BMJ Public Health

Contacts with health services for COVID-19-related reasons during the first wave of the pandemic in Portugal: a longitudinal study

Mónica Granja ,[1,2] Daniela Correia,[1,2] Luís Alves,[1,2] Milton Severo,[1,2] Raquel Lucas,[1,2] Sofia Correia,[1,2] ISPUP/INESC TEC Task Force COVID-19

To cite: Granja M, Correia D, Alves L, *et al*. Contacts with health services for COVID-19-related reasons during the first wave of the pandemic in Portugal: a longitudinal study. *BMJ Public Health* 2024;**2**:e000979. doi:10.1136/bmjph-2024-000979

► Additional supplemental material is published online only. To view, please visit the journal online (https://doi.org/10.1136/bmjph-2024-000979).

Received 27 January 2024
Accepted 6 June 2024

[1]EPIUnit e Instituto de Saúde Pública, Universidade do Porto, Porto, Portugal
[2]Laboratório para a Investigação Integrativa e Translacional em Saúde Populacional (ITR), Universidade do Porto, Porto, Portugal

Correspondence to
Dr Mónica Granja;
monicagranja66@gmail.com

ABSTRACT

Introduction Access to COVID-19-related care during the pandemic deserve attention and study to inform future strategies to deal with similar health emergencies in the future. We aimed to describe access to care for COVID-19-related reasons during the first 9 weeks of the pandemic in Portugal, to quantify the frequency of remote and in-person contacts with healthcare for COVID-19-related reasons and to assess the association between individual and context characteristics and contacts with health services.

Methods We conducted an internet-based open cohort study with a non-probabilistic sample of 12 006 persons aged 16 years or more. One questionnaire was sent daily from 23 March 2020 for 9 weeks.

Results General practitioners (GPs) were the main points of contact of patients with health services for COVID-19-related reasons. In our population, the main drivers found for any difference in the probability of contact with health services for COVID-19-related reasons were perceived high-risk contacts, followed by the existence of COVID-19 main symptoms. There were 17% more (0.17, 95% CI 0.15 to 0.18) contacts with health services among participants who reported personal contact with a confirmed case, 7% more (0.07, 95%CI 0.06 to 0.07) contacts if the contact had been with a suspected case and 6% more (0.06, 95%CI 0.05 to 0.07) contacts among participants who reported COVID-19 main symptoms in the previous 24 hours. Sociodemographic and household factors were not associated with major differences in healthcare contacts. The probability of contact with any health service for COVID-19-related reasons was highest at the beginning of the pandemic.

Conclusion Most contacts with health services for COVID-19-related reasons during the first wave of the pandemic were with GPs, highlighting the role of first-contact care with these clinicians in Portuguese Primary Care, particularly in the context of the COVID-19 pandemic. Sociodemographic and household factors were not associated with major risk differences, suggesting that universal coverage and equity worked in our study sample at this pandemic stage.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ The WHO's response plan to the pandemic of COVID-19 advised countries to ensure adequate capacity at their first point of care. However, in many countries, the initial response was largely hospital centric.

WHAT THIS STUDY ADDS

⇒ This cohort, assembled to collect daily information on different aspects of the life of the Portuguese population during the first wave, collected information about contacts with health services for COVID-19-related reasons. Despite the social distancing restrictions in healthcare facilities and mandatory isolation of many doctors, the Primary Care features of first contact with General Practitioners and equity worked in the studied sample.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Preparedness plans for future pandemics should ensure and foster appropriate capacity of Primary Care and of the general practitioner workforce.

BACKGROUND

The WHO officially declared the novel COVID-19 a pandemic on 11 March 2020.[1] Portugal reported its first COVID-19 confirmed case on 2 March 2020[2] and the first COVID-19 death in the country was reported on 16 March 2020. The epidemic peak of the first wave was reached on 30 March 2020, with grossly 9 cases/100 000 inhabitants reported.[3]

The Portuguese National Health Service is Primary Care based[4] and provides universal and free coverage for most healthcare services. Family doctors/general practitioners (GPs) act as gatekeepers before public secondary hospital care, and, for most users, they are the first contact each time they need care for a non-emergent new health problem.[5] Hospital emergency services are open access

and are deemed overused for non-emergent problems.[4] A national phone hotline conceived for patient-initiated first contacts with the national health service, known as SNS24, has been operational since 2007. Its purpose is to triage problems, guiding individuals towards either self-care or the appropriate setting (Primary Care or hospital emergency services).[6]

During the first wave of the COVID-19 pandemic in Portugal, there was a 6-week lockdown starting on 18 March 2020, with the closing of non-essential businesses and services.[7 8] On 2 April 2020, intermunicipal travel was banned, airports were closed and border control was put in place.[8] Lockdown measures were gradually eased during May. The Portuguese COVID-19 public health response was coordinated by the national Public Health authority, Direção Geral da Saúde. From the perspective of individual healthcare provision, lockdown measures included advice to stay at home and, in case of cough, fever or shortness of breath (symptoms suggestive of COVID-19),[9] to call the person's GP or the national phone line 'SNS24', which was made free on 13 March 2020. The SNS24 phone line had a surge in calls and was then boosted with extra staff.[10] On 16 March 2020, hospitals and family practices were directed to cancel non-urgent care and put in place triage systems. Family practices switched most in-person contacts to telephone and e-mail. Dedicated areas were created, both in the community (run by GPs) and hospitals, to assess patients presenting with symptoms suggestive of COVID-19.[11]

Patients deemed to be suspected COVID-19 cases (by 'SNS24' staff, GPs or hospital doctors) were sent to be tested and entered into a national database.[12] Suspected cases without clinical severity criteria for hospital assessment were advised to stay home for self-isolation and assigned daily remote follow-up by the respective GP until the criteria of cure were achieved.[9] Public Health services were responsible for the contact tracing of confirmed cases.

COVID-19 was the first pandemic to severely hit Portugal since the rise of its National Health Service, in 1979. The Influenza A pandemic in 2009 had a minor impact on health services[13] and the pandemic before that had been caused by influenza back in 1957.[14] The COVID-19 pandemic was also unique regarding the global unprecedented preparedness for the adoption of digital technologies.[15]

According to the lessons learnt from previous pandemics,[16 17] the WHO's first preparedness and response plan to the pandemic of COVID-19 advised countries to ensure adequate capacity at their first point of care (usually primary care).[18]

However, on the ground, reports show that the role of GPs in tackling the pandemic varied.[19 20] Some severely hit countries had an initial approach that was largely hospital centric,[21 22] focusing on maximising hospital and intensive care unit capacity and taking a long time before testing was readily accessible from primary care. Like in Portugal, worldwide, GPs swiftly switched in-person to remote triage and remote consults,[23] both for COVID-19-related problems and other health problems[24–27] and clinical guidance was adapted to the remote assessment of infected patients.[28] GPs also took part in COVID-19 in-person assessment facilities.[29–31]

Access to COVID-19-related care during the pandemic and the barriers and facilitators to this use deserve attention and study to inform future strategies to deal with similar health emergencies in the future. We aimed to describe access to care for COVID-19-related reasons during the first 9 weeks of the pandemic in Portugal. Our specific objectives were to quantify the frequency of remote and in-person contacts with healthcare for COVID-19-related reasons and to assess the association between individual and context characteristics and contacts with health services.

METHODS

Study design

The Institute of Public Health of the University of Porto (ISPUP) and the Institute of Systems and Computers Engineering, Technology and Science (INESC TEC) designed an internet-based open cohort study (Diários de uma Pandemia, in English, Diaries of a Pandemic) that aimed to collect daily information on different aspects of the life of the Portuguese population during the first wave of the SARS-CoV-2/COVID-19 pandemic in Portugal. The procedures for assembling the cohort are described elsewhere[32] and were as follows. We used a dynamic cohort design, with participants being allowed to enter and leave the study at any time during follow-up and fill in any number of questionnaires, with any periodicity. The study was primarily designed for residents in Portugal, even though a minority (n=59) of Portuguese nationals living in other countries were also included. A non-probabilistic sampling method was used, where the dissemination of the survey and a call for participation were made primarily through a national daily newspaper (PÚBLICO), which published several news pieces on the study and posted a temporary banner on their website, as well as through the institutional websites of ISPUP and INESC TEC, their social network accounts and mailing lists. In addition, key opinion leaders were contacted to contribute to the dissemination through their own networks.

Persons aged 16 years or above were eligible to participate. Potential participants were asked to provide an email address which was used to generate a unique pseudonymised token that directed them to an informed consent page. Participation was considered valid only if the respondent had scrolled through the whole privacy policy and consent document. Each participant was resent their unique token every day as part of a reminder to fill in that day's questionnaire. One questionnaire was sent daily from 23 March 2020 for 9 weeks. All items of the daily questionnaire referred to the prior 24 hours.

The questionnaire, including the privacy policy and consent forms, is available as an online supplemental file.

Participants with one or more answers to at least one of the items relating to contact with health services for COVID-19-related reasons (outcome) were selected to be included in the current study. The outcome was the existence of contact with health services for COVID-19-related reasons. It was operationalised as dichotomous and analysed as any contact and stratified as: (1) any remote contact; (2) any in-person contact; (3) remote contact with the GP or in-person contact with a family practice and (4) in-person contact with public hospitals or private clinics. Outcomes were drawn from a series of items of the survey querying if, in the past 24 hours, the subject had contacted the SNS24 line or his/her own GP remotely and if he/she had been in person to either a family practice or a public or private hospital. This contact had to be specifically related to COVID-19. Time-invariant covariates were sociodemographic and household characteristics, which were collected only once, on recruitment. Additional covariates were high-risk contacts and COVID-19 main symptoms, which were collected on the daily questionnaires. Household context was assessed by querying if there was anyone in the household under 10 or over 60 or with any chronic condition. Perceived high-risk contacts were assessed by questioning if, in the past 24 hours, the subject had had personal contact with anyone with a confirmed or suspected diagnosis of COVID-19. Main COVID-19 symptoms were assessed by questioning if, in the past 24 hours, the subject had had a dry cough, a temperature above 37.5° or shortness of breath. During the study period, and according to the health authority guidelines, anyone with a positive test for SARS-CoV-2 was considered a COVID-19 case, irrespective of symptoms.[33] Time was also studied as a covariate of interest.

Data analysis

We carried out linear mixed effects modelling to study the associations between outcomes and participant characteristics, high-risk contacts (with suspected or confirmed COVID-19 cases) and the presence of any of the three main COVID-19 symptoms, in the 24 hours before contact. Our effect measure was risk difference in outcomes between exposure groups. We tested variables with significant effects for interactions with time, modelling interactions with time as a linear, quadratic as well as cubic function, due to the multiple factors that could affect the outcome. We plotted estimates for the probability of contact using mixed effects modelling for main symptoms and contact with COVID-19 confirmed cases. Then we built three models. Model 1 adjusted for sociodemographic characteristics, household context, contacts with anyone with a suspected or confirmed diagnosis of COVID-19 and main symptoms. Model 2 adjusted model 1 further for the interaction between main symptoms and time, time^2 and time^3. Model 3 adjusted model 2 for the interaction between contacts with COVID-19-confirmed cases and time, time^2 and time^3.

Missing data were deleted pairwise. The linear mixed effects models we used assume missing at random. We tested this assumption by performing a Cox regression analysis of factors associated with attrition.

Patient and public involvement

Due to the emergent nature of the pandemic, patients were not included in the design or conduction of the study. In the daily questionnaire, the last question was an open-ended one: 'Feel free to use this space for any comments you may have'. Also, an online debate was carried in the aftermath of the second wave, including two lay people who participated in the survey. The resulting participants' accounts were considered in reporting this study.

RESULTS

During the 9-week time frame of our study, there were 12 006 participants in the Diaries of the pandemic. Of these, 11 443 (95%) had data related to the variables of interest and were included in the analysis. These participants yielded 226 831 observations, corresponding to a median of 17 observations per participant (IQR=4–34).

Most of our subjects were higher educated women, from the North region of the country, employed and with an income they perceived as 'comfortable' or 'enough for needs'. Over 40% of households had someone living with a chronic disease, and around one-fourth had either under 10 and/or over 60-year old (table 1).

In our cohort, retention was higher in women and among participants aged over 40 when compared with their younger counterparts. Retention was also higher among participants from Lisbon, Centre and North regions, as compared with those from other regions, and among the higher educated participants. Those reporting having to mind expenses or insufficient income had a lower retention rate than the ones reporting comfortable income. Compared with the unemployed, retention was higher among participants who were retired. Retention was lower among participants living in households with children under 10 years, as compared with those without children in that age (online supplemental table 1).

Of the study participants, 5.7% became in personal contact with at least one person with a confirmed COVID-19 infection, and 12.5% with a suspected case at least once during the study (table 2). As for COVID-19 main symptoms, 15.2% of participants reported at least one of them. Cough was the most frequent symptom, reported on 3% of all observations, while fever and shortness of breath together were reported on less than 0.2% of all observations.

During the study period, 8.9% of participants had at least one contact with any health service. Most often (4.5% of participants) this contact was a remote contact with their own GP. If it was an in-person contact, most often it would be with a public hospital (table 2).

Table 1 Characteristics of study participants (n=11 443)

	n (%)
Sex	
Women	8276 (72.3)
Age	
<40 years	5482 (47.9)
40–59 years	4700 (41.1)
60+ years	1261 (11.0)
Region	
North	6951 (60.7)
Lisbon	2209 (19.3)
Centre	1491 (13.0)
Others	792 (6.9)
Educational level	
Higher educated	8894 (77.7)
Income	
Comfortable	3544 (31.0)
Enough for needs	4601 (40.2)
Has to mind expenses/not enough	3298 (28.8)
Working status	
Employed	7941 (69.4)
Student	1591 (13.9)
Retired	627 (5.5)
Unemployed	364 (3.2)
Other	920 (8.0)
Chronic disease in household	4722 (41.3)
Over 60s in household	3075 (26.9)
Under 10 in household	2575 (22.5)

Table 2 Participants who reported at least one contact with any health service, one contact with a suspected or confirmed COVID-19 case or the presence of any COVID-19 main symptoms (n=11 443)

	n	%
Any main COVID-19 symptoms	1739	15.2
At least one contact with		
Someone with confirmed COVID-19	654	5.7
Someone suspected of having COVID-19	1425	12.5
Any health service	1024	8.9
Remote contact	757	6.6
SNS24 hotline	411	3.6
GP	516	4.5
In-person contact	503	4.4
Family practice	189	1.7
Public hospital	247	2.2
Private hospital	174	1.5

GP, general practitioner; SNS24, national hotline.

In-person contacts with family practices were reported by 2% of participants.

Figure 1 plots the probability of contact with any health service, for COVID-19-related reasons, over time, according to the existence of main symptoms and contacts with confirmed COVID-19 cases. Four categories are shown: having symptoms and contact with confirmed cases, having contact with confirmed cases but no symptoms, having symptoms but no contact with confirmed cases and having no symptoms nor contact with confirmed cases.

The association between the outcome and time was non-linear and displayed complex inflections. The highest probability of contact with any health service for COVID-19-related reasons occurred at the beginning of the study. Participants reporting contact with confirmed COVID-19 cases had the highest probability of contact at all times. Having COVID-19 main symptoms heightened this probability further. The lowest probability of contact occurred around the end of the third week of the study (13 April 2020). Then, the probability gradually rose for 4 weeks to a flattened lower peak, 1 week after the end of the first lockdown (on 11 May 2020). From this date on, the effect of having either symptoms or contacts with confirmed cases weakened. The probability of contact with health services for COVID-19-related reasons remained low for participants without COVID-19 main symptoms and without contact with confirmed cases.

Table 3 shows the results of the different models on the main outcome, contact with any health service (either remote or in-person) for COVID-19-related reasons. Risk differences are presented multiplied by 100, for readability. High-risk contacts and symptoms were covariates with significant and important effects on the outcome. The full adjustment heightened the effect of reporting personal contact with a confirmed case of COVID-19 and of having had COVID-19 main symptoms during the previous 24 hours. In our population, and compared with participants who did not report it, there were 17% more (0.168, 95% CI 0.152 to 0.185) contacts with health services among participants who reported personal contact with a confirmed case, 7% more (0.067, 95% CI 0.064 to 0.071) contacts if the contact had been with a suspected case and 6% more (0.061, 95% CI 0.054 to 0.067) contacts among participants who reported COVID-19 main symptoms in the previous 24 hours. Sex and job status also showed significant associations with the probability of contact with any health service, but the effects were very small. There were 0.27% more (0.003, 95% CI 0.000 to 0.005) contacts with health services among women, as compared with men, and 0.76% fewer (−0.008, 95% CI −0.011 to −0.004) contacts among students, as compared with employed participants. The interaction with time of the covariates 'COVID-19 main symptoms' and 'contacts with confirmed COVID-19 cases' was confirmed in the adjusted models. For participants with contacts with confirmed cases or any main symptoms, time had a very

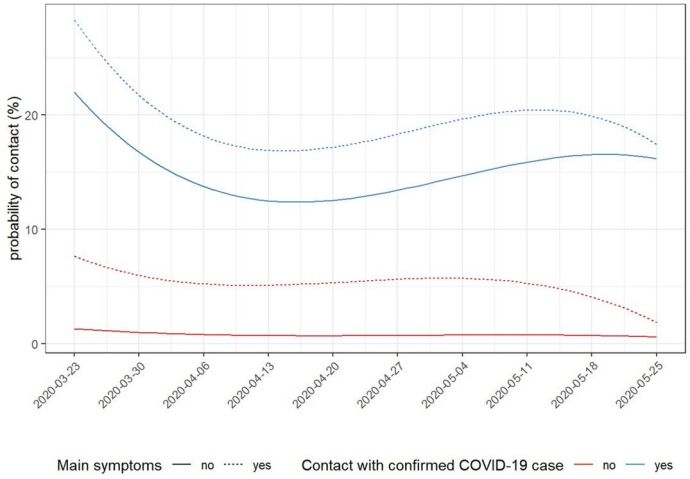

Figure 1 Probability of participants contacting any health service for COVID-19-related reasons, over time and according to the existence of COVID-19 main symptoms or contact with a confirmed COVID-19 case.

small but significant negative effect on the probability of contacting any health service.

Table 4 shows the comparative results of the fully adjusted models (M3) on the four secondary outcomes: remote contacts, in-person contacts, contacts with GPs (remotely) or family practices (in-person) and in-person contacts with public hospitals or private clinics, for COVID-19-related reasons. When modelling for any of the secondary outcomes, high-risk contacts with suspected or confirmed COVID-19 cases and COVID-19 main symptoms retained significant, but smaller, effects. The female sex retained its small effect. The small negative effect of being a student was retained as well. Some new significant effects of some covariates arose, but they were all of a very small size (below 0.5%). When compared with living in the North region, living in regions other than the North, Lisbon or Centre was significantly and inversely associated with remote contacts with any health service. When compared with living in the North region, living in the Lisbon region was inversely associated with contacts with GPs (remotely) and/or family practices (in-person). When compared with living in the North region, living in the Centre region was associated with more in-person contacts with public hospitals and/or private clinics. Living in a household with someone with a chronic condition, compared with not living with anyone with a chronic condition, and reporting an income like 'has to mind expenses' or 'not enough', when compared with reporting a 'comfortable' income, was associated with more remote contacts and with more contacts with GPs (remotely) and/or family practices (in-person). Compared with not living with a child, living in a household with a child under 10 years old was associated with more remote contacts. The interaction with time of the covariates 'COVID-19 main symptoms' and 'contacts with confirmed COVID-19 cases' was confirmed in the adjusted models of the secondary outcomes, with one exception. The interaction with time of having main symptoms lost any effect on contacting public hospitals or private clinics in person for COVID-19-related reasons. Online supplemental tables 2–5 show the results of the different models on the four secondary outcomes.

DISCUSSION

Main findings

In this cohort, during the first wave of the COVID-19 pandemic in Portugal, GPs were the main points of contact for patients with health services for COVID-19-related reasons. This is consistent with the role of Primary Care as a pillar of the Portuguese National Health Service.[34] Data from our later study in a municipality in the north of Portugal also showed a high prevalence of adoption of first-contact care with GPs.[5] This result also agrees with the specific role of primary care during pandemics.[17 35] Such a role needs to be considered in future pandemics before pondering the diversion of the GP workforce to cover other areas and tasks.

Participants with COVID-19 main symptoms (n=1739) largely exceed those who made any contact with health services for COVID-19-related reasons (n=1024). In the open comments section of the questionnaire, some subjects reported having tried to contact health services but not being able to get through.[36] This was also reported in the media during the first wave.[37] Participants might also choose not to contact any health services, either because they were not willing to be tested for COVID-19 or to self-isolate. This could happen in fear of loss of income or autonomy, a concern voiced by some study participants.[36] Another explanation could be the contact not being captured by the questionnaires if it was made later, on a day in which the subject did not fill out the questionnaire. However, some participants reported that on the days when there were contacts with healthcare, they felt it was more worthwhile to fill out the questionnaire and report it.

The main drivers found for any difference in the probability of contact with health services for COVID-19-related

Table 3 Effects (risk differences × 100 and 95% CIs) of socio-demographic and context variables, of high-risk contacts, COVID-19 main symptoms and time in the probability of contacting any health service, either remotely or in person, for COVID-19-related reasons

	M1		M2		M3	
Predictors	**Estimates (95% CI)**	**P**	**Estimates (95% CI)**	**P**	**Estimates (95% CI)**	**P**
(Intercept)	0.76 (0.36 to 1.15)	**<0.001**	1.16 (0.75 to 1.58)	**<0.001**	1.12 (0.70 to 1.53)	**<0.001**
Sex (woman)	0.25 (0.03 to 0.48)	**0.028**	0.27 (0.04 to 0.49)	**0.021**	0.27 (0.04 to 0.49)	**0.019**
Education (high)	−0.24 (−0.50 to 0.02)	0.068	−0.23 (−0.49 to 0.03)	0.084	−0.23 (−0.49 to 0.03)	0.080
Working status (ref: employed)						
Unemployed	−0.28 (−0.85 to 0.29)	0.343	−0.29 (−0.86 to 0.28)	0.324	−0.29 (−0.86 to 0.28)	0.322
Other	−0.13 (−0.49 to 0.23)	0.475	−0.13 (−0.48 to 0.23)	0.489	−0.12 (−0.48 to 0.23)	0.496
Student	−0.76 (−1.11 to -0.42)	**<0.001**	−0.76 (−1.10 to -0. 41)	**<0.001**	−0.76 (−1.10 to −0.41)	**<0.001**
Retired	−0.11 (−0.65 to 0.43)	0.691	−0.10 (−0.64 to 0.43)	0.708	−0.10 (−0.64 to 0.43)	0.702
Age (ref: <40 years)						
40–59 years	−0.07 (−0.30 to 0.15)	0.520	−0.03 (−0.26 to 0.19)	0.771	−0.03 (−0.26 to 0.20)	0.789
60+ years	0.06 (−0.40 to 0.51)	0.799	0.12 (-0.34 to 0.57)	0.620	0.12 (−0.34 to 0.57)	0.609
Region (ref: north)						
Others	−0.41 (−0.81 to -0.00)	**0.049**	−0.40 (−0.81 to 0.00)	0.051	−0.41 (−0.81 to −0.00)	**0.049**
Lisbon	−0.18 (−0.43 to 0.08)	0.176	−0.16 (−0.42 to 0.09)	0.206	−0.17 (−0.43 to 0.09)	0.193
Centre	0.09 (−0.21 to 0.39)	0.558	0.11 (−0.19 to 0.41)	0.478	0.11 (−0.19 to 0.41)	0.476
Chronic disease in household (yes)	0.27 (0.06 to 0.48)	**0.012**	0.27 (0.06 to 0.48)	**0.012**	0.27 (0.06 to 0.48)	**0.012**
Under 10 in household (yes)	0.15 (−0.09 to 0.40)	0.217	0.15 (−0.10 to 0.39)	0.244	0.15 (−0.10 to 0.39)	0.239
Over 60s in household (yes)	−0.04 (−0.31 to 0.23)	0.774	−0.04 (−0.31 to 0.23)	0.773	−0.04 (−0.30 to 0.23)	0.790
Income (ref=comfortable)						
Enough for needs	−0.12 (−0.35 to 0.12)	0.326	−0.12 (−0.35 to 0.11)	0.317	−0.12 (−0.35 to 0.12)	0.324
Has to mind expenses/not enough	0.25 (−0.02 to 0.51)	0.065	0.25 (−0.02 to 0.51)	0.067	0.24 (−0.02 to 0.51)	0.069
Contact suspected case (yes)	6.84 (6.49 to 7.18)	**<0.001**	6.77 (6.43 to 7.11)	**<0.001**	6.73 (6.39 to 7.07)	**<0.001**
Contact confirmed case (yes)	11.3 (10.80 to 11.79)	**<0.001**	11.31 (10.81 to 11.80)	**<0.001**	16.84 (15.21 to 18.47)	**<0.001**
Main symptoms (yes)	4.69 (4.45 to 4.93)	**<0.001**	6.13 (5.45 to 6.80)	**<0.001**	6.05 (5.37 to 6.73)	**<0.001**
Time			−0.06 (−0.08 to −0.03)	**<0.001**	−0.05 (−0.07 to −0.03)	**<0.001**
$Time^2$			0.00 (0.00 to 0.00)	**<0.001**	0.00 (0.00 to 0.00)	**<0.001**
$Time^3$			0.00 (−0.00 to −0.00)	**<0.001**	0.00 (−0.00 to −0.00)	**0.001**
Main Symptoms x Time			−0.25 (−0.36 to −0.15)	**<0.001**	−0.24 (−0.35 to −0.14)	**<0.001**
Main Symptoms x $Time^2$			0.01 (0.01 to 0.01)	**<0.001**	0.01 (0.01 to 0.01)	**<0.001**
Main Symptoms x $Time^3$			0.00 (−0.00 to −0.00)	**<0.001**	0.00 (−0.00 to −0.00)	**<0.001**

Continued

Table 3 Continued

Predictors	M1 Estimates (95% CI)	M1 P	M2 Estimates (95% CI)	M2 P	M3 Estimates (95% CI)	M3 P
Contact Confirmed Case x Time					−0.76 (−0.99 to -0.52)	**<0.001**
Contact Confirmed Case x Time^2					0.02 (0.01 to 0.03)	**<0.001**
Contact Confirmed Case x Time^3					0.00 (−0.00 to −0.00)	**<0.001**

M1: model adjusted for sociodemographic characteristics, household context, contacts with anyone with a suspected or confirmed diagnosis of COVID-19 and main symptoms; M2: model adjusted M1 for the interaction between main symptoms and time, time^2, and time^3; M3: model adjusted M2 for the interaction between contact with confirmed cases and time, time^2, and time^3.

Bold: statistically significant.

Ref, reference class.

reasons were perceived high-risk contacts, followed by the existence of COVID-19 main symptoms. This agrees with the findings of a survey that the majority of the population perceived themselves as at high risk of COVID-19 in the first 2 weeks of the pandemic,[38] while active cases kept below 1% for the whole study period.[39] Sociodemographic and household factors were not associated with major differences in healthcare contacts. This may mean that universal coverage and equity worked in the studied sample, during the first wave of the pandemic. An assessment of access to healthcare in Portugal found that cancellations of healthcare services in the first pandemic year were more equitable than those in 2021.[40] This is an important finding because social distancing[41] and the shift to telehealth[42] had the potential to widen inequities. However, these results cannot be generalised to the rest of the population in Portugal.

The association between time and the outcome was a cubic function. The highest probability of contact with any health service for COVID-19-related reasons occurring at the beginning of the study (23 March 2020) matches the first days of the first lockdown. The lowest probability of contact occurred around 13 April, by the end of the third week of the study and 2 weeks after COVID-19 incidence peaked, and an aggravation of restrictions followed. Then, the probability gradually rose again, but keeping lower than the probability of contact in the beginning of the study. This new rise in the probability of contact with health services for COVID-19-related reasons lasted for 4 weeks, up until around 11 May, 1 week after the end of the first lockdown. By then, the first wave peak of active cases was reached.[39] The effects of reporting contact with suspected COVID-19 cases and COVID-19 main symptoms started to decline in the last 2 weeks of the study, 1 week after the restrictions were eased.[8]

Strengths and limitations

Study strengths include the longitudinal approach, the large sample size and number of observations and the availability of data that were real-time accounts of the early pandemic times. We focus on contact between individuals and healthcare services, shedding light on how and where people reach care early in a pandemic. Reaching care is a key dimension of accessibility that might be threatened during a pandemic, with increasing case incidence, shortages in staff and personal protective equipment and an urge to minimise transmission.

As for limitations, the non-probabilistic sampling, aiming at a real-time outreach of people's perceptions and decisions during a much uncertain time, yielded a set of participants that differs from the Portuguese population regarding education levels, with highly educated study subjects being overrepresented, as reported in a similar study.[43] Also, we found retention in our cohort to be related with being a female, aged over 40, living in the Lisbon, Centre and North regions, having higher income and being retired.

Table 4 Results of the fully adjusted models for the effects (risk differences x 100 and 95% CIs) of sociodemographic and context variables, of high-risk contacts, COVID-19 main symptoms and time in the probability of the four secondary outcomes

	Remote		In person		GP remotely/family practice in person		Public hospital/private clinic	
Predictors	**Estimates (95% CI)**	**P value**	**Estimates (95% CI)**	**P value**	**Estimates (95% CI)**	**P value**	**Estimates (95% CI)**	**P value**
(Intercept)	0.83 (0.46 to 1.19)	**<0.001**	0.33 (0.10 to 0.56)	**0.005**	0.49 (0.15 to 0.84)	**0.004**	0.22 (0.03 to 0.41)	**0.023**
Sex (woman)	0.23 (0.04 to 0.43)	**0.021**	0.12 (0.00 to 0.24)	0.044	0.24 (0.06 to 0.43)	**0.010**	0.12 (0.02 to 0.22)	**0.016**
Education (high)	−0.17 (−0.40 to 0.05)	0.132	−0.15 (−0.29 to −0.01)	**0.030**	−0.03 (−0.24 to 0.19)	0.817	−0.13 (−0.24 to −0.01)	**0.030**
Working status (ref: employed)								
Unemployed	−0.22 (−0.71 to 0.28)	0.396	−0.15 (−0.45 to 0.15)	0.337	−0.12 (−0.59 to 0.35)	0.623	−0.16 (−0.41 to 0.09)	0.219
Other	−0.03 (−0.34 to 0.29)	0.871	−0.07 (−0.25 to 0.12)	0.486	−0.2 (−0. 49 to 0.10)	0.191	−0.01 (−0.17 to 0.14)	0.869
Student	−0.46 (−0.76 to −0.16)	**0.003**	−0.33 (−0.51 to −0.15)	**<0.001**	−0.43 (−0.71 to −0.15)	**0.003**	−0.26 (−0.41 to −0.10)	**0.001**
Retired	−0.01 (−0.48 to 0.46)	0.978	−0.02 (−0.30 to 0.26)	0.906	−0.13 (−0.57 to 0.31)	0.572	0.12 (−0.12 to 0.35)	0.329
Age (ref: <40 years)								
40–59 years	0 (−0.20 to 0.20)	0.997	−0.02 (−0.14 to 0.10)	0.701	0.11 (−0.08 to 0.30)	0.259	−0.04 (−0.14 to 0.06)	0.445
60+years	0.13 (−0.27 to 0.53)	0.526	0 (−0. 24 to 0. 24)	0.985	0.25 (−0.12 to 0.63)	0.185	−0.1 (−0.30 to 0.10)	0.313
Region (ref: north)								
Others	−0.39 (−0.74 to −0. 04)	**0.031**	−0.05 (−0. 26 to 0. 17)	0.676	−0.28 (−0.61 to 0.06)	0.105	−0.04 (−0.22 to 0.14)	0.675
Lisbon	−0.14 (−0.36 to 0.08)	0.220	−0.01 (−0. 14 to 0. 13)	0.902	−0.22 (−0.43 to −0.01)	**0.041**	0.02 (−0.09 to 0.14)	0.673
Centre	−0.03 (−0.30 to 0.23)	0.797	0.12 (−0. 04 to 0. 28)	0.128	0.07 (−0.18 to 0.32)	0.598	0.16 (0.02 to 0. 29)	**0.022**
Chronic disease in household (yes)	0.31 (0.12 to 0.49)	**0.001**	0.03 (−0. 08 to 0. 14)	0.632	0.21 (0.00 to 0.39)	**0.016**	0.01 (−0.08 to 0.10)	0.860
Under 10 in household (yes)	0.26 (0.05 to 0.48)	**0.017**	−0.06 (−0. 19 to 0. 07)	0.402	0.12 (−0.08 to 0.32)	0.230	0 (−0.11 to 0.11)	0.993
Over 60s in household (yes)	−0.03 (−0.26 to 0.20)	0.804	0.01 (−0. 13 to 0. 15)	0.880	0 (−0.22 to 0.22)	0.985	0.01 (−0.11 to 0.13)	0.884
Income (ref=comfortable)								
Enough for needs	−0.09 (−0.30 to 0.11)	0.368	−0.07 (−0. 19 to 0. 05)	0.277	−0.07 (−0.26 to 0.13)	0.507	−0.09 (−0.19 to 0.02)	0.101
Has to mind expenses/not enough	0.32 (0.09 to 0.55)	**0.007**	−0.04 (−0. 18 to 0. 10)	0.597	0.23 (0.01 to 0.45)	**0.037**	−0.06 (−0.18 to 0.05)	0.279
Contact suspected case (yes)	5.07 (4.78 to 5.36)	**<0.001**	3.62 (3.40 to 3.84)	**<0.001**	3.73 (3.47 to 4.00)	**<0.001**	3.25 (3.06 to 3.44)	**<0.001**
Contact confirmed case (yes)	12.53 (11.13 to 13.93)	**<0.001**	9.88 (8.83 to 10.93)	**<0.001**	9.01 (7.74 to 10.28)	**<0.001**	9.93 (9.02 to 10.84)	**<0.001**
Main symptoms (yes)	6.01 (5.43 to 6.59)	**<0.001**	1.09 (0. 65 to 1.52)	**<0.001**	3.31 (2.78 to 3.84)	**<0.001**	0.62 (0.24 to 0.99)	**0.001**
Time	−0.05 (−0.07 to −0.03)	**<0.001**	−0.01 (−0. 02 to 0. 01)	0.412	−0.04 (−0.05 to −0.02)	**<0.001**	0 (−0.02 to 0.01)	0.484
$Time^2$	0 (0.00 to 0.00)	**<0.001**	0 (−0. 00 to 0. 00)	0.227	0 (0.00 to 0.00)	**<0.001**	0 (−0.00 to 0.00)	0.277
$Time^3$	0 (−0.00 to −0. 00)	**<0.001**	0 (−0.00 to 0.00)	0.204	0 (−0.00 to −0. 00)	**0.001**	0 (−0.00 to 0.00)	0.263
Main Symptoms x Time	−0.3 (−0.38 to −0. 21)	**<0.001**	−0.03 (−0.10 to 0.04)	0.371	−0.12 (−0.20 to −0.04)	**0.005**	0.02 (−0.03 to 0.08)	0.419
Main Symptoms x $Time^2$	0.01 (0.01 to 0. 02)	**<0.001**	0 (0.00 to 0.01)	**0.036**	0.01 (0.00 to 0. 01)	**<0.001**	0 (−0.00 to 0.00)	0.983
Main Symptoms x $Time^3$	0 (−0.00 to −0.00)	**<0.001**	0 (−0.00 to −0.00)	**0.037**	0 (−0.00 to −0.00)	**<0.001**	0 (−0.00 to 0.00)	0.880

Continued

Table 4 Continued

Predictors	Remote		In person		GP remotely/family practice in person		Public hospital/private clinic	
	Estimates (95% CI)	P value	Estimates (95% CI)	P value	Estimates (95% CI)	P value	Estimates (95% CI)	P value
Contact Confirmed Case x Time	−0.54 (−0.75 to −0.34)	**<0.001**	−0.58 (−0.73 to −0.42)	**<0.001**	−0.35 (−0.54 to −0.17)	**<0.001**	−0.67 (−0.80 to −0.54)	**<0.001**
Contact Confirmed Case x Time^2	0.02 (0.01 to 0.02)	**<0.001**	0.02 (0.01 to 0.02)	**<0.001**	0.01 (0.00 to 0.02)	**0.001**	0.02 (0.00 to 0.03)	**<0.001**
Contact Confirmed Case x Time^3	0 (−0.00 to −0.00)	**0.002**	0 (−0.00 to −0.00)	**<0.001**	0 (−0.00 to −0.00)	**0.004**	0 (−0.00 to −0.00)	**<0.001**

Bold: statistically significant.
GP, general practitioner; Ref, reference class.

These findings, in line with known determinants of attrition,[44 45] prevent the generalisation of our results to the whole population in Portugal. However, the fact that, in our sample, the proportion of COVID-19 cases was similar to the Portuguese population, argues for a partial representativeness. Also, in a cohort overrepresenting the higher educated, a bias towards less adoption of first-contact care with a GP would be expected.[5] Yet, notably, GPs remained the main point of contact of patients with health services for COVID-19-related reasons. The questionnaire also had limitations. Data on the severity of symptoms were not collected, because in the early weeks of the pandemic in Portugal, the National public health agency directions publicised the triad of cough, fever and shortness of breath as the typical COVID-19 symptoms to beware of, with no specifications about its severity. If available, data on the severity of symptoms could help us understand the appropriateness of the choice of which health service to contact. Remote contacts with hospitals were launched early in the pandemic but also this was not captured in survey questions. However, we argue that remote contacts between the population and public hospitals were minimal at this stage because they occurred only on provider initiative and most non-urgent hospital activity had been cancelled. Also, in person contacts with family practices did not discriminate if they were with a GP or with other healthcare worker. Knowing this would build up our main result that the majority of contacts with health services for COVID-19-related reasons during the first wave of the pandemic were with GPs. As for remote contacts, the questionnaire did not disaggregate them into patient versus provider initiated. As, during the study period, GPs had been directed to proactively contact suspected and confirmed COVID-19 cases, it would have been of interest to understand which was which. Patient-initiated contacts are more likely to portray patients' agendas and needs and therefore work better at gauging realised access. For this purpose, querying about unsuccessful attempts to contact any health service for COVID-19-related reasons could have yielded relevant insights.

CONCLUSIONS

We conclude that, in this cohort, during the first wave of the COVID-19 pandemic in Portugal, GPs were the main points of contact of patients with health services for COVID-19-related reasons. This suggests that the role of first-contact care in Portuguese Primary Care remains crucial in a pandemic like COVID-19.

Perceived high-risk contacts, such as those with confirmed or suspected cases, were the factors more strongly associated with the probability of contacting healthcare services for COVID-19-related reasons. Having COVID-19 symptoms in the previous 24 hours was also associated with the probability of contact. Sociodemographic and household factors were not associated with

major risk differences, suggesting that universal coverage and equity worked in our study sample during the first wave of the pandemic.

Collaborators ISPUP/INESC TEC COVID-19 Task Force: Ana Cristina Santos, Ana Isabel Ribeiro, Artur Rocha, Carla Lopes, Daniela Correia, Elisabete Ramos, Gonçalo Gonçalves, Henrique Barros, Joana Araújo, Makram Talih, Margarida Tavares, Milton Severo, Nuno Lunet, Paula Meireles, Raquel Duarte, Raquel Lucas, Rui Camacho, Sílvia Fraga, Sofia Correia, Susana Silva, Teresa Leão.

Contributors MG conceived and designed the current study protocol nested in the wider cohort study, participated in the analysis and wrote the paper. DC: Member of the ISPUP/INESC TEC COVID-19 Task Force, served as scientific advisor and critically reviewed the cohort assembly and study proposal, conceived and designed the current study protocol, collected data, performed the analysis and critically reviewed the paper. LA conceived and designed the current study protocol nested in the wider cohort study, participated in the analysis and critically reviewed the paper. MS: Member of the ISPUP/INESC TEC COVID-19 Task Force, served as scientific advisor and critically reviewed the cohort assembly and study proposal, conceived and designed the current study protocol, collected data, collected data, supervised the analysis and critically reviewed the paper. RL: Member of the ISPUP/INESC TEC COVID-19 Task Force, served as scientific advisor and critically reviewed the cohort assembly and study proposal, the building of the questionnaire, and recruitment strategy, conceived and designed the current study protocol, participated in the analysis and critically reviewed the paper. SC: Member of the ISPUP/INESC TEC COVID-19 Task Force, served as scientific advisor and critically reviewed the cohort assembly and study proposal, conceived and designed the current study protocol, participated in the analysis, critically reviewed the paper and is the guarantor of the study. The ISPUP/INESC TEC COVID-19 Task Force designed the study and the data collection instruments, managed data collection, storage and use, and oversaw study outputs. Non-author contributors: Ana Cristina Santos, Ana Isabel Ribeiro, Artur Rocha, Carla Lopes, Elisabete Ramos, Gonçalo Gonçalves, Henrique Barros, Joana Araújo, Margarida Tavares, Nuno Lunet, Paula Meireles, Raquel Duarte, Rui Camacho, Sílvia Fraga, Susana Silva, Teresa Leão: Member of the ISPUP/INESC TEC COVID-19 Task Force, served as scientific advisor and critically reviewed the cohort assembly and study proposal. Makram Talih: Member of the ISPUP/INESC TEC COVID-19 Task Force, served as scientific advisor and critically reviewed the cohort assembly and study proposal and the final version of the paper.

Funding This work was supported by FCT—Fundação para a Ciência e Tecnologia, I.P. through the projects with references UIDB/04750/2020 and LA/P/0064/2020 and DOI identifiers https://doi.org/10.54499/UIDB/04750/2020 and https://doi.org/10.54499/LA/P/0064/2020.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval The study received ethical approval by the Ethics Committee at Instituto de Saúde Pública da Universidade do Porto (ref: CE20142). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer-reviewed.

Data availability statement Data are available upon reasonable request. Data may be available upon reasonable request.

ORCID iD

Mónica Granja http://orcid.org/0000-0001-7478-5320

REFERENCES

1 World Health Organization. WHO director-general's opening remarks at the media briefing on COVID-19–11 March 2020. Available: https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020 [Accessed 11 Jan 2024].
2 Direção-Geral da Saúde [Directorate-General for Health]. Comunicado - casos de infeção por novo Coronavírus (2/3/2020) [bulletin - COVID-19 cases (2/3/2020)]. 2020.
3 Direção-Geral da Saúde [Directorate-General for Health]. Número de Novos Casos E Óbitos Por DIA. 2024. Available: https://covid19.min-saude.pt/numero-de-novos-casos-e-obitos-por-dia/ [Accessed 13 Apr 2024].
4 de Almeida Simoes J, Augusto GF, Fronteira I, *et al*. Portugal health system review. *Health Syst Transit* 2017;19:1–184.
5 Granja M, Alves L, Correia S. First contact with the health system: a survey study in northern Portugal. *BMJ Open* 2023;13:e076849.
6 Administração Central do Sistema de Saúde I [Health SCA. Centro de Atendimento do Serviço Nacional de Saúde [national health service call center]. 2007. Available: https://www2.acss.min-saude.pt/ÁreaseUnidades/ParceriasSaúde/Apresentação/CentrodeAtendimentodoServiçoNacionaldeSaúde/tabid/514/language/pt-PT/Default.aspx [Accessed 23 Jan 2021].
7 Governo de Portugal [Portuguese Government. Regulamenta a Aplicação do Estado de Emergência Decretado Pelo Presidente DA República [regulates the Adhibiton of the emergency state enacted by the president of the Republic], no 57/2020. Portugal Diário da República; 2020.1–19. Available: https://diariodarepublica.pt/dr/legislacao-consolidada/decreto/2020-130531803 [accessed 11 Jan 2024]
8 State of Health in the EU. OECD/European observatory on health systems and policies. Portugal Country Health Profile 2021; 2021. Available: https://health.ec.europa.eu/system/files/2021-12/2021_chp_pt_english.pdf [accessed 11 Jan 2024]
9 Direção-Geral da Saúde [Directorate-General for Health]. Norma 004/2020 COVID-19: fase de mitigação [guideline 004/2020 COVID-19: mitigation phase]. 2020.1–22.
10 Serviço Nacional de Saúde [National Health Service]. Recorde de 13 mil chamadas atendidas DIA 16 de Março [thirteen thousand call record received on the 16th of March]. 2020. Available: https://www.sns.gov.pt/noticias/2020/03/17/covid-19-linha-sns24/ [Accessed 11 Jan 2024].
11 Direção-Geral da Saúde [Directorate-General for Health]. COVID-19: primeira fase de Mitigação - Medidas Transversais de Preparação [COVID-19: first mitigation phase - general preparedness measures], 001/2020. 2020. Available: https://www.ordemenfermeiros.pt/media/17771/norma-001-2020-covid-19-primeira-fase-de-mitigação-medidas-transversais-de-preparação.pdf [Accessed 11 May 2024].
12 G20 Digital Health Taskforce. Digital health implementation approach to pandemic management. 2020. Available: https://digitalhealthtaskforce.org/wp-content/uploads/2020/11/G20-2020-Digital-Health-Implementation-approach-to-Pandemic-Management.pdf [Accessed 23 Jan 2021].
13 Correia AM, Queirós L, Dias J. Pandemic influenza A (H1N1) in the north of Portugal: how did the autumn-winter wave behave? *Rev Port Pneumol* 2010;16:880–6.
14 George F, Rodrigues B. Gripe em Lisboa 1957 e 2008 [Flu in Lisbon 1957 and 2008]. Ministério da Saúde [Ministry of Health]. Direção-Geral da Saúde [Directorate-General for Health]. Lisboa, 2008:1–10.
15 World Health Organization. Digital technology for COVID-19 response. 2020. Available: https://www.who.int/news/item/03-04-2020-digital-technology-for-covid-19-response [Accessed 26 Oct 2020].
16 World Health Organization. Declaration of Astana. In: *Global conference on primary health care*. 2018: 12. Available: https://www.who.int/docs/default-source/primary-health/declaration/gcphc-declaration.pdf
17 Rust G, Melbourne M, Truman BI, *et al*. Role of the primary care safety net in pandemic influenza. *Am J Public Health* 2009;99 Suppl 2:S316–23.
18 World Health Organization. 2019 Novel Coronavirus (2019-nCoV): strategic preparedness and response plan. Geneva, 2020. Available: https://www.who.int/docs/default-source/coronaviruse/jmo-who-ncov-report-4feb-web.pdf?sfvrsn=d82d752a_2&download=true [accessed 12 Jan 2024]

19 Huston P, Campbell J, Russell G, *et al*. COVID-19 and primary care in six countries. *BJGP Open* 2020;4:bjgpopen20X101128.
20 Tanne JH, Hayasaki E, Zastrow M, *et al*. Covid-19: how doctors and Healthcare systems are tackling Coronavirus worldwide. *BMJ* 2020;368:m1090.
21 Iparraguirre ST, Álvarez RM. Semfyc and family medicine in the time of the Coronavirus. *Aten Prim* 2020;52:291–3.
22 Mirco N, Andrea C, Angelo G, *et al*. At the epicenter of the COVID-19 pandemic and humanitarian crises in Italy: changing perspectives on preparation and mitigation. *Catal Innov Care Deliv* 2020. Available: https://catalyst.nejm.org/doi/full/10.1056/CAT.20.0080
23 Kennelly B, O'Callaghan M, Coughlan D, *et al*. The COVID-19 pandemic in Ireland: an overview of the health service and economic policy response. *Health Policy Technol* 2020;9:419–29.
24 van Olmen J, Remmen R, Van Royen P, *et al*. Regional coordination and bottom-up response of general practitioners in Belgium and the Netherlands. *BMJ* 2020;369:m1377.
25 Verhoeven V, Tsakitzidis G, Philips H, *et al*. Impact of the COVID-19 pandemic on the core functions of primary care: will the cure be worse than the disease? A qualitative interview study in Flemish GPs. *BMJ Open* 2020;10:e039674.
26 Muñoz M-A, López-Grau M. Lessons learned from the approach to the COVID-19 pandemic in urban primary health care centres in Barcelona, Spain. *Eur J Gen Pract* 2020;26:106–7.
27 Thornton J. Covid-19: how Coronavirus will change the face of general practice forever. *BMJ* 2020;1279:m1279.
28 Greenhalgh T, Koh GCH, Car J. Covid-19: a remote assessment in primary care. *BMJ* 2020;368:m1182.
29 de Nicolás Jiménez JM, Blázquez Recio LM, Fabregat Domínguez MT, *et al*. COVID-19 and assistance effort in primary care. *Aten Primaria* 2020;52:588–90.
30 Bury G, Smith S, Kelly M, *et al*. COVID-19 community assessment hubs in Ireland—the experience of clinicians. *Ir J Med Sci* 2021;190:475–80.
31 Majeed A, Maile EJ, Bindman AB. The primary care response to COVID-19 in England's national health service. *J R Soc Med* 2020;113:208–10.
32 Goncalves M, Henriques A, Costa AR, *et al*. Insomnia and nightmare profiles during the COVID-19 pandemic in Portugal: characterization and associated factors. *Sleep Med* 2022;90:44–52.
33 Direção-Geral da Saúde [Directorate-General for Health]. Orientação 02A/2020 - doença pelo novo Coronavírus (COVID-19) – Nova definição de caso [guideline 02A/2020 - Nover Coronavirus disease (COVID-19) - new case definition]. 2020.1–2.
34 Kringos D, Boerma W, Bourgueil Y, *et al*. The strength of primary care in Europe: an international comparative study. *Br J Gen Pract* 2013;63:e742–50.
35 Lee JQ, Loke W, Ng QX. The role of family physicians in a pandemic: a blueprint. *Healthcare (Basel)* 2020;8:198.
36 Silva S, Machado H, de Freitas C, *et al*. Concerns and coping mechanisms during the first national COVID-19 lockdown: an online prospective study in Portugal. *Public Health* 2022;207:24–7.
37 Campos A. Centros de saúde não conseguem atender telefones. Quebra nas consultas presenciais é de três milhões [Family Practices can't manage to answer the telephone. Three million drop in consultations]. Público; 2020. Available: https://www.publico.pt/2020/07/31/sociedade/noticia/centros-saude-nao-conseguem-atender-telefones-quebra-consultas-presenciais-tres-milhoes-1926354 [Accessed 31 Jul 2020].
38 Peres D, Monteiro J, Almeida MA, *et al*. Risk perception of COVID-19 among Portuguese healthcare professionals and the general population. *J Hosp Infect* 2020;105:434–7.
39 Worldometer. COVID-19 Coronavirus pandemic. Portugal, 2020.
40 Barros PP, Costa E. Acesso a Cuidados de Saúde, 2022 as escolhas dos Cidadãos no Pós-Pandemia [Access to health care, 2022 post-pandemic citizens' choices]. 2022. Available: https://www.novasbe.unl.pt/Portals/0/Files/Social Equity Initiative/Acesso a Cuidados de Saude%2C 2022.pdf [Accessed 11 Jan 2024].
41 Douglas M, Katikireddi SV, Taulbut M, *et al*. Mitigating the wider health effects of COVID-19 pandemic. *BMJ* 2020;369:m1557.
42 Stoffers J. The promise of eHealth for primary care: opportunities for service delivery, patient–doctor communication, self-management, shared decision making and research. *Eur J Gen Pract* 2018;24:146–8.
43 Valente de Almeida S, Costa E, Lopes FV, *et al*. Concerns and adjustments: how the Portuguese population met COVID-19. *PLoS ONE* 2020;15:e0240500.
44 Radler BT, Ryff CD. Who participates? Longitudinal retention in the MIDUS national study of health and well-being. *J Aging Health* 2010;22:307–31.
45 Vinther-Larsen M, Riegels M, Rod MH, *et al*. The Danish youth cohort: characteristics of participants and non-participants and determinants of attrition. *Scand J Public Health* 2010;38:648–56.