.4264]	−0.1314	0.6830	[-0.7628	0.4999]
3	−0.8070**	0.0360	[-1.5597	−0.0542]	−0.2993	0.3400	[-0.9144	0.3157]
4	−0.7475	0.0420	[-1.4692	−0.0258]	−0.5123*	0.0960	[-1.1163	0.0917]
5	−0.9357**	0.0120	[-1.6618	−0.2095]	−0.6696**	0.0250	[-1.2559	−0.0833]
Age ≥ 55	−0.4225	0.3930	[-1.3917	0.5468]	−0.1015	0.7970	[-0.8765	0.6734]
Female	−1.4068**	0.0800	[-2.9810	0.1673]	0.2443	0.6760	[-0.9016	1.3902]
Married	−0.2603	0.0710	[-0.5429	0.0223]	−0.1882	0.1490	[-0.4440	0.0676]
Education level ≥ Secondary school	−0.2778**	0.0880	[-0.5974	0.0418]	−0.0045	0.9790	[-0.3387	0.3298]
Good health	−0.8510***	0.0000	[-1.2717	−0.4303]	−0.4429**	0.0170	[-0.8072	−0.0786]
Chronic disease	−0.2088	0.2580	[-0.5709	0.1533]	0.3229**	0.0480	[0.0031	0.6428]
Employee	−0.0949	0.6670	[-0.5277	0.3379]	−0.1145	0.6040	[-0.5476	0.3185]
Informal	0.2763	0.1820	[-0.1293	0.6819]	−0.0098	0.9650	[-0.4474	0.4278]
Education level*Age	−0.2939	0.6260	[-1.4768	0.8891]	0.3256	0.4530	[-0.5256	1.1768]
Employee*Female	0.2246	0.6130	[-0.6470	1.0962]	−0.1918	0.6170	[-0.9434	0.5598]
Good health *Female	0.4213	0.2010	[-0.2245	1.0670]	−0.2495	0.3610	[-0.7844	0.2855]
*Income*Female*								
2	0.6677	0.3750	[-0.8066	2.1421]	0.0502	0.9330	[-1.1143	1.2147]
3	0.9252	0.1990	[-0.4878	2.3382]	0.3216	0.5230	[-0.6646	1.3078]
4	1.1507*	0.0920	[-0.1892	2.4905]	0.3918	0.4230	[-0.5665	1.3500]
5	0.9997	0.1420	[-0.3335	2.3330]	0.3912	0.4010	[-0.5218	1.3043]
Informal*Female	0.1705	0.6160	[-0.4958	0.8369]	0.3877	0.2570	[-0.2829	1.0582]
Chronic disease*Age	0.2641	0.6380	[-0.8349	1.3630]	0.2066	0.6260	[-0.6244	1.0375]
Constant	0.4095	0.3560	[-0.4596	1.2786]	−0.2175	0.5860	[-1.0007	0.5656]
	Log likelihood = -224.422				Log likelihood = -278.228			
	(1/df)Deviance = 0.543				(1/df)Deviance = 0.828			
	(1/df)Pearson = 1.047				(1/df)Pearson = 1.025			
	PseudoR^2 = 0.1312				PseudoR^2 = 0.1117			
	AIC = 0.580				AIC = 0.865			
	BIC = -5136.211				BIC = -3840.085			

* significant at 10%, ** significant at 5%, *** significant at 1%.

Table A4

Marginal Effects of Probit Regression for unmet health care needs in Istanbul 2019 and 2021.

Variables	2019				2021			
	dy/dx	*p-value*	95% Confidence Intervals		dy/dx	*p-value*	95% Confidence Intervals	
Income (reference: Lowest 20% income group)								
2	−0.0014	0.9850	[-0.1390	0.1363]	−0.0224	0.7670	[-0.1702	0.1255]
3	−0.0829	0.2070	[-0.2117	0.0458]	−0.0378	0.5830	[-0.1731	0.0974]
4	−0.0695	0.2880	[-0.1977	0.0586]	−0.0914	0.1600	[-0.2189	0.0362]
5	−0.1006	0.1200	[-0.2274	0.0262]	−0.1229*	0.0510	[-0.2465	0.0008]
Age ≥ 55	−0.0531	0.1640	[-0.1278	0.0216]	0.0239	0.6320	[-0.0738	0.1215]
Female	0.0105	0.6100	[-0.0298	0.0507]	0.0663**	0.0190	[0.0110	0.1215]
Married	−0.0366*	0.0680	[-0.0758	0.0027]	−0.0380	0.1870	[-0.0944	0.0184]
Education level ≥ Secondary school	−0.0422	0.0560	[-0.0854	0.0010]	0.0095	0.7890	[-0.0598	0.0787]
Good health	−0.1047***	0.0000	[-0.1576	−0.0517]	−0.1210***	0.0000	[-0.1886	−0.0533]
Chronic disease	−0.0294	0.2560	[-0.0802	0.0213]	0.0803**	0.0180	[0.0139	0.1467]
Employee	−0.0050	0.8520	[-0.0581	0.0480]	−0.0408	0.3050	[-0.1189	0.0372]
Informal	0.0423*	0.0740	[-0.0041	0.0887]	0.0397	0.2930	[-0.0344	0.1139]

* significant at 10%, ** significant at 5%, *** significant at 1%.

test and confirmed that there was no problems with probit specification.[3] As our GLMs analysis reveals that our data have binomial family distribution and probit link function, we end up with a standard probit model estimation. The probit model is appropriate when modeling interactions between variables and comparing coefficients between groups.

3. Results

3.1. Descriptive Statistics

In our analysis, we randomly select one individual from each household to prevent dependency among observations by using Matlab R2015a. Thus, our data sets contain 1,746 and 1,512 observations of one randomly selected participant 15 years or older from each household in 2019 and 2021 samples respectively. Table 2 presents the descriptive statistics of dependent and explanatory variables used in the study. As it is seen in Table 2, the frequency of the Istanbulers who had unmet healthcare needs was 9.22% before COVID-19 in 2019, and rose to 14.62% during the COVID-19 pandemic in 2021. The distribution of the explanatory variables across 2019 to 2021 is balanced, even though

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[3] The Information criterion values, and Pregibon's goodness-of-link test results are presented in the appendix as Table A.1 and Table A.2.

there is an almost 4%-point decrease in the ones with good health and around 3%-point increase of the ones belonging to first the 20% poorest income level.

In the Income and Living Conditions Survey, in question FS060, the ones who had at least one unmet health occasion were asked the main reason for unmet need as in eight categories: Financial difficulty / could not afford to (too expensive or not covered by insurance fund); could not take time because of work, care for children or for others; too far to travel to healthcare organization/no means of transportation; fear of surgical operation/treatment; giving too late time for appointment; wanted to wait and see if problem got better on its own; didn't know any good doctor or specialist and finally other reasons. Fig. 1 present the percentage distribution of the reasons of avoiding in Istanbul.

According to Fig. 1 the main reason of unmet health care needs in Istanbul is late appointment date, both 2019 (37.27%) and 2021 (52.94%). After the COVID-19, late appointment date raises as a crucial constraint to get health care needs in Istanbul. Among the reasons of unmet need for medical examination or treatment, financial difficulty (23.6% in 2019 and 8.14% in 2021) take the second slot and followed by having not enough time in 2019 and by fear in 2021.

3.2. Empirical findings

Table 3 presents the results of the GLMs constructed to determine the unmet health care needs for Istanbul case for both 2019, a year before COVID-19 outbreak, and 2021, a pandemic year.

In Table 3, panel (1) and panel (4) denote, respectively, model estimates of coefficients for the 2019 and the 2021. In probit models positive coefficients indicate that the probability of occurring dependent variable increases with independent variable, or vice versa. As being female has positive coefficient both in 2019 and 2021, respectively $\hat{\beta} = 0.073$ and $\hat{\beta} = 0.296$, we can claim that females are more likely to have unmet health care needs, compared to males. Indeed, this disadvantage of women becomes statistically significant at 5% significance level during the COVID-19 ($\hat{\beta} = 0.296, p = 0.019 < 0.05$) in 2021. Furthermore, before the pandemic the coefficient of having chronic disease ($\hat{\beta} = -0.204, p = 0.255$) was negative keeping in mind that it was not statistically significant we can interpret that chronic disease patients were less likely to having unmet health care needs in 2019. But after the COVID-19 outbreak it turns statistically significantly and positive ($\hat{\beta} = 0.359, p = 0.019 < 0.05$), thus the ones with chronic diseases become more likely to have unmet needs during the pandemic. The effect of education level on the chance of having unmet needs turns positive but become statistically insignificant in 2021. But, neither age nor employment status were among the significant determinants of unmet needs in both years.

According to our findings, the ones belonging to top quintile, ie 5th 20% income group, have negative and statistically significantly coefficients both in 2019 ($\hat{\beta}_{2019} = -0.598, p = 0.047 < 0.05$) and 2021 ($\hat{\beta}_{2021} = -0.511, p = 0.027 < 0.05$), and thus they are less likely to have unmeet healthcare needs compared to the reference group of 1th 20% income group. Furthermore, we see that having good perceived health decreases the chance of having unmet healthcare in both 2019 ($\hat{\beta} = -0.725, p = 0.000 < 0.01$) and 2021 ($\hat{\beta} = -0.540, p = 0.001 < 0.01$). Similarly, married individuals are less likely to have unmet healthcare needs in both 2019 ($\hat{\beta}_{2019} = -0.253, p = 0.067 < 0.10$) and 2021 ($\hat{\beta}_{2021} = -0.170, p = 0.188 > 0.10$), though significance lost in 2021. Moreover, the informal, *i.e.* uninsured, ones are more likely to have unmet healthcare needs ($\hat{\beta}_{2019} = 0.293, p = 0.074; \hat{\beta}_{2021} = 0.178, p = 0.294$) both pre and post COVID-19 outbreak, but again significance lost during the pandemic.

In our analysis, we have also introduced interaction terms into the model in an attempt to capture vulnerable groups. But their coefficients were too small and/or statistically insignificant. Therefore, we present the output of the model without interaction terms. The model estimation with interaction terms is shown in Table A.3 in the appendix. Furthermore, when comparing the models, the AIC and BIC values of models containing the interaction term ($AIC_{2019} = 0.580$ and $AIC_{2021} = 0.865$) are higher than those models that do not include the interaction term ($AIC_{2019} = 0.567$ and $AIC_{2021} = 0.847$). Also marginal effects have been calculated and are shown in the Table A.4 in the appendix.

4. Discussion

In our study we see that the frequency of the Istanbulers who had unmet healthcare needs increased more than 1.5 time during to pandemic and reached to 14.62% during the COVID-19 pandemic while it was 9.22% before COVID-19 in 2019. We see that most prominent barriers were late appointment dates and financial difficulty both before and during the pandemic. However after the COVID-19, the share of respondents citing late appointment date as a crucial constraint rises to almost 53% and financial difficulty decreases to 8.14%. Also, Baker (2022) indicate that waiting list for hospital in England has risen more quickly after COVID-19.

Following the breakout of the pandemic to lessen its spread, like many countries, in Türkiye the strict preventive measures have been set (Sulku, Cosar and Tokatlioglu, 2021). The Ministry of Health of Türkiye has published general instructions notifying all physicians to cease surgeries except urgent interventions in order to minimize the risk of infection and to make available hospital beds for the COVID-19 patients (Oruc et al., 2021). These strict precautions of course attributable to increased unmet health needs and late appointment dates in Istanbul. High cost barrier could be attributable to ongoing currency and debt crisis in Türkiye since 2018, which has been deepened after break out of COVID-19 pandemic as it has brought economic life to a grinding halt causing loss of jobs and income (Yucel and Kabalay, 2022). Indeed, in Türkiye pharmaceutical and medical products supply heavily depends on imports (Corintco, 2022; Export, 2022; Invest, 2022). Thus, Turkish Lira's depreciation made financing of healthcare costlier.

Even though, the frequency of people with unmet health needs significantly increased during pandemic in Istanbul, compared to other countries experience it was smaller. According to population based survey results applied to adults the avoidance frequency was around 41% in USA during June 24–30, 2020 (Czeisler et al., 2020), 20% in Rotterdam in the Netherlands April 20 to July 10, 2020 (Splinter et al., 2021), 44% in Portugal July 2020 to August 2021 (Soares et al., 2021). We should underline that our study's data, Living Conditions Survey Data of 2021 was gathered by TurkStat a year later then the break out of the COVID-19 from March to July 2021. In Türkiye, controlled normal life took place since June 2020 after the COVID-19 mitigated via stringent restrictions and measures (Koca, 2020), consequently, in many hospitals routine healthcare services had been started. Moreover, Türkiye's COVID-19 vaccination program have been taken place since 2021 (MoH, 2021). Considering Türkiye's effective fight against COVID-19, relatively low rate of unmet health care needs compared to other countries could be reasonable. However, the limitations of the survey data used in this study should not be ignored, in TurkStat's SILC of 2021 only question related to unmet needs was asking whether there was any existence of unmet needs for healthcare services during the last 12 months and if yes the main reasons were queried. Indeed, while the survey was conducted in the March-July 2021 period, and the question inquiring the last 12 months could cause a recall bias.

According to our GLM analysis we see that in İstanbul women were more likely to have unmet needs both in 2019 and 2021, but females' disadvantage becomes significant after the COVID-19 outbreak. This finding is parallel to literature as Burch (2022) and Islam et al. (2022) indicate that women were more likely to be disadvantaged during the pandemic, as they were more likely to lose their jobs and/or work more for unpaid labor like home care duties etc. (Lazzerini et al., 2020). Furthermore, although before the pandemic people with chronic disease

were less likely to have unmet needs, after the COVID-19 they become more likely to have unmet needs. Our finding is similar to Burch (2022), and like other countries experiences (Kendzerska et al., 2021; Fekadu et al., 2021) the break out of the pandemic created barriers to follow up and treat patient with chorionic disease in Türkiye (Gulesen et al., 2020). Moreover, according to our findings the respondents belonging to lowest income group were more likely to have unmet health needs both in 2019 and 2021 with respect to all other income levels, though this disadvantage statistically significant only against the highest income group, top 20th percent. This finding is also supported by literature as having lower socio-economic status significantly associated to having higher risk of unmet health needs during the COVID-19 (Islam et al., 2022; Soares et al., 2021; Lee and You, 2021).

In addition, our study observes that having bad perceived health significantly increase chances of having unmet health needs both before and during the COVID-19 period as oppose to Burch (2022) but similar to Leyva et al. (2020) and Splinter et al. (2021). Furthermore, although being married, having a lower level of education level and having informal jobs were significant determinants of having unmet needs in 2019 (similar to Soares et al., 2021; Hung et al., 2020; Lee and You, 2021), they lose their significance during the pandemic in 2021. We could interpret our finding as with the outbreak of the pandemic unmet needs increased significantly regardless of education level or marital or insurance statutes of the people living in Istanbul.

Finally, even though being older than + 55 increases chances of having unmet needs during the pandemic, as similar to Lee and You (2021), Splinter et al. (2021), its effect was not significant.

5. Limitations

This study has some limitations. First, in the TurkStat's 2019 and 2021 Income and Living Conditions Surveys, the ones who had at least one unmet healthcare needs were asked the main reason for unmet occasion in predefined eight categories with last category as other reasons. However, other reasons were not queried with open ended questions, and thus all reasons are not observed and most common reason may be overestimated. Furthermore, we face up limitations on data. In fact, TurkStat's Health Surveys provide the most comprehensive source of information about on individual's health including general health section, chronic diseases section, functional abilities section, utilization of primary care services/outpatient care services/inpatient care services, satisfaction levels from these services, oral dental health care services, use of medicine, healthy life style habits as well as socio-economic characteristics. However, health surveys have not been conducted since 2019. Therefore, unlike Sulku, Cosar and Tokatlioglu (2021, 2023b) in order to estimate unmeet health care needs, instead of using health surveys, we had to employ more general data source, SILC covering pre and post pandemic periods. Consequently, because of the data unavailability neither we can introduce specific variables on health condition of individuals though in literature that were found among important determinants of unmet needs like life style habits, mental health problems, using non/prescription medication and detailed conditions of the ones having chronic disease (Andersen and Newman, 1973; Iskandarsyah et al., 2013; Basar et al., 2021; Sulku et al., 2023b) nor we can distinguish at which stage of healthcare service provision the unmet needs were occurred. Moreover, we intentionally did not cover TurkStat's 2020 SILC survey data, as unexpected and substantial decrease in the percentage of people with unmet healthcare needs was seen. Because of the pandemic precautions, like curfews, bans to hospital admissions etc., were strictly applied in 2020, we consider that this observed decrease could be attributable to the change in perception of individuals but not the real health care needs. Some unmet needs may become acceptable when resources are scarce (Allin et al., 2010). Still future researches on healthcare needs under pandemic would be valuable using panel data since 2019.

Furthermore, in our study we only consider Istanbul the most

important center of in-country population movements of Türkiye. According to the 2000 population census, nearly 28% of the population was born in a different province that they now reside in, but this ratio goes up to 62% for Istanbul, a major province that has drawn migrants for years (Gökhan, 2008). Thus Istanbul is a city which represent all Türkiye itself constituting the first region of NUTS1&2. But still İstanbul has its unique settlement of being a world city, therefore the comparison of Istanbul case to the other regions of Türkiye should be done as future study.

6. Conclusions

We identify the factors of unmet healthcare need among people aged 15 or older, in Istanbul during COVID-19 pandemic, compare with pre-COVID-19 period, examining TurkStat's SILC data of 2019 and 2021. Our GLMs analyses revealed that women, those with a lower income level, and those having any chronic disease, and lower perceived health were more likely to have unmet health needs during the pandemic compared to pre-pandemic period. Indeed, we observed that people with chronic disease were worst effected ones by outbreak of pandemic, as prior to COVID-19 they were less likely to have unmet healthcare needs, after pandemic they become more likely to have. Moreover, having bad perceived health increase possibility of unmet health needs both before and during the COVID-19 period. Although having a lower level of education level, working at informal jobs, being married were significant determinants of unmet needs in 2019 not during the pandemic in 2021.

Understanding factors of unmet healthcare needs during infectious disease outbreaks is valuable for prioritizing appropriate policies and efforts to protect these vulnerable populations reducing unmet healthcare needs. As our study is the first questing Istanbul experience, we believe that our findings shade light to policy makers and researches.

Data availability The authors used Turkish Statistical Institute's (TurkStat) 2019 and 2021 Living Conditions Survey Data records based on official data. TurkStat prohibits the sharing of the data with the third parties, thus the authors cannot share it with the third parties. The 2019 and 2021 Living Conditions Survey Data were issued by the Article 13 of Statistics Law of Türkiye No. 5429 and, could not be copied or released to any other person or organization, as stated in the Article 14 of the same law.

CRediT authorship contribution statement

Yagmur Tokatlioglu: Conceptualization, Methodology, Software, Writing – original draft. **Seher Nur Sulku:** Conceptualization, Methodology, Software, Writing – original draft.

Declaration of Competing Interest

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.

Data availability

The authors do not have permission to share data.

Appendix A

Appendix B. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pmedr.2023.102400.

References

Ahorsu, D.K., Lin, C.Y., Imani, V., Saffari, M., Griffiths, M.D., Pakpour, A.H., 2022. The Fear of COVID-19 Scale: Development and Initial Validation. Int. J. Ment. Health Addict. 20 (3), 1537–1545. https://doi.org/10.1007/s11469-020-00270-8.

Allin, S., Grignon, M.L., Grand, J., 2010. Subjective unmet need and utilization of health care services in Canada: What are the equity implications? Soc. Sci. Med. 70 (3), 465–472. https://doi.org/10.1016/j.socscimed.2009.10.027.

Alvarez, M.D., Yarcan, Ş., 2010. Istanbul as a world city: a cultural perspective. Int. J. Culture, Tourism Hospitality Res. 4 (3), 266–276. https://doi.org/10.1108/17506181011067646.

Andersen, R., Newman, J.F., 1973. Societal and Individual Determinants of Medical Care Utilization in the United States. Milbank Mem. Fund Q. Health Soc. 51 (1), 95–124. https://doi.org/10.2307/3349613.

Baker, C., 2022. NHS Key Statistics: England, November 2022. [WWW Document]. House of Commons. URL https://researchbriefings.files.parliament.uk/documents/CBP-7281/CBP-7281.pdf.

Barak, N., Sommer, U., Mualam, N., 2021. Urban attributes and the spread of COVID-19: The effects of density, compliance and socio-political factors in Israel. Sci. Total Environ. 1 (793), 148626 https://doi.org/10.1016/j.scitotenv.2021.148626.

Basar, D., Dikmen, F.H., Ozturk, S., 2021. The prevalence and determinants of unmet health care needs in Turkey. Health Policy 125 (6), 786–792. https://doi.org/10.1016/j.healthpol.2021.04.006.

Biehl, K.S., 2014. Migration, urban space and diversity: a case from Istanbul. Insight Turkey 16 (4), 55–63.

Bostan, S., 2020. Koronalı Günlerde Hastaneye Gitme Niyeti. [WWW Document]. USSAM. URL http://ussam.org/tr/ussam/koronal%C4%B1-g%C3%BCnlerde-hastaneye-gitme-niyeti/.

Burch, A.E., 2022. Factors responsible for healthcare avoidance among rural adults in the Eastern Region of North Carolina. J. Community Health 47, 737–744. https://doi.org/10.1007/s10900-022-01106-3.

Byrne, S.K., 2008. Healthcare avoidance: a critical review. Holist. Nurs. Pract. 22 (5), 280–292. https://doi.org/10.1097/01.hnp.0000334921. 31433.c6.

Corintco, 2022. Health Services, Pharmaceutical and Medical Devices. [WWW Document]. Corintco corporate interface consultancy. URL https://corintco.com/en/health_services_pharmaceutical_medical_devices.html.

Czeisler, M.É., Marynak, K., Clarke, K.E., Salah, Z., Shakya, I., Thierry, J.M., Ali, N., McMillan, H., Wiley, J.F., Weaver, M.D., 2020. Delay or avoidance of medical care because of COVID-19–related concerns—United States. MMWR Morb. Mortal. Wkly Rep. 69, 1250–1257. https://doi.org/10.15585/mmwr.mm6936a4.

Czeisler, M.É., Kennedy, J.L., Wiley, J.F., Facer-Childs, E.R., Robbins, R., Barger, L.K., Czeisler, C.A., Rajaratnam, S.M., Howard, M.E., 2021. Delay or avoidance of routine, urgent and emergency medical care due to concerns about COVID-19 in a region with low COVID-19 prevalence: Victoria, Australia. Respirology 26, 26(7):707–712. https://doi.org/10.1111/resp.14094.

Dubey, S., Biswas, P., Ghosh, R., Chatterjee, S., Dubey, M.J., Chatterjee, S., Lahiri, D., Lavie, C.J., 2020. Psychosocial impact of COVID-19. Diabetes Metab. Syndr. 14 (5), 779–788. https://doi.org/10.1016/j.dsx.2020.05.035.

Eurostat, 2023. Unmet health care needs statistics. [WWW Document]. Eurostat, Statistics Explained URL https://ec.europa.eu/eurostat/statistics-explained/SEPDF/cache/37395.pdf).

Export, 2022. Healthcare Resource Guide: Turkey. [WWW Document]. International trade administration. URL https://2016.export.gov/industry/health/healthcareresourceguide/eg_main_092302.asp.

Fekadu, G., Bekele, F., Tolossa, T., et al., 2021. Impact of COVID-19 pandemic on chronic diseases care follow-up and current perspectives in low resource settings: A narrative review. Int. J. Physiol. Pathophysiol. Pharmacol. 13 (3), 86–93.

Garg, R., Shen, C., Sambamoorthi, N., Sambamoorthim, S., 2017. Type of multimorbidity and propensity to seek care among elderly medicare. J. Health Dispar. Res. Pract. 10 (4), 34–51. PMCID: PMC6590680.

Gertz, A.H., Pollack, C.C., Schultheiss, M.D., Brownstein, J.S., 2022. Delayed medical care and underlying health in the United States during the COVID-19 pandemic: A cross-sectional study. Prev. Med. Rep. 28, 101882 https://doi.org/10.1016/j.pmedr.2022.101882.

Gökhan, A., 2008. The determinants of Internal Migration in Turkey. Sabancı University. Master Thesis.

Gulesen, I.A., Karakaya, S., Karadag, I., Ceken, S., Oksuzoglu, B., 2020. Evaluation of Sars-Cov-2 Infection in Cancer Patients: Single-Center Experience from Turkey. Acta Oncologica Turcica. 53 (3), 441–447. https://doi.org/10.5505/aot.2020.79664.

Hardin, H.K., Alchami, H., Lee, D., Jones, M.S., 2021. Unmet health need and perceived barriers to health care among adolescents living in a rural area. Child. Health Care 50 (1), 108–123. https://doi.org/10.1080/02739615.2020.1833333.

Hung, K.K., Walline, J.H., Chan, E.Y.Y., Huang, Z., Lo, E.S.K., Yeoh, E.K., Graham, C.A., 2020. Health Service Utilization in Hong Kong During the COVID-19 Pandemic - A Cross sectional Public Survey. Int. J. Health Policy Manag. 11 (4), 508–513. https://doi.org/10.34172/ijhpm.2020.183.

Invest, 2022. Why Invest in Turkish Pharmaceuticals Industry? [WWW Document]. Presidency of the Republic of Turkey, Investment Office. URL https://www.invest.gov.tr/en/library/publications/lists/investpublications/pharmaceuticals-industry.pdf.

IQVIA, 2020. Shifts in Healthcare Demand, Delivery and Care During the COVID-19 Era. Tracking the Impact in the United States. [WWW Document]. IQVIA. Institute Report. URL https://www.iqvia.com/insights/the-iqvia-institute/covid-19/shifts-in-healthcare-demand-delivery-and-care-during-the-covid-19-era.

Iskandarsyah, A., Klerk, C., Suardi, D.R., Soemitro, M.P., Sadarjoen, S.S., Passchier, J., 2013. Psychosocial and cultural reasons for delay in seeking help and nonadherence to treatment in Indonesian women with breast cancer: A qualitative study. Health Psychol. 33 (3), 214–221. https://doi.org/10.1037/a0031060.

Islam, M.I., Freeman, J., Chadwick, V., Martiniuk, A., 2022. Healthcare Avoidance before and during the COVID-19 Pandemic among Australian Youth: A Longitudinal Study. Healthcare (Basel). 10 (7), 1261. https://doi.org/10.3390/healthcare10071261.

Kam, G. 2020. Her 10 vakadan 4'ü İstanbul'da. [WWW Document]. Milliyet. URL https://www.milliyet.com.tr/gundem/her-10-vakadan-4u-istanbulda-6341696.

Kannan, V.D., Veazie, P.J., 2014. Predictors of avoiding medical care and reasons for avoidance behavior. Med. Care 52 (4), 336–345. https://doi.org/10.1097/MLR.0000000000000100.

Kannan, V.D., Veazie, P.J., 2015. Who avoids going to the doctor and why? Audience segmentation analysis for application of message development. Health Commun. 30 (7), 635–645. https://doi.org/10.1080/10410236.2013.878967.

Kendzerska, T., Zhu, D.T., Gershon, A.S., Edwards, J.D., Peixoto, C., Robillard, R., Kendall, C.E., 2021. The effects of the health system response to the COVID-19 pandemic on chronic disease management: A narrative review. Risk Manag. Healthc Policy. 14, 575–584. https://doi.org/10.2147/RMHP.S293471.

Koca, F., 2020. Turkey's Management of COVID-19: Measures and Strategies of Health Policies. Minister of Health, Turkey, Insight Turkey. 22 (3), 55–65.

Kulle, C.B., Azamat, I.F., Vatansever, D., Erus, S., Tarim, K., Akyoldas, G., Gokler, O., Deveci, M.A., Cakar, N., Ergonul, O., Agcaoglu, O., Kiremit, M.C., Yavuz, O., Kiris, T., Unsaler, S., Giray, B., Korkmaz, M., Dilege, E., Kilic, M., Cesur, E., Solaroglu, I., Altuntas, O., Simsek, A., Tanju, S., Erkan, M., Canda, E., Sasani, M., Hafiz, A.M., Kordan, Y., Balik, E., Bilge, O., Bugra, D., Taskiran, C., Dilege, S., 2021. Is elective cancer surgery feasible during the lock-down period of the COVID-19 pandemic? Analysis of a single institutional experience of 404 consecutive patients. J. Surg. Oncol. 123 (7), 1495–1503.

Larkey, L.K., Hecht, M.L., Miller, K., Alatorre, C., 2001. Hispanic cultural norms for health-seeking behaviors in the face of symptoms. Health Educ. Behav. 28, 65–80. https://doi.org/10.1177/109019810102800107.

Lazzerini, M., Barbi, E., Apicella, A., Marchetti, F., Cardinale, F., Trobia, G., 2020. Delayed access or provision of care in Italy resulting from fear of COVID-19. Lancet Child Adolesc Health. 4(5):e10-e11. doi: 10.1016/S2352-4642(20)30108-5.

Lee, S.Y., Kim, C.W., Kang, J.H., Seo, N.K., 2014. Unmet healthcare needs depending on employment status. Health Policy 119 (7), 899–906. https://doi.org/10.1016/j.healthpol.2014.09.007.

Lee, M., You, M., 2021. Avoidance of healthcare utilization in South Korea during the coronavirus disease 2019 (COVID-19) pandemic. Int. J. Environ. Res. Public Health 18 (8), 4363. https://doi.org/10.3390/ijerph18084363.

Leyva, B., Taber, J.M., Trivedi, A.N., 2020. Medical care avoidance among older adults. J. Appl. Gerontol. 39 (1), 74–85. https://doi.org/10.1177/0733464817747415.

Masahisa, F., Nobuaki, H., 2020. Globalisation and the COVID-19 pandemic: A spatial economics perspective, [WWW Document]. Vox. URL https://voxeu.org/article/globalisation-and-covid-19-pandemic.

MoH, 2021. T.C. Saglik Bakanligi COVID-19 Bilgilendirme Platformu. [WWW Document]. Ministery of Health. URL https://covid19.saglik.gov.tr/.

Murray, P., Lauerman, J., 2020. What a century of disease outbreaks can teach us about Covid-19. [WWW Document]. Bloomberg. URL https://www.bloomberg.com/graphics/2020-history-of-pandemics-coronavirus-covid-19/.

OECD, 2020. The territorial impact of covid-19: Managing the crisis across levels of government. [WWW Document]. Organisation for Economic Co-operation and Development. URL https://www.oecd.org/coronavirus/policy-responses/theterritorial-impact-of-covid-19-managing-the-crisis-across-levels-ofgovernment-d3e314e1/.

Oruc, Z., Kaplan, M.A., Isikdogan, A., 2021. Changes in medical oncology practice due to the COVID-19 pandemic in Turkey, and the risk of neglect of cancer patientsChanges in medical oncology practice due to the COVID-19 pandemic in Turkey, and the risk of neglect of cancer patients. Dicle Tip Dergisi 48 (4), 881–888.

Pregibon, D., 1980. Goodness of link tests for generalized linear models. Appl. Stat. 29, 15–24. https://doi.org/10.2307/2346405.

Quintal, C., Moura Ramos, L., Antunes, M., et al., 2023. Unmet healthcare needs among the population aged 50+ and their association with health outcomes during the COVID-19 pandemic. Eur. J. Ageing 20 (1), 12. https://doi.org/10.1007/s10433-023-00758-x.

Ronksley, P.E., Sanmartin, C., Quan, H., Ravani, P., Tonelli, M., Manns, B., Hemmelgarn, B.R., 2012. Association between chronic conditions and perceived unmet health care needs. Open Med. 6 (2), e48–e58. PMID: 23696769.

Shi, L., Stevens, G.D., 2004. Vulnerability and unmet health care needs. J. Gen. Intern. Med. 20, 148–154. https://doi.org/10.1111/j.1525-1497.2005.40136.x.

Singh, D.R., Sunuwar, D.R., Shah, S.K., Karki, K., Sah, L.K., Adhikari, B., Sah, R.K., 2021. Impact of COVID-19 on Health Services Utilization in Province-2 of Nepal: A Qualitative Study among Community Members and Stakeholders. BMC Health Serv. Res. 21, 174. https://doi.org/10.1186/s12913-021-06176-y.

Soares, P., Leite, A., Esteves, S., Gama, A., Laires, P.A., Moniz, M., Pedro, A.R., Santos, C. M., Goes, A.R., Nunes, C., Dias, S., 2021. Factors Associated with the Patient's Decision to Avoid Healthcare during the COVID-19 Pandemic. Int. J. Environ. Res. Public Health 18 (24), 13239.

Solanke, F., Easton, S., Selby, A., James, D., Roberts, G., 2022. Impact of COVID-19 pandemic on emergency department attendances for young people. Archives of Diseases in Childhood. 107 (10).

Splinter, M.J., Velek, P., Ikram, M.K., Kieboom, B.C.T., Peeters, R.P., Bindels, P.J.E., Ikram, M.A., Wolters, F.J., Leening, M.J.G., de Schepper, E.I.T., Licher, S., Basu, S., 2021. Prevalence and determinants of healthcare avoidance during the COVID-19 pandemic: A population-based crosssectional study. PLoS Med. 18 (11) https://doi. org/10.1371/journal.pmed.1003854.

Statista, 2022. Largest urban agglomerations in Europe in 2020. [WWW Document]. Statista. URL https://www.statista.com/statistics/1101883/largest-european-cities/ .

Sulku, S.N., Cosar, K., Tokatlioglu, Y., 2021. COVID-19 Sureci: Turkiye Deneyimi. Sosyoekonomi 29 (49), 345–372. https://doi.org/10.17233/ sosyoekonomi.2021.03.18.

Sulku, S.N., Tokatlioglu, Y., Cosar, K., 2023a. Determinants of health care avoidance and avoidance reasons in Turkey. J Public Health (Berl.) 31 (5), 817–829.

Sulku, S.N., Tokatlioglu, Y., Cosar, K., 2023b. Receiving or not deemed necessary healthcare services. BMC Public Health 23, 208. https://doi.org/10.1186/s12889-023-15135-7.

Taber, J.M., Leyva, B., Persoskie, A., 2015. Why do people avoid medical care? A qualitative study using national data. J. Gen. Intern. Med. 30 (3), 290–297. https:// doi.org/10.1007/s11606-014-3089-1.

Tadiri, C.P., Gisinger, T., Kautzky-Willer, A., Kublickiene, K., Herrero, M.T., Norris, C.M., Raparelli, V., Pilote, L., 2021. Determinants of perceived health and unmet healthcare needs in universal healthcare systems with high gender equality. BMC Public Health 21 (1). https://doi.org/10.1186/s12889-021-11531-z.

TurkStat, 2019. Income and Living Conditions Survey 2019. Ankara: Turkish Statistical Institute.

TurkStat, 2021. Income and Living Conditions Survey 2021. Ankara: Turkish Statistical Institute.

Uchicago, 2020. Data from over 200 U.S. urban areas highlight need for more aggressive countermeasures. [WWW Document]. Uchicago News. URL https://news.uchicago. edu/story/coronavirus-hitting-larger-cities-harder-how-should-they-respond.

Unsal, A., Sulku, S.N., 2020. Bolgeler Arasi Gelismislik Duzeylerinin Belirlenmesi ve Karsilastirilmasi: Turkiye Ornegi. Bilig 95, 177–209. https://doi.org/10.12995/ bilig.9508.

WHO, 2020. WHO Timeline-COVID-19. [WWW Document]. World Health Organization, News. URL https://www.who.int/news-room/detail/27-04-2020-who-timeline—covid-19.

WHO, 2022. Addressing backlogs and managing waiting lists during and beyond the COVID-19 pandemic. [WWW Document]. World Health Organization. Policy Brief 47. URL https://eurohealthobservatory.who.int/publications/i/addressing-backlogs-and-managing-waiting-lists-during-and-beyond-the-covid-19-pandemic.

Zhao, X., Yang, P., Gai, R., Mei, L., Wang, X., Xu, L., 2014. Determinants of health care-seeking delay among tuberculosis patients in Shandong Province. China. Eur J Pub Health 24 (5), 757–761. https://doi.org/10.1093/eurpub/ckt113.