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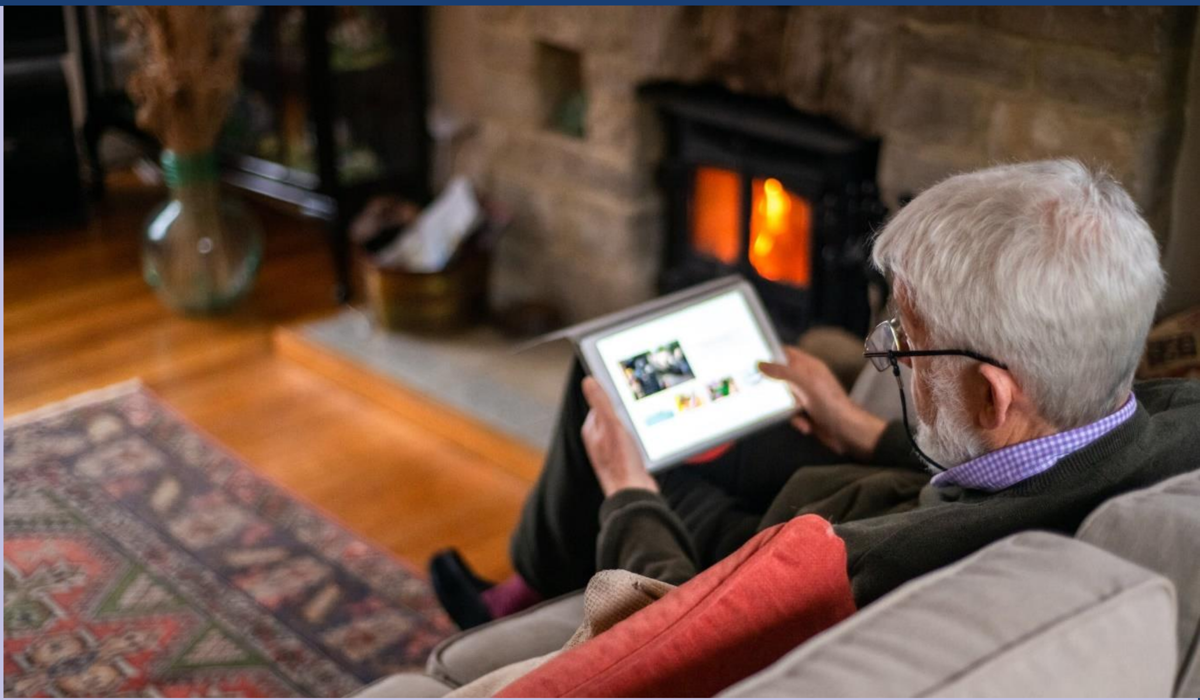

Full Report

Impact of digitalisation on access to primary care for older people during the COVID-19 pandemic: an analysis using OpenSAFELY

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Full Report

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Contents

Background

The COVID-19 pandemic in the UK saw the first confirmed patients on 29th January 2020 and the first national lockdown commencing on 23rd March 2020. This period of lockdowns and restrictions lasted for two years with restrictions finally eased in February/March 2022. Overall, the COVID-19 pandemic precipitated considerable changes in the delivery of primary healthcare services worldwide, prompting a notable shift towards digital and remote modes of accessing health services [1]. Public health measures aimed at containing the spread of the virus necessitated restrictions that disrupted traditional primary care services [2], including face-to-face appointments, most notably among general practice (GP) services. Consequently, there was a marked increase in the adoption of technologies including telephone, video, and electronic consultation within GP practices to facilitate remote consultations during the pandemic [1].

The use of digital technologies to access and deliver healthcare services is not new. The World Health Organization (WHO) has long advocated for the integration of digital technologies to enhance healthcare delivery, acknowledging their expanding role in modern society [3]. In the UK, the move towards digital services predates the pandemic as it had already been prioritised by NHS England (NHSE) as part of a broader strategy to enhance access to primary care services prior to the pandemic [3]. The pandemic accelerated this change, and it continues to be emphasised post-pandemic [4]. In line with this digital transformation, the NHS Long Term Plan envisioned a 'digital-first' approach to service delivery, prioritising digital access as a cornerstone of healthcare provision [5]. NHS England's post-pandemic plan for 'recovering accesses to primary care outlines the implementation of Modern General Practice Access via online requests and digital telephony to tackle the well-known problem of the '8am rush' of patients having to telephone their GP first thing in the morning to make an appointment [5] This strategic alignment is reinforced by the UK government's broader agenda for a national transformation of digital access to public services by 2025 [6].

The increased transition to digitalised health services, while offering numerous benefits, raises concerns about potentially amplifying health inequalities from the inadvertent digital exclusion of certain demographic groups [7]. The digital and social exclusion of older adults during the pandemic has been highlighted and discussed extensively [8-12]. Inequalities in access to digital health involves factors including age, socioeconomic status, education level, ethnicity, limited infrastructure in rural or deprived areas, and people's digital skills, motivation, and health literacy [7]. Relationships between these factors can be complex. For example, older adults, particularly those aged 75 and over, are the least likely group to access and use the internet, but there are less-explored nuanced interactions between age and other factors that may influence use of digital technologies for health [12-15].

Prior to the pandemic, we conducted a high-level evidence 'review of reviews' on whether digital technologies improve older people's access to health services. Overall, the review highlighted a gap in knowledge in this area and that further research was needed to understand the impact of digital technologies on health care access and to identify groups most vulnerable to exclusion [16,17]. A systematic review of pre-pandemic evidence on inequalities in GP remote consultations compared to face-to-face appointments found that younger people tended to use more telephone and online consultations, but older people aged 85 and above tended to use telephone consultations and not online consultations [18].

In July 2021, we developed a programme of work to explore the impact of the increased roll-out of digital technologies on access to health and care services among older people. Following our earlier review-of-reviews, we conducted a systematic mapping review to chart the international evidence on the impact of digitalisation of health and social care services for older adults since the start of the COVID-19 pandemic in early 2020. In the early months of the pandemic, longitudinal mixed methods research showed that that GPs maintained overall consultation rates with patients aged 70 years and above, but some practices with a large older, deprived or immigrant population reported that telephone consultations were challenging because of the lack of non-verbal cues that would be picked up during face-to-face consultations [19]. The digital readiness of GP practices may be negatively influenced by staff perceptions of their patients' digital confidence; staff in practices with higher numbers of older patients have reported feeling that these patients have lower digital confidence, which can negatively influence the digital readiness of practice staff themselves [20]. Work by Healthwatch highlighted age-related unfamiliarity with technology as a barrier to access health services during the pandemic [21]. The larger, more robust longitudinal quantitative studies of GP access in England suggest that in the early stages of the pandemic, in-person appointments were either maintained or saw less reduction for some groups of older patients, particularly those with higher clinical need (those with polypharmacy, those from the most deprived areas, or the oldest patients) [19,22]. However, this work was conducted in the first three months of the pandemic (April-June 2020), and there is a lack of evidence about longer-term trends in access to GPs for older people. The present study builds on this work to examine longer term trends in telephone, video, and online GP consultations (hereafter referred to as 'remote consultations') among older people in England.

Research aim, and objectives

This study aims to explore the impact of the pandemic on changes in GP consultation, and the medium of consultation, among older people via longitudinal quantitative analysis of electronic health records. It is a feasibility study involving the primary care platform OpenSAFELY (https://www.OpenSAFELY.org/) to access health records. Therefore, our primary aim is to assess the feasibility of using pseudo-anonymised data accessed via the OpenSAFELY platform to address the following research questions.

The research questions are:

1. How did remote consultations vary among older people (in different age groups from 65+ years, and compared to younger groups) before the COVID-19 pandemic (pre-March 2020), and after the pandemic (March 2020 - March 2022)?

2. What is the impact of age, gender, ethnicity, and socioeconomic status on the use of remote consultation in primary care?

Methods

Study Participants and Study Design:

Retrospective cohort study using pseudo-anonymised patient data from healthcare consultation records in England. As a feasibility study, we examined the potential of using OpenSAFELY platform to investigate our research questions. Through the OpenSAFELY platform, we analysed an estimated 19 million records between 2019 and 2022 from individuals who were aged 18 years and over. OpenSAFELY is a secured research environment for accessing electronic health records (EHR) created during the COVID-19 pandemic to facilitate urgent research. It is a collaboration between the Bennett Institute for Applied Data Science at the University of Oxford, the EHR group at London School of Hygiene and Tropical Medicine, The Phoenix Partnership (TPP), Egton Medical Information Systems (EMIS) and other electronic health record software companies (who already manage NHS patients' records), working on behalf of NHS England [23].

For this project, we used OpenSAFELY's TPP database (OpenSAFELY-TPP), which includes 24.2 million individuals presently registered with 2,546 GP surgeries employing TPP SystmOne software and covering approximately 40% of all practices in England [24]. We believe that the TPP database contains sufficient data to answer our research questions and feasibility assessment. The TPP data are generally representative of the English population [25] and contain information such as patient socio-demographic data (age, gender, ethnicity, index of multiple deprivation), clinical case definitions, covariates, and outcomes. These are benchmarked to Office for National Statistics (ONS) standard populations to enable rapid comparisons between the study and national populations.

Information governance (IG) and ethical approval

This study was submitted to the Health Research Authority, Research Ethics Service and approved by the West of Scotland Research Ethics Service [REC reference: 23/WS/0032]. NHS England is the data controller of the NHS England OpenSAFELY COVID-19 Service; TPP is the data processor; all study authors using OpenSAFELY have the approval of NHS England [26]. This implementation of OpenSAFELY is hosted within the TPP environment which is accredited to the ISO 27001 information security standard and is NHS IG Toolkit compliant [27]. Patient data have been pseudonymised for analysis and linkage using industry standard cryptographic hashing techniques. All pseudonymised datasets transmitted for linkage onto OpenSAFELY are encrypted, and access to the NHS England OpenSAFELY COVID-19 service is via a virtual private network (VPN) connection. The researchers conducting analysis hold contracts with NHS England and only access the platform to initiate database queries and statistical models. All database activity is logged, and only aggregate statistical outputs leave the platform environment following best practice for anonymisation of results such as statistical disclosure control for low cell counts [28].

The service adheres to the obligations of the UK General Data Protection Regulation (UK GDPR) and the Data Protection Act 2018. The service previously operated under notices initially issued in February 2020 by the Secretary of State under Regulation 3 [29] of the Health Service (Control of Patient Information) Regulations 2002 (COPI Regulations), which required organisations to process confidential patient information for COVID-19 purposes; this set aside the requirement for patient consent [29]. As of 1st July 2023, the Secretary of State has requested that NHS England continue to operate the Service under the COVID-19 Directions 2020 [30]. In some cases of data sharing, the common law duty of confidentiality is met using, for example, patient consent or support from the Health Research Authority Confidentiality Advisory Group [31]. Taken together, these provide the legal bases to link patient datasets using the service. GP practices, which provide access to the primary care data, are required to share relevant health information to support the public health response to the pandemic and have been informed of how the service operates.

Data source:

OpenSAFELY contains a range of flexible, pragmatic, but broadly standardised tools that users work with to convert raw patient data into "research ready" datasets, and to then execute code across those datasets [23]. All data were linked, stored, and analysed securely using the OpenSAFELY platform, https://www.opensafely.org/, as part of the NHS England OpenSAFELY COVID-19 service. Data include pseudonymised data such as coded diagnoses, medications, and physiological parameters. All code is shared openly for review and re-use under Massachusetts Institute of Technology (MIT) open license (https://github.com/opensafely/digital-access-to-primary-care). Analysis code is sent securely into the live data environment to be executed against the real patient data. OpenSAFELY patient data are not moved outside of the secure environments in which they reside. Users are not granted unconstrained access to view and manipulate raw data on a remote machine: instead, users work on the data at arm's length using OpenSAFELY services, following the recommendations of the Goldacre review [32]. There are also requirements of transparency, including the requirement for all researchers to publish the codes they write to query the data.

In primary care EHR systems, information about patients is collected using clinical coding ontologies such as the Systematised Nomenclature of Medicine (SNOMED). The TPP system is compliant with SNOMED, and GPs utilise it in their interactions with EHR systems. We utilised SNOMED codes for consultation events and for patient variables such as age, gender, ethnicity, and deprivation status. The details of the coding framework and a list of our code list is available for review and freely available for use (Appendix I).

Primary outcome:

Remote consultations: Remote consultations, including telephone, computer link, video, text, remote, e-consultation events were included in this study. The remote consultations variable was defined using virtual consultation clinical events in TPP. The focal point of analysis was the first national lockdown day in the UK, 23rd March 2020 [2]. This date served as a reference point for distinguishing between the pre-pandemic period (23rd March 2019 – 22nd March 2020) and two years of the pandemic period (23rd March 2020 – 22nd March 2021) and (23rd March 2021 to 22nd March 2022). The end dates do not exactly match formal end of restrictions but do reflect full years for the analysis and perhaps many people's behaviour remained restrictive in immediate months post "end of pandemic announcement".

Total appointments: Due to inconsistency in the coding of face-to-face events in the OpenSAFELY-TPP database, we opted to use available appointment data (appointments table) to investigate patients who had been "seen" as evidence of an appointment event instead of using face-to-face code lists. More caveats relating to consultation data via OpenSAFELY have been documented in another study [24]. The appointment table in the OpenSAFELY-TPP database comes with three columns (patient_id, seen_date, status) to filter patients' appointment. To query the appointments table, we followed the recommendations from OpenSAFELY by creating total appointments using 'seen' as well as 'arrived, 'in progress', finished', 'visit', 'waiting', and 'patient walked out' [33]. Appointment records from the OpenSAFELY-TPP appointments table were counted for each patient and utilised as denominator for the consultation data.

Covariates:

Patients' age was categorised into five age bands 18 to 49 years, 50 to 64 years, 65 to 74 years, 75 to 84 years, and 85+ years. Gender was categorised as Women and Men. Ethnicity was grouped into the Office for National Statistics' higher-level categories as "Asian, Asian British, Asian Welsh", "Black, Black British, Black Welsh, Caribbean or African", "Mixed or Multiple", "White", "Other ethnic group". Deprivation status was based on scores from the English Index of Multiple Deprivation (IMD). Although it was initially intended to investigate point changes in IMD scores, we defined area deprivation using IMD quintiles (quintile 1 — most deprived; quintile 5 — least deprived) due to processing capacity of the OpenSAFELY platform.

Statistical Procedures

Software and Reproducibility:

Data management was performed using Python 3.8, with analysis carried out using R version 4.3.1. Researchers with OpenSAFELY data access agreements can write and execute code for data management and data analysis without direct access to the underlying raw pseudonymised patient data, and to review the outputs of this code. Statistical codes are written on a local machine and pushed to the OpenSAFELY workflow via GitHub to be tested using dummy data for operational errors. Once checked the codes can be run against the OpenSAFELY-TPP database held securely on their platform OpenSAFELY jobsite (https://jobs.opensafely.org/event-log/). All code for the full data management pipeline — from raw data to completed results for this analysis is available for review at (https://github.com/opensafely/digital-access-to-primary-care). Live information about projects and analysis running on the jobsite can be viewed publicly. The data management and analysis code for this paper was led by Dr Abodunrin Aminu and contributed to by Dr David Sinclair.

Statistical analysis:

Descriptive statistics were used to investigate the monthly frequency of remote consultations and appointments over the study period. The proportions of remote consultations were plotted using line graphs to visualise changes in monthly remote consultations by total appointments. This was achieved by dividing total remote consultations recorded in each month by the total number of appointments in the same month across the entire study period. To contextualise the results in terms of population size, the total number of consultations made during the study period was compared alongside with the size of the England adult population by age-group. We conducted binomial regression with marginal effects to quantify variations in the probability of remote consultations. The proportion of remote consultations were derived by dividing remote consultations by the total appointments for the periods 23 March 2019 – 22 March 2020, 23 March 2020 – 22 March 2021, 23 March 2021 – 22 March 2022. Marginal effects are a method of calculating results as differences in probabilities [34]. After fitting the binomial models, we calculated the marginal (effect) probabilities using average adjusted predictions in R’s marginal effects library. The probabilities were based on best-fit logistic regression, incorporating age, gender, ethnicity, area deprivation and time-period. The interactions of time-period with age, gender, ethnicity, and area deprivation were evaluated. Outputs are reported as Odds Ratios (ORs) and probability (proportion) with 95% confidence intervals (CIs).

Results

1. **Frequency of remote consultations and total appointments during the period 2019 to 2022**

Tables 1 and 2 show the numbers of remote consultations and total appointments for each of the three years in the study period. Remote consultations accounted for 23.9% of the overall appointments in the study period (Table 1). The annual number of remote consultations increased from 10 million remote consultations in the pre-pandemic period to 32 million in the pandemic years – an increase of over 200% (Table 2). Initially, there was a drop in the total number of appointments in the first year of the pandemic, possibly owing to reduced number of face-to-face appointments. However, the total number of appointments increased by 16% between March 2021 and February 2022, compared to the pre-pandemic period. The 85+ year olds had the lowest crude numbers of remote consultations and total appointments across the study periods despite having the highest proportion of remote consultations pre-pandemic (Table 2).

Table 1: Combined numbers of remote and total primary care appointments by patients in OpenSAFELY, from 23 March 2019 to 22 March 2022. Numbers rounded to the nearest thousand.

Group	Remote (1000s)	Total (1000s)	Percentage remote (%)
Age			
18-49	30 564	115 407	26.5
50-64	17 456	75 740	23.0
65-74	10 977	53 598	20.5
75-84	9 560	44 368	21.5
≥85	5 323	20 289	26.2
Gender			
Women	46 709	188 101	24.8
Men	27 172	121 303	22.4
Ethnicity			
Asian or Asian British	4 052	18 742	21.6
Black or Black British	1 316	5 685	23.1
Mixed	695	2 810	24.7
Other Ethnic Groups	727	3 184	22.8
White	50 568	212 897	23.8
(missing)	(16 524)	(66 085)	(25.0)
Deprivation quintile			
Most deprived	14 435	58 947	24.5

2nd	14 426	58 625	24.6
3rd	15 485	64 021	24.2
4th	14 438	61 275	23.6
Least deprived	12 715	57 083	22.3
(missing)	2 382	9 453	25.2
Total	73 881	309 403	23.9

Overall, the proportion of remote consultations relative to total primary care appointments has varied throughout the study duration. Specifically, the proportion of remote consultations rose from 10.2% before the pandemic to 34.1% and 27.2% in the first and second years of the pandemic respectively (Table 2).

Table 2: Number of remote and total primary care appointments by patients in OpenSAFELY, from 23 March 2019 to 22 March 2022. Numbers rounded to the nearest thousand.

	Mar 2019 – Mar 2020			Mar 2020 – Mar 2021			Mar 2021 – Mar 2022		
Group	Remote (1000s)	Total (1000s)	Percentage remote (%)	Remote (1000s)	Total (1000s)	Percentage remote (%)	Remote (1000s)	Total (1000s)	Percentage remote (%)
Age									
18-49	3 908	36 984	10.6	13 516	35 714	37.8	13 140	42 709	30.8
50-64	2 261	23 851	9.5	7 724	23 403	33.0	7 471	28 487	26.2
65-74	1 541	17 685	8.7	4 891	16 412	29.8	4 545	19 501	23.3
75-84	1 427	14 118	10.1	4 226	13 836	30.5	3 908	16 414	23.8
≥85	895	6 102	14.7	2 355	6 649	35.4	2 074	7 538	27.5
Gender									
Women	6 316	59 637	10.6	20 658	58 710	35.2	19 735	69 754	28.3
Men	3 715	39 103	9.5	12 054	37 304	32.3	11 403	44 896	25.4
Ethnicity									
Asian or Asian British	535	5 810	9.2	1 771	5 688	31.1	1 745	7 243	24.1
Black or Black British	171	1 751	9.8	580	1 765	32.9	565	2 170	26.0
Mixed	86	844	10.1	303	877	34.5	307	1 090	28.2
Other Ethnic Groups	86	981	8.8	308	940	32.7	333	1 264	26.4
White	6 580	66 326	9.9	22 164	65 834	33.7	21 823	80 737	27.0

(missing)	2 573	23 029	11.2	7 586	20 910	36.3	6 365	22 146	28.7
Deprivation quintile									
Most deprived	1 973	18 678	10.6	6 380	18 387	34.7	6 082	21 881	27.8
2nd	1 987	18 626	10.7	6 390	18 241	35.0	6 048	21 758	27.8
3rd	2 133	20 451	10.4	6 856	19 857	34.5	6 495	23 713	27.4
4th	1 957	19 669	9.9	6 383	18 943	33.7	6 098	22 663	26.9
Least deprived	1 680	18 427	9.1	5 665	17 648	32.1	5 370	21 008	25.6
(missing)	301	2 889	10.4	1 037	2 937	35.3	1 044	3 626	28.8
Total	10 031	98 740	10.2	32 712	96 014	34.1	31 139	114 649	27.2

Table 3 shows the total consultations between March 2019to March 2022 by age-group (1000s) and population size by age-group (2021 Census).

Table 3: Total consultations March 2019to March 2022 by age-group (1000s) and population size by age-group (2021 Census)				
	Total Consultations March 2019-March 2022		2021 Census Population data	
	Consultations (1000s)	Percentage of consultations by age-group	Population by age-group	Percentage in age-group
18-49	115,407	37.3%	24,533,915	53.7%
50-64	75,740	24.5%	11,608,075	25.4%
65-74	53,598	17.3%	5,923,115	13.0%
75-84	44,368	14.3%	2,171,788	4.7%
85+	20,289	6.6%	1,454,740	3.2%
Total	309,402		45,691,633	

The England 2021 census identified that there were some 45.7 million adults aged as shown in Table 3. Between 2019 and 2022, whilst 53.7% of the adult (18+) population is aged 18-49 this age-group made 37.3% of the consultations identified in our study. Conversely 85+ year olds made up 3.2% of the adult population but had 6.6% of the consultations, and 75-84 year olds make up 4.7% of the population but made 14.3% of the consultations. However, it must be noted that the TPP data does not cover the total England population: they receive data from approximately 40% of practices and 19 million patients. The proportions in each age-group cell of Table 3 are important to note when interpreting the absolute numbers of consultations.

2. Trends in the remote consultations

In this section we describe the trends in remote consultations observed, before turning in the subsequent section to fuller statistical analysis. Figures 1 to 4 show the monthly proportion of remote consultations to total appointment by patients' age, gender, ethnicity and deprivation quintiles. Figure 1 shows the monthly proportion of appointments conducted remotely between 23 March 2019 and 22 March 2022 by age. Prior to the pandemic, the proportion of remote consultations stood at around 10% for most age categories, except for those aged 85 years and above, which recorded a slightly higher proportion of 13.5%.

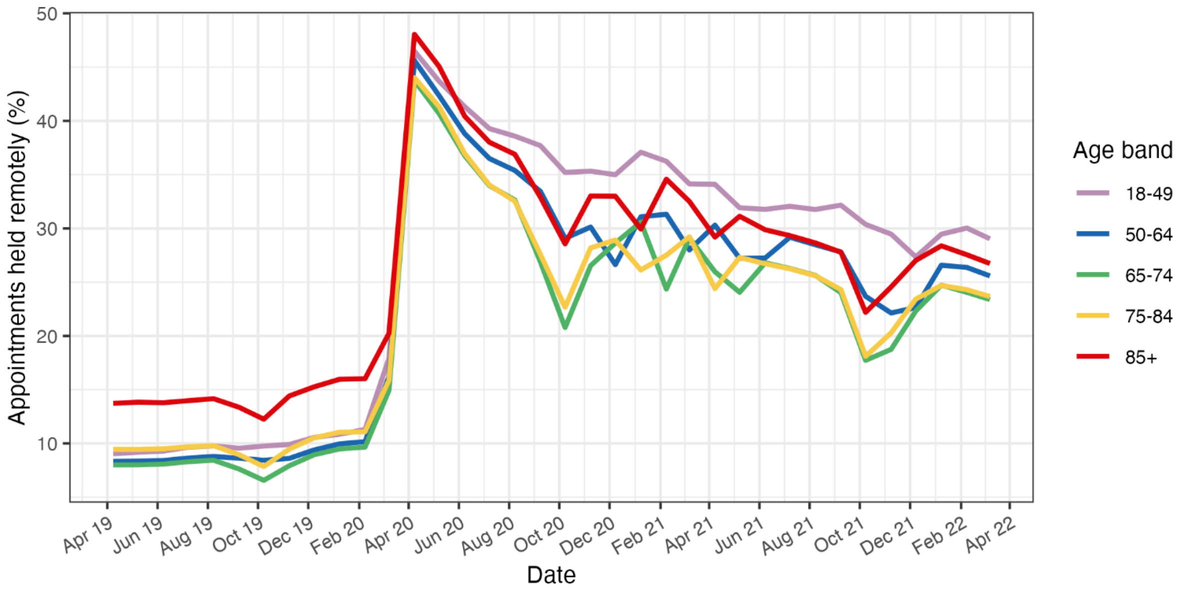

Figure 1: Monthly proportion of remote consultations by age-group (23 March 2019 to 22 March 2022).

With the onset of the pandemic, the proportion of remote consultations experienced a surge, reaching peak levels of 43-48% across all age groups in March 2020, coinciding with the initial national lockdown in the UK. Subsequently, although the proportions gradually declined in the ensuing months, they did not revert to pre-pandemic levels by February 2022. Instead, they reached approximately 25-30% for all age groups post-pandemic. Notably, since the beginning of the pandemic, the age group of 18-49 years consistently exhibited the highest proportion of remote consultations.

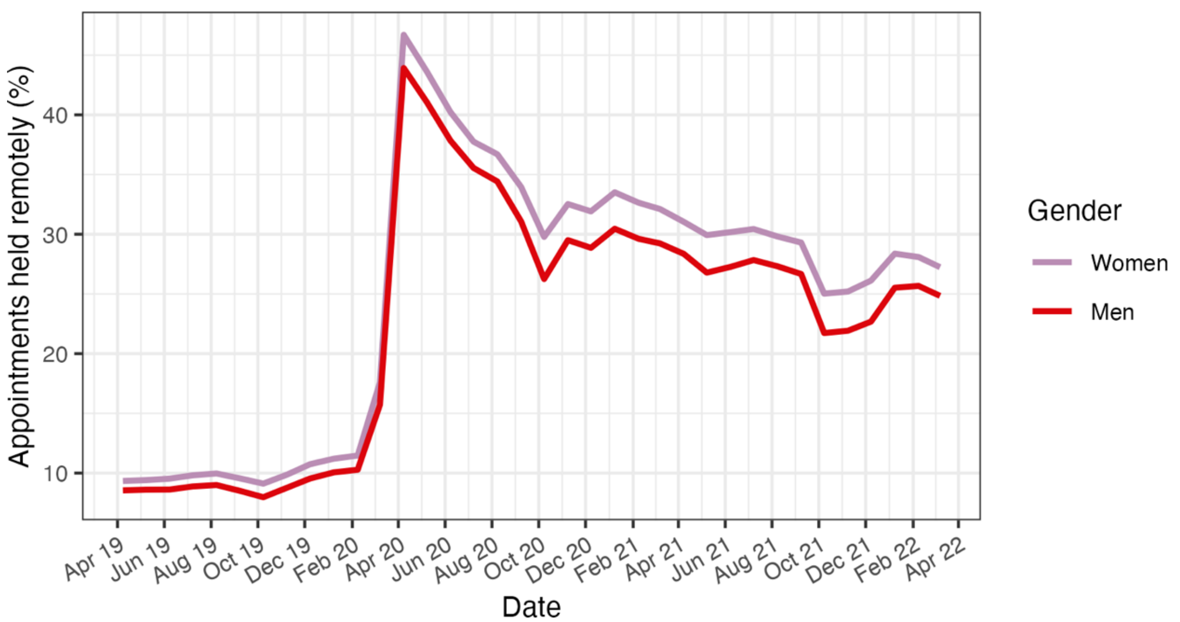

Figure 2: Monthly proportion of remote consultations by gender (23 March 2019 to 22 March 2022)

We observed pre-pandemic proportion of remote consultations to be between 9-11% for both genders (Figure 2), with women having slightly more remote consultations than men. The upward trend in the proportion of remote consultations occurred in March 2020, coinciding with the onset of the initial lockdown period, with proportions surging to 44% for men and 47% for women. Subsequently, there was a decline in proportions in the following months until September 2020, after which they stabilised. From then until February 2022, remote consultations remained relatively steady for both genders, with women consistently having a greater proportion of remote consultations than men.

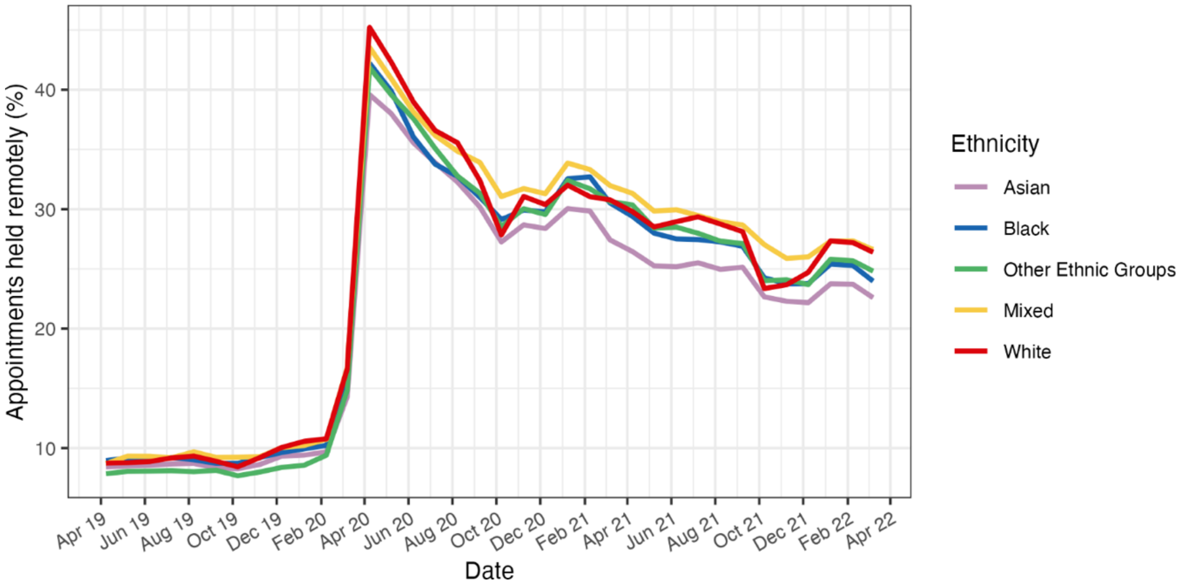

Figure 3: Monthly proportion of remote consultations by ethnicity (23 March 2019 to 22 March 2022).

At the outset of the pre-pandemic period (March 2019), the proportion of remote consultations stood at less than 12% across all ethnic groups (Figure 3). However, a surge in the proportion of remote consultation occurred for patients of all ethnic backgrounds in March 2020, with the white ethnic group registering the highest overall proportion at 45%. Subsequently, patients with a mixed ethnic background experienced the highest proportion of remote consultations, while the Asian group recorded the lowest proportion. Throughout the pandemic period up to March 2022, the proportion of remote consultations remained elevated for all ethnic groups compared to the pre-pandemic period.

Figure 4: Monthly proportion of remote consultations by area deprivation quintiles. Area deprivation measured by Index of Multiple Deprivation (23 March 2019 to 22 March 2022).

Figure 4 illustrates the trends in remote consultations by deprivation status. As with other variables, a surge happened in March 2020, settling into a relatively stable, higher than pre-pandemic, level of remote consultations. Patients in the most deprived quintile consistently exhibited the highest proportion of remote consultations both before and during the pandemic period analysed. Throughout the pandemic until February 2022, remote consultations remained elevated for patients across all deprivation quintiles compared to the pre-pandemic period.

3. Probability of remote consultation

The probability of a remote consultation was determined for each age group, gender, ethnicity, and deprivation quintile. Details of the odds ratio from the regression model and the marginal effect probabilities can be found in Appendix II (Tables 1-5). Horizontal bars on the dots indicate the 95% confidence interval. The probability of a person aged 85+ having a remote consultation was p=0.133 [95%CI 0.132 to 0.133] in the March 2019 – March 2020 period, greater than any of the other age groups (Figure 5, and Table 1 in Appendix II).

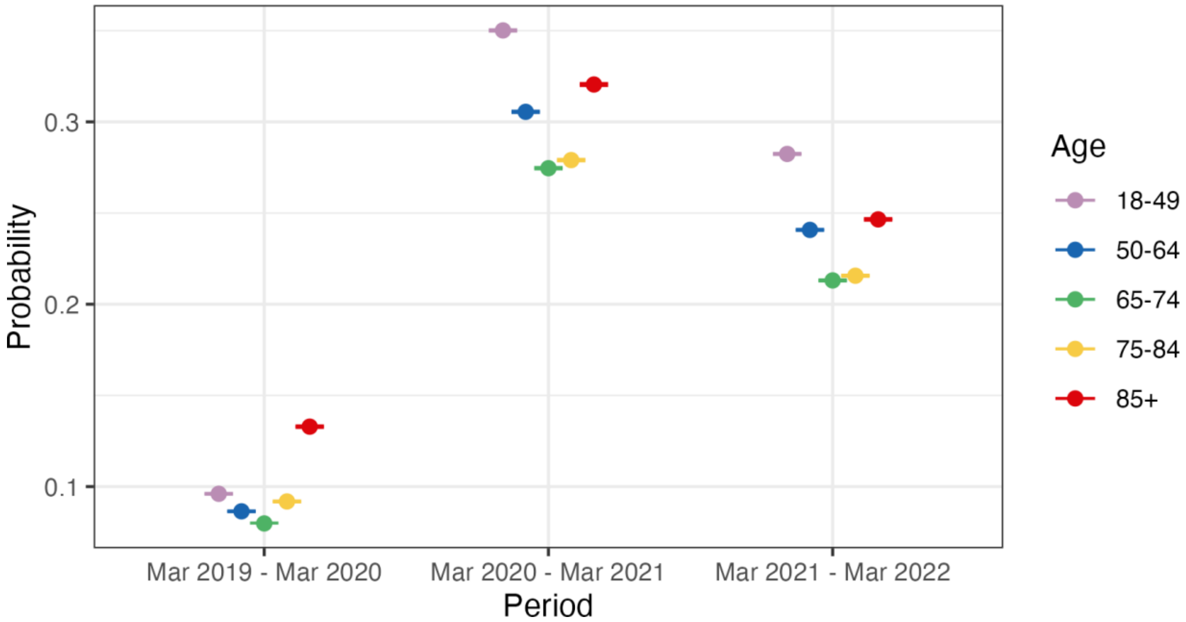

Figure 5: Probability of a consultation being held remotely by age group and time-period (23 March 2019 to 22 March 2022).

In the first year of the pandemic (March 2020 – March 2021) 18-49 years were most likely to have remote consultations p=0.350 (95%CI 0.350 to 0.351), with people aged 85+ the second most likely p=0.321 (95%CI 0.320 to 0.321). A U-shaped association with age emerged, with the youngest and oldest groups more likely to have a consultation held remotely than 50–64 year olds, 65-74 years old and 75-84 year olds in the first pandemic year. The U-shaped association holds in the second pandemic year (March 2021 to March 2022), but the probabilities drop for all age groups. As shown in Table 1 (Appendix II), we found 85+ year olds to have the lowest rise (11 points) in the probability of remote consultations from March 2019 to March 2022 (p=0.133, 95% CI 0.133 to 0.133 to p=0.247, 95% CI 0.246 to 0.247) compared to the 19 points rise among the 18-49 year olds (p=0.096, 95% CI 0.096 to 0.096 to p=0.282, 95% CI 0.282 to 0.283), the 15 points rise among the 50-64 year olds (p=0.086, 95% CI 0.086 to 0.087 to p=0.241, 95% CI 0.241 to 0.241), the 13 points rise among 65-74 years (p=0.08, 95% CI 0.08 to 0.08 to p=0.213, 95% CI 0.213 to 0.213) and the 12 points rise among the 75-84 years (p=0.092, 95% CI 0.092 to 0.092 to p=0.216, 95% CI 0.215 to 0.216).

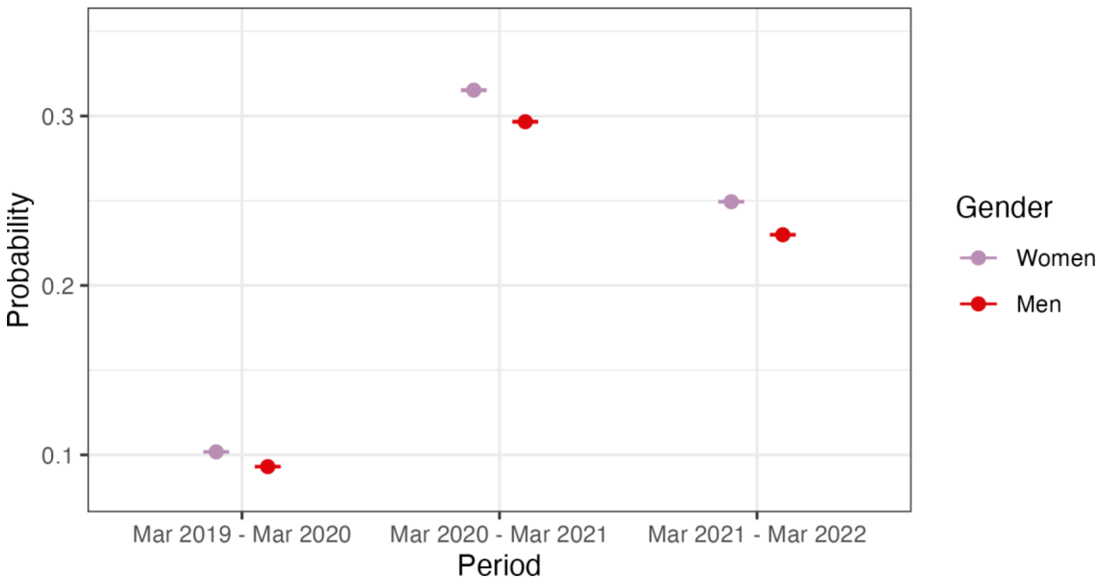

Figure 6: Probability of remote consultations by gender and time-period (23 March 2019 to 22 March 2022).

Women were consistently more likely than men to have consultations held remotely (Figure 6, and Table 2 in Appendix II). The probability of women having remote consultations in the period March 2019 to March 2020 was p=0.102 (95%CI 0.102 to 0.102) compared to p=0.0930 (95% CI 0.093 to 0.093) for men. This pattern was sustained in the pandemic years as women had a probability of remote consultations p=0.315 (95% CI 0.315 to 0.316) and p=0.249 (95% CI 0.249 to 0.250) compared to men p=0.297 (95% CI 0.296 to 0.297) and p=0.230 (95% CI 0.230 to 0.230) in periods March 2020 to March 2021 and March 2021 to 2022 respectively. This indicates the relative differences between women and men are very similar throughout the three years analysed.

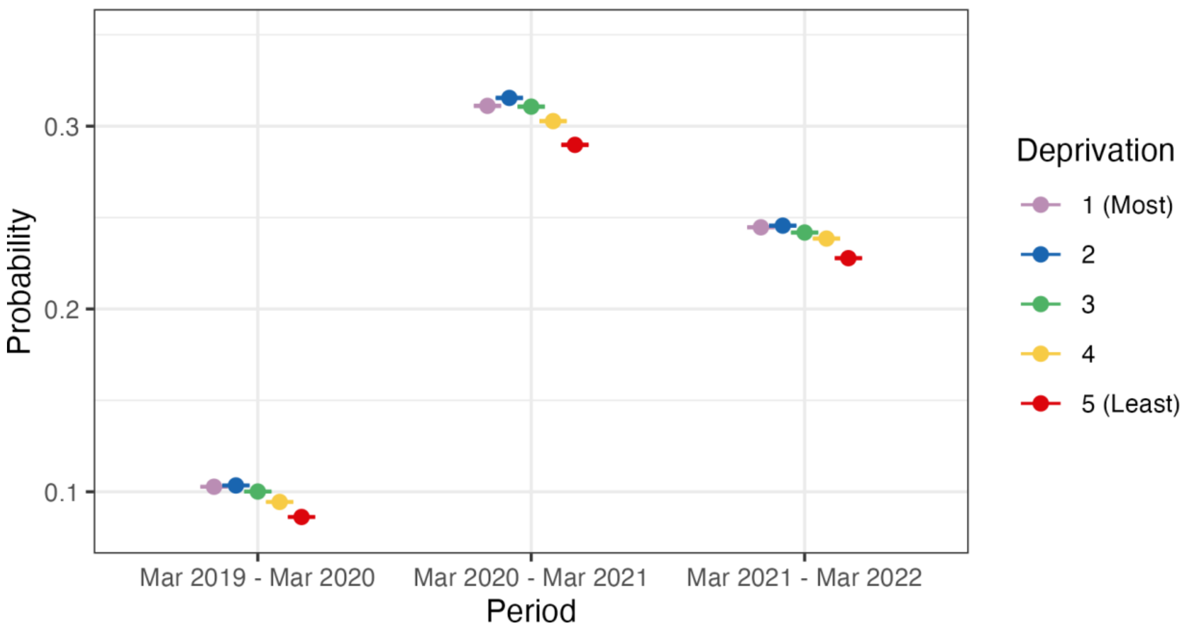

Figure 7: Probability of remote consultations by deprivation quintile status and time-period (23 March 2019 to 22 March 2022).

People living in the two most deprived area quintiles were the most likely to have a consultation held remotely in all three years (Figure 7, and Table 3 in Appendix II). People in the least deprived areas were the least likely. However, the relative difference between the most and least deprived groups decreased from before to during the pandemic (Table 3 in Appendix II). Before the pandemic, the probability of the most deprived people having a consultation held remotely was p=0.103 (95% CI 0.103 to 0.103) compared to p=0.086 (95% CI 0.086 to 0.086) for the least deprived. During the first year of the pandemic those in the 2nd deprivation quintile had the highest probability of remote consultations p=0.315 (95% CI 0.315 to 0.316) while the least deprived quintile had the lowest probability p=0.29 (95% CI 0.29 to 0.29). Similar differences in the probability of remote consultations between the deprivation quintiles continued in the second year of the pandemic.

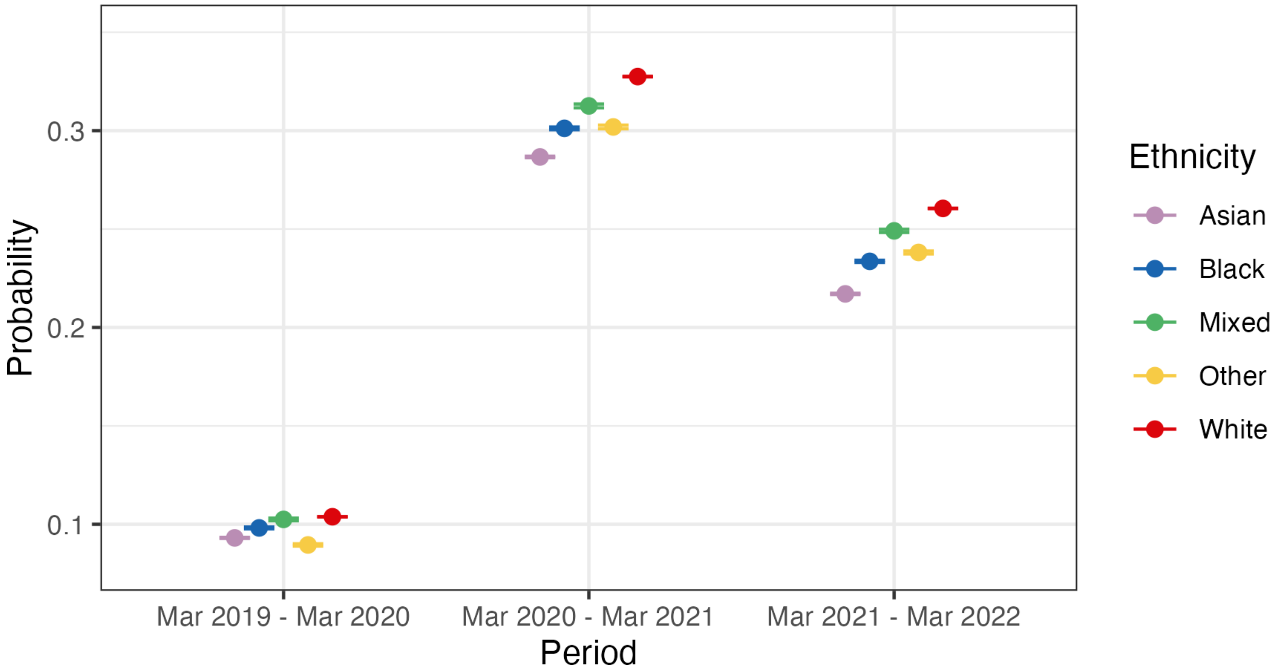

Figure 8: Probability of remote consultations by ethnicity and time-period (23 March 2019 to 22 March 2022).

Figure 8 presents the probability of remote consultations for different ethnicities. In each of the three years analysed, white people were the ethnic group most likely to have a consultation held remotely. In both years of the pandemic, people who are Asian, Black or have a Mixed ethnic background had a smaller relative increase in the probability of a remote consultation than people who are White (Table 4 in Appendix II). For instance, people who are white had 22 points increase in remote consultations from period March 2019 to 2020 to period March 2020 to 2021 (p=0.104, 95% CI 0.104 to 0.104 to p=0.328, 95% CI 0.327 to 0.328) than people who are Asian with a 19 points rise (p=0.093, 95% CI 0.093 to 0.093 to p=0.287, 95% CI 0.286 to 0.287); people who are Black with a 20 points rise (p=0.098, 95% CI 0.098 to 0.099 to p=0.301, 95% CI 0.301 to 0.302); people from other ethnic backgrounds with a 21 points rise (p=0.090, 95% CI 0.089 to 0.090 to p=0.302, 95% CI 0.301 to 0.303); and people with a Mixed background with 21 points rise (p=0.103, 95% CI 0.102 to 0.103 to p=0.313, 95% CI 0.312 to 0.314).

Discussion

In this feasibility study, we investigated the patterns and variations in remote consultations prior to and during the COVID-19 pandemic using TPP electronic health records via the OpenSAFELY research platform. Pre-pandemic, whilst 85+ year olds had the least overall number of remote consultations of all adult age-groups, they also had the highest proportion of a remote consultation (13%). In the pandemic years, the probability of remote consultation increased for all age groups with those age 18-49 years having highest proportion and those age 85+ having the second highest proportion. In terms stratification by population size, the 85+ year olds who make up 3.2% of the population had 6.6% of the remote consultations, while the 75-84 year olds make up 4.7% of the population but made 14.3% of the consultations. Men were less likely to have remote consultations compared to women pre-pandemic and in the two years following the pandemic start. Prior to the pandemic, people from the two most deprived quintiles (IMD 1&2) had higher probabilities of remote consultations (0.103 and 0.104, respectively) compared to the least deprived quintiles (IMD 4&5, 0.094 and 0.086. respectively). This trend was maintained through the first two years of the pandemic with the most deprived group being more likely to have remote consultations.

Increasing age has been associated with increased risk of multiple-morbidity, frailty, long-term chronic conditions, and healthcare utilisation [35-36]. Research has shown that some older adults are likely to experience difficulties with activities of daily living, including transportation and mobility challenges, due to health conditions [37-39]. Where remote consultations are available, it is likely to facilitate healthcare access for this group. Even though the 85+ year olds in our study had the fewest total number of appointments and were also the smallest age stratum of any age group, they were most likely to have a remote consultation before the pandemic. There is a possibility that this high proportion of remote consultations relates to the consultations being made by proxies either for older people living in their own homes/community or for those in residential care, which cannot be substantiated due to inadequate meta-data from TPP. Despite the increase in total appointments overall, our findings suggest that digitalisation of primary care services during the pandemic have favoured the younger age groups more in terms of facilitating remote consultations. It is crucial to continuously observe the trends in remote consultations to avoid a potential digital gap in the provision of primary care to the most vulnerable groups.

Women had a higher proportion of remote consultations compared to men. Men are less likely to seek primary care in the first place, so perhaps tend to seek care when things are more severe and thus more likely to benefit from face-to-face assessment [40]. Because men attend so irregularly, when they do attend, GPs might prioritise face-to-face appointments to allow for screenings such as blood pressure checks. Alternatively, some regular appointments for women, such as contraceptive or

Hormone Replacement Therapy (HRT) reviews, can be effectively managed over the phone [41]. Our findings on gender differences in remote consultation align with existing research indicating gender-based disparities in healthcare-seeking behaviour, with women generally being more proactive in seeking medical advice and accessing healthcare services [41,42]. The higher prevalence of remote consultations among women may be attributed to these established gender differences in health-seeking patterns, where women tend to consult healthcare professionals more frequently than men [42].

Socioeconomic inequality is a risk factor for healthcare access [43-45]. Research has shown that there are fewer GPs per person in deprived areas in England [46]. We found that people from more deprived socioeconomic areas were more likely to engage in remote consultations compared to those from less deprived backgrounds. Socioeconomically disadvantaged individuals often face multiple barriers to accessing healthcare services, including limited financial resources, transportation challenges, and reduced availability of healthcare facilities and staff in their communities. For example, because of staffing pressures, GPs that are present in more deprived areas may need to decrease the time spent per patient to treat their patient population, and this might be more efficiently done using telephone appointments. Although, it is seeming favourable that socioeconomically disadvantaged patients were more likely to have remote consultations, it would be interesting to have more granular assessment of how this has impacted patients with specific health conditions (out of scope of the present study). This is important considering that social deprivations are linked to more serious health conditions [47,48] that might warrant face to face appointments.

The analyses presented in this report is not without certain caveats or limitations. It is important to note that some assumptions have been made about the TPP data. An assumption that there was no change in practices by patients during the study period, as appointment data are currently not carried forward when a patient changes their practice to another using a different EHR provider, or when a practice changes EHR provider. There is recent guidance from OpenSAFELY to identify patients who have a continuous practice registration, but this cannot meet the timeline of the present study (Appendix III). There was also lack of clarity on what constitutes the total appointment data and the trigger of ‘seen’ patients. If an appointment was recorded multiple times under different appointment statuses, it was impossible to identify this because of the insufficient metadata provided by TPP. However, given that the appointment data was used as a denominator it was unlikely to impact the proportions found.

As this was a feasibility study, the impact of remote consultations on patient health outcomes was not examined. Additionally, there was no data available to investigate the potential causes of the observed patterns in remote consultations. Further quantitative and qualitative research is required to explore these aspects. Our study is strengthened by the ability to access large EHR data in England via OpenSAFELY, allowing us to examine trends in remote consultations. Furthermore, the observed trends and patterns in remote consultations are consistent with the NHS England digital appointment data for the same period (Appendix IV). This alignment provides valuable insights into the differences in remote consultation usage between older adults and the younger age group.

Conclusion

Increased use of digital services is part of an NHSE policy for improving access to primary care and aligns with government policy for a national transition to digital telephony scheduled for completion in 2025. There are some concerns that a transition to digital services in primary care may exclude access for some older people. We found that 85+ year olds had largest proportion of remote consultations pre-pandemic but younger adults were more likely to have remote consultations during the first two years of the pandemic. There is also a persistent gender-gap in remote consultations, and differences by ethnicity and deprivation status. Whilst our findings show that there were significant variations in remote consultations during the pandemic, digitalisation may also have contributed to a greater number of appointments overall, potentially reducing barriers to primary care. Further research is warranted to examine the impact of these variations on health outcomes and OpenSAFELY as a platform for conducting such analysis is feasible.

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Appendices

Appendix I: Coding framework in OpenSAFELY

Coding Frameworks: https://www.opencodelists.org/codelist/user/KatieDavies_1234/virtual-consultation/17b2bb3d/#full-list
In primary care EHR systems, information about patients is collected using clinical coding ontologies such as the Systematised Nomenclature of Medicine - Clinical Terms (SNOMED-CT). The TPP system is compliant with SNOMED, and general practitioners (GPs) utilise it in their front-end interactions with EHR systems having formerly utilised Clinical Terms version 3 (CTV3) before the NHS-wide standard was adopted. OpenSAFELY can query the records using either CTV3 or SNOMED, which allows flexibility to examine past activity that cannot be easily mapped to SNOMED CT. Although there was a paucity of existing nationally standardised codelists for activity associated with online consultation systems, we found SNOMED codes from the NHS England digital publication that could be utilised to investigate consultation events. To determine clinical events relating to consultation, SNOMED codes for face-to-face codelists and virtual consultation type were identified by searching relevant terms using the SNOMED CT browser. Two authors independently determined which of the codes were relevant. Where there was disagreement, a consensus was agreed through discussion. Failed and future planned encounters were excluded. Triage was included where undertaken by a clinician. Relevant SNOMED codes were inputted into the OpenSAFELY platform, OPENCODE LIST (https://www.opencodelists.org/). Additional relevant codes were selected from code tree hierarchies. The OpenSAFELY Codelists is an open platform for creating and sharing codelists of clinical terms and drug. Most studies in OpenSAFELY - and other health data research utilises the codelists - to select patients with activities and conditions of interest within the dataset(s) being used. By authors independently reviewing the relevance of virtual consultation type codes and using consensus where there was disagreement, we aim to have comprehensively selected reflective virtual consultations within primary care. However, challenges in categorising occur. Where SNOMED codes were originally produced for clinical documentation, not all codes are specific for consultation type. Additionally, there is variation in clinical coding by individual and by practice. Further work could be performed to standardise coding to more effectively evaluate clinical practice. We excluded consultations which occurred primarily with relatives/carers as our study focused on consultation types with older adults, where this may have excluded those most predisposed to digital exclusion. We excluded codes for telehealth monitoring where it was unclear a clinical encounter had taken place, although this may have underrepresented virtual consultation.

Appendix II: Tables 1 to 5 showing the probabilities and Odds ratio of remote consultations.

Table 1: Probability of a consultation being remote by age group and date.

Period	Age	Estimate	95% CI
23 Mar 2019 – 22 Mar 2020	18-49	0.0960	[0.0958-0.0963]
23 Mar 2019 – 22 Mar 2020	50-64	0.0864	[0.0862-0.0867]
23 Mar 2019 – 22 Mar 2020	65-74	0.0798	[0.0796-0.0800]
23 Mar 2019 – 22 Mar 2020	75-84	0.0918	[0.0916-0.0921]
23 Mar 2019 – 22 Mar 2020	85+	0.1329	[0.1324-0.1333]
23 Mar 2020 – 22 Mar 2021	18-49	0.3501	[0.3498-0.3505]
23 Mar 2020 – 22 Mar 2021	50-64	0.3055	[0.3051-0.3059]
23 Mar 2020 – 22 Mar 2021	65-74	0.2746	[0.2742-0.2750]
23 Mar 2020 – 22 Mar 2021	75-84	0.2790	[0.2786-0.2794]
23 Mar 2020 – 22 Mar 2021	85+	0.3205	[0.3200-0.3210]
23 Mar 2021 – 22 Mar 2022	18-49	0.2824	[0.2821-0.2827]
23 Mar 2021 – 22 Mar 2022	50-64	0.2408	[0.2405-0.2411]
23 Mar 2021 – 22 Mar 2022	65-74	0.2131	[0.2127-0.2134]
23 Mar 2021 – 22 Mar 2022	75-84	0.2156	[0.2153-0.2159]
23 Mar 2021 – 22 Mar 2022	85+	0.2465	[0.2461-0.2470]

Table 2: Probability of a consultation being remote by gender and date			
Period	Gender	**Estimate**	**95% CI**
23 Mar 2019 – 22 Mar 2020	Women	0.1018	[0.1015-0.1020]
23 Mar 2019 – 22 Mar 2020	Men	0.0930	[0.0928-0.0933]
23 Mar 2020 – 22 Mar 2021	Women	0.3153	[0.3149-0.3156]
23 Mar 2020 – 22 Mar 2021	Men	0.2966	[0.2963-0.2970]
23 Mar 2021 – 22 Mar 2022	Women	0.2494	[0.2492-0.2497]
23 Mar 2021 – 22 Mar 2022	Men	0.2299	[0.2296-0.2302]

Table 3: Probability of a consultation being remote by area deprivation quintile and date.

Period	**Deprivation quintile**	**Estimate**	**95% CI**
23 Mar 2019 – 22 Mar 2020	1 (Most)	0.1028	[0.1025-0.1030]
23 Mar 2019 – 22 Mar 2020	2	0.1035	[0.1032-0.1037]
23 Mar 2019 – 22 Mar 2020	3	0.1001	[0.0999-0.1004]
23 Mar 2019 – 22 Mar 2020	4	0.0944	[0.0942-0.0947]
23 Mar 2019 – 22 Mar 2020	5 (Least)	0.0862	[0.0860-0.0864]
23 Mar 2020 – 22 Mar 2021	1 (Most)	0.3111	[0.3107-0.3115]
23 Mar 2020 – 22 Mar 2021	2	0.3154	[0.3151-0.3158]
23 Mar 2020 – 22 Mar 2021	3	0.3107	[0.3103-0.3111]
23 Mar 2020 – 22 Mar 2021	4	0.3028	[0.3024-0.3031]
23 Mar 2020 – 22 Mar 2021	5 (Least)	0.2898	[0.2894-0.2902]
23 Mar 2021 – 22 Mar 2022	1 (Most)	0.2447	[0.2444-0.2450]
23 Mar 2021 – 22 Mar 2022	2	0.2456	[0.2453-0.2459]
23 Mar 2021 – 22 Mar 2022	3	0.2418	[0.2415-0.2421]
23 Mar 2021 – 22 Mar 2022	4	0.2385	[0.2382-0.2388]
23 Mar 2021 – 22 Mar 2022	5 (Least)	0.2278	[0.2275-0.2281]

Table 4: Probability of a consultation being remote by ethnic group and date.

Period	Ethnicity	Estimate	95% CI
23 Mar 2019 – 22 Mar 2020	Asian	0.0931	[0.0928-0.0933]
23 Mar 2019 – 22 Mar 2020	Black	0.0981	[0.0977-0.0986]
23 Mar 2019 – 22 Mar 2020	Other	0.0895	[0.0889-0.0901]
23 Mar 2019 – 22 Mar 2020	Mixed	0.1025	[0.1018-0.1031]
23 Mar 2019 – 22 Mar 2020	White	0.1038	[0.1037-0.1039]
23 Mar 2020 – 22 Mar 2021	Asian	0.2866	[0.2863-0.2870]
23 Mar 2020 – 22 Mar 2021	Black	0.3012	[0.3005-0.3019]
23 Mar 2020 – 22 Mar 2021	Other	0.3019	[0.3010-0.3028]
23 Mar 2020 – 22 Mar 2021	Mixed	0.3126	[0.3116-0.3135]
23 Mar 2020 – 22 Mar 2021	White	0.3275	[0.3273-0.3276]
23 Mar 2021 – 22 Mar 2022	Asian	0.2171	[0.2168-0.2174]
23 Mar 2021 – 22 Mar 2022	Black	0.2336	[0.2330-0.2342]
23 Mar 2021 – 22 Mar 2022	Other	0.2381	[0.2374-0.2389]
23 Mar 2021 – 22 Mar 2022	Mixed	0.2491	[0.2483-0.2499]
23 Mar 2021 – 22 Mar 2022	White	0.2605	[0.2604-0.2606]

Table 5: Binomial regression of the proportion of remote consultations including interaction with period			
	Regression model with interactions		
	23 Mar 2019 – 22 Mar 2020[a]	23 Mar 2020 – 22 Mar 2021[b]	23 Mar 2021 – 22 Mar 2022[b]
	Odds OR, [95% CI]	Odds OR, [95% CI]	Odds OR, [95% CI]
Age group			
18-49 years	Ref	Ref	Ref
50-64 years	0.89 [0.88-0.89]	0.91 [0.91-0.92]	0.90 [0.90-0.91]
65-74 years	0.82 [0.81-0.82]	0.86 [0.85-0.86]	0.84 [0.84-0.84]
75-84 years	0.95 [0.94-0.95]	0.75 [0.75-0.76]	0.73 [0.73-0.74]
85+ years	1.44 [1.43-1.44]	0.60 [0.60-0.61]	0.57 [0.57-0.58]
Gender			
Women	Ref	Ref	Ref
Men	0.90 [0.90-0.91]	0.90 [0.90-0.91]	0.99 [0.99-0.99]
Deprivation			
1 (Most)	Ref	Ref	Ref
2	1.00 [1.00-1.01]	1.01 [1.00-1.01]	0.99 [0.99-1.00]
3	0.97 [0.96-0.97]	1.02 [1.02-1.03]	1.01 [1.01-1.02]
4	0.91 [0.90-0.91]	1.05 [1.05-1.06]	1.06 [1.05-1.06]
5 (Least)	0.82 [0.82-0.83]	1.09 [1.09-1.10]	1.10 [1.10-1.11]
Ethnicity			
White	Ref	Ref	Ref
Asian	0.88 [0.88-0.89]	0.93[0.92-0.93]	0.88[0.88-0.89]
Black or Black British	0.94 [0.93-0.94]	0.94[0.93-0.94]	0.92[0.91-0.92]
Other Ethnic Groups	0.84 [0.84-0.85]	1.04[1.03-1.05]	1.04[1.03-1.05]
Mixed	0.98 [0.97-0.99]	0.94[0.93-0.95]	0.95[0.94-0.96]

The regression model:
Proportion of remote consultation (Y) = Age+Gender+Ethnicity+IMD+Period+Age×Period+Gender×Period+Ethnicity×Period+IMD×Period, where Period indicates 23 Mar 2019 – 22 Mar 2020 (=0), 23 Mar 2020 – 22 Mar 2021 (=1), and 23 Mar 2021 – 22 Mar 2022.

a. Main effect
b. Interaction effect

Appendix III: Updated guidelines with use of appointments data on OpenSAFELY

https://docs.opensafely.org/ehrql/reference/schemas/tpp/#appointments [Accessed May 2024]

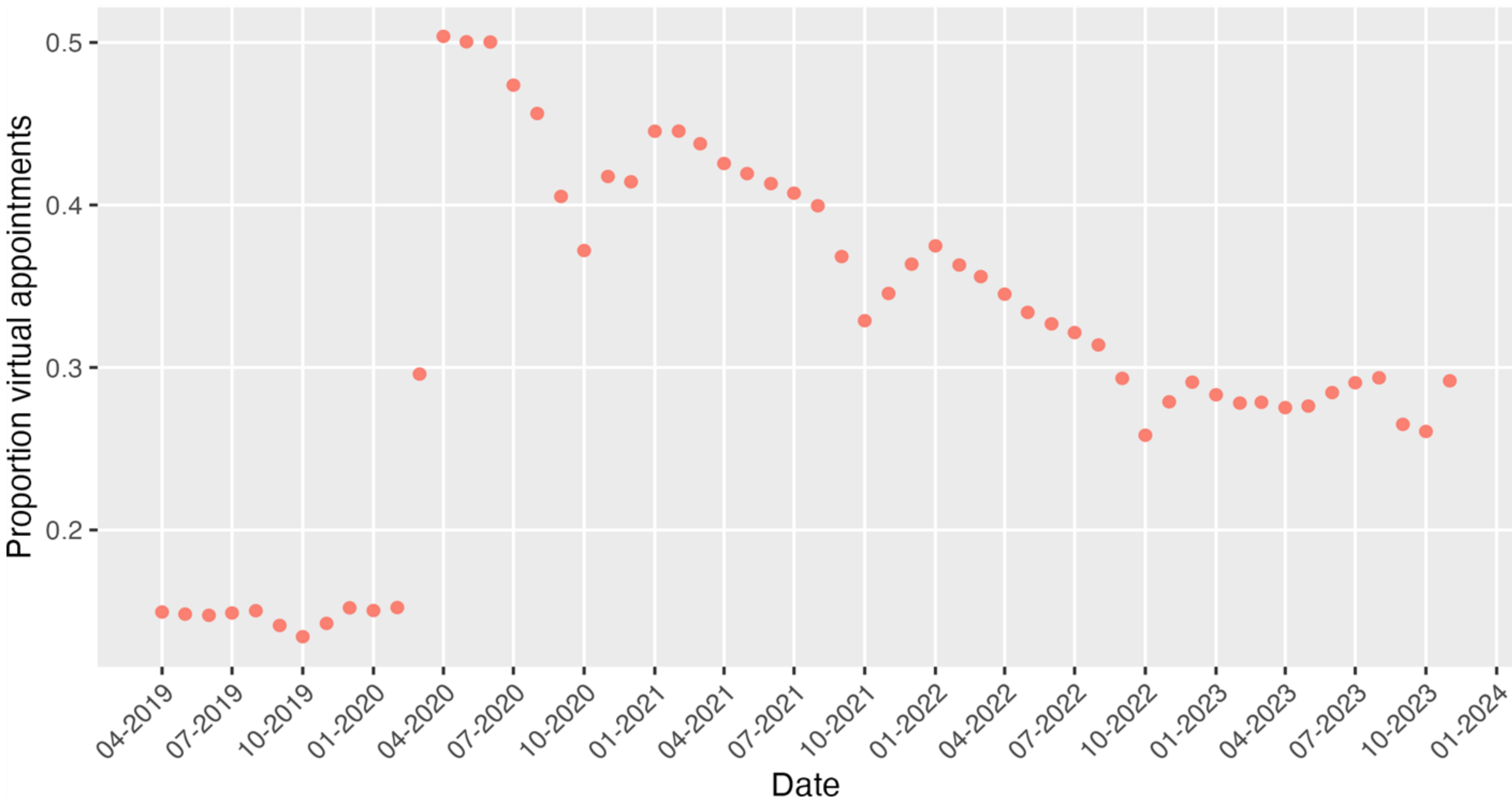
Warning

In TPP this data comes from the "Appointment" table. This table has not yet been well characterised, so there are some issues around how to interpret findings from it. The data contains records created when an appointment is made with a GP practice, but may not capture absolutely all GP/patient interactions, for example it's uncertain whether an ad-hoc call to a patient would be included. There are also duplicate events in the table that we need to better understand.

As a consequence, if you try to use the appointment table, you will see warnings when running your code locally, and failures when the GitHub action tests your code. If you need access to the appointments data, please speak to your OpenSAFELY co-pilot. We will be considering projects on a case by case basis until it can enter the normal stable pool of data.

A **very important** caveat for this data: there are some circumstances where historical appointment records will be incomplete, for example when a patient moves from a practice using a different EHR provider, or when a practice changes EHR provider. If your study could be negatively affected by such missing data, it may be important to use the `practice_registrations.spanning_with_systmone()` method to identify patients which have a suitably continuous practice registration during the study period.

Appendix IV: NHS Digital General Practice (GP) data (2019-2024)



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