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Contacts in general practice during the COVID-19 pandemic: a register-based study

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ABSTRACT

Background: The COVID-19 pandemic has altered the provision of healthcare and expanded telehealth consultations.

Aim: To study the effect of the COVID-19 pandemic on contact patterns in general practice, and to identify patient groups at risk of losing care.

Design and setting: Register-based study in Danish general practice, including daytime and out-of-hours (OOH) services.

Methods: All individuals residing in Denmark from 1 January 2017 to 31 October 2020 were included. We calculated the incidence rate (IR) for six contact types in general practice and adjusted incidence rate ratio (IRR) by comparing the IR in the pandemic period with adjusted expected IR based on IR in the pre-pandemic period.

Results: The number of face-to-face in-clinic consultations declined during the lockdown in March 2020. A subsequent increase in the number of clinic consultations was observed, rising to a level above that of the pre-pandemic period; this increase resulted mainly from the introduction of telehealth consultations. The number of daytime email consultations increased, whereas the number of daytime home visits decreased. Likewise, the number of OOH telephone consultations increased, whereas the number of OOH home visits and clinic consultations decreased. Consultation rates of vulnerable patients, i.e., those with low education, old age, and comorbidity, were most adversely affected by the pandemic. The most adverse impact in OOH clinic consultations was seen for children aged 0-10 years.

Conclusions: New methods are called for to ensure access to general practice for vulnerable patients during a pandemic. The potential of telehealth consultations should be further investigated.

KEYWORDS

Primary health care, general practice, COVID-19, telemedicine, health equity

How this fits in

- The COVID-19 pandemic has altered the provision of healthcare worldwide, and telehealth consultations have to some extent replaced the traditional face-to-face in-clinic consultations to limit the risk of infection.
- A substantial part of in-clinic consultations were substituted with a new type of extended telephone consultations in daytime general practice.
- Video consultations replaced a considerable part of in-clinic consultations in the out-of-hours services, but only a small part of in-clinic consultations in daytime general practice.
- Consultation rates of the most vulnerable patient groups were most adversely affected by the pandemic; this was seen for most contact types.

INTRODUCTION

The COVID-19 pandemic has altered the provision of healthcare. Across the world, telehealth consultations have widely replaced in-clinic consultations because of the risk of spreading severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).¹⁻⁴ Telehealth solutions can be defined as 'remote delivery of healthcare services using information and communication technology'.⁵ They include video consultation (VC), telephone consultation, text/instant messaging, email consultation, and online patient portals.⁶

Several studies have reported lower use of primary and ambulatory care and rapid increases in the use of remote consultations during the early phases of the COVID-19 pandemic.⁷⁻¹⁰ The pandemic and the introduction of virtual care might have caused variations in the healthcare use in the populations,^{9, 10} as VC may constitute a barrier to receiving healthcare for some patients.⁸ Thus, the shift to remote consultations may have exacerbated disparities in the access to healthcare.¹¹⁻¹³ The decline in contacts seemed less pronounced among women, older adults, patients with poor mental health, and patients with high expected

healthcare use.^{9, 10} The greatest decline was seen among parents contacting regarding children and among those with low expected healthcare use.¹⁰ Some delayed care occurred for health problems that could be postponed without harm, but some patients may still have faced complications due to delayed treatment of acute medical issues or insufficient management of chronic illness.¹⁴ Even though these studies add relevant knowledge, most focus on regional daytime care. The national registers in Denmark enable us to study the entire population during both daytime and outside office hours. More insight into the implications of the COVID-19 and the introduction of virtual care is needed to optimise future healthcare provision. Moreover, we need to gain more knowledge on how to use these new telehealth possibilities in the best way in general practice.

This study aims to explore the effect of the COVID-19 pandemic on contact patterns in general practice in Denmark and to identify patient groups at risk of losing care.

METHOD

Design and population

We conducted a register-based time series study, including all Danish residents from 1 January 2017 to 31 October 2020. The number of contacts to general practice during 2017-2019 was compared to the number of contacts during the first months of the COVID-19 pandemic.

Setting

In Denmark, general practice is tax-funded and free of charge for the patient. During daytime, general practitioners (GPs) provide care to their listed patients. GPs are remunerated through a fee per capita, but the main income (approximately 70-75%) is based on fee-for-service reimbursement. In daytime, GPs offer a range of basic services, including face-to-face in-clinic consultations (regular, prenatal appointments, preventive childcare, and conversational therapy *for mental health issues*), home visits, regular telephone consultations, and email consultations. Outside office hours, GPs are paid on a fee-for-service basis. In four

of the five Danish regions, GPs run the out-of-hours (OOH) general practice service, also referred to as a GP cooperative (GPC), which patients must call to schedule an appointment. At the GPC, GPs perform telephone triage and decide whether to offer a regular telephone consultation, referral to face-to-face GP consultation (in-clinic or home visit), or referral to hospital or emergency medical service. The OOH general practice service is open on weekdays between 4 pm and 8 am as well as during weekends and holidays. Only the Capital Region of Denmark operates a different OOH healthcare service, the medical helpline 1813 (MH-1813). As data from the MH-1813 is not available in the national registers, we excluded the Capital Region of Denmark from our analyses of the use of general practice outside office hours.

VC was rapidly introduced during the COVID-19 pandemic. To enhance the use of virtual care as an alternative to the regular face-to-face in-clinic consultations in the daytime, the GPs could choose to perform a range of basic services by video or as an extended telephone consultation for health problems that would usually have prompted a face-to-face in-clinic consultation in the pre-pandemic period. Examples include consultations for prenatal appointments and preventive childcare. However, an extended telephone consultation could not be used for conversational therapy. In OOH care, the GPs could use VCs. For these consultations, new (temporary) remuneration codes were introduced, and these temporary codes could be used in combination with existing codes for reimbursement purposes.

Outcome measures

We defined the following outcome measures: number of contacts to general practice per patient year (daytime, OOH, and all; stratified on basic remuneration codes before and during the pandemic). Contact types are registered with a range of remuneration codes. In this paper, the term '*virtual care*' refers to both VCs and extended telephone consultations (see overview of remuneration codes in Supplementary table 1). Preventive care contacts consisted of prenatal appointments and preventive childcare. Furthermore, as extended telephone consultations and VCs were new alternatives to contacts concerning health problems that were previously managed by face-to-face in-clinic consultations, we considered these equivalent to face-

to-face in-clinic consultations. Thus, clinic consultations consisted of three subtypes: 1) regular face-to-face in-clinic consultations, 2) VCs, and 3) extended telephone consultations. The term ‘telephone consultations’ covered solely regular telephone consultations.

Data collection

We collected data from a range of national registers for the study period and linked these data through the personal identification number. The National Health Insurance Service Register¹⁵ provided us with information on date, time, and type of contact to daytime GP and OOH general practice, and services delivered (through remuneration codes). The National Patient Register holds records on hospital contacts (somatic, psychiatric as well as private hospitals), and provided the diagnosis codes included in the Charlson Comorbidity Index.¹⁶ The Civil Registration System¹⁷ and Statistics Denmark delivered data on patient characteristics (age, sex, cohabitation, education, ethnicity, income, urbanisation, and employment status). Comorbidity was defined as the number of diagnoses included in the Charlson Comorbidity Index. Apart from age, sex and comorbidity, all co-variables were on household level, for example with the highest level of income selected to represent the household. Thus, we avoided excluding contacts for children due to missing values. Furthermore, we expect that socio-economic characteristics (e.g., education or income) on the household level are stronger predictors for help-seeking behaviour than those on the individual levels. Help-seeking is often discussed with or suggested by other members of the household, in particular for children, who have low levels of education level and income in the registers. Prior to any analysis, persons with missing values for income, employment status, or cohabitation were excluded, as this information was often missing concurrently and thus led to convergence issues for the model. This meant excluding 40,246 unique persons (0.66%). For the remaining persons, missing covariates were placed in a separate category.

Analyses

The study population was followed from birth, immigration, or 1 January 2017 (whichever came last) until death, emigration, or 31 October 2020 (whichever came first). For each person, this period was divided into shorter time spans according to changes in covariates (Supplementary table 2). For each time span, the number of outcomes per resident was recorded along with the duration of each time span. However, age and sex of each resident were recorded at the beginning of each time span. Next, we summed the number of outcomes and the durations by month and year. Dividing the number of outcomes by the risk time gave us the unadjusted observed incidence rate (IR), which was plotted in categories of related remuneration codes. We used the 11th of March 2020 as the starting data for the pandemic period, when the first official lockdown in Denmark was announced.

To provide adjusted IRRs, we ran Poisson regressions for each group of remuneration codes on the data for 2017-2019 (i.e. pre-pandemic period), with risk time serving as the offset, and adjusted for the following covariates: sex, age, cohabitation, education, ethnicity, comorbidity, income, urbanisation, employment status, month, and month-ID; with the latter being treated as a continuous linear effect. Seasonality was taken into account through adjustment for month. This allowed us to calculate the expected utilisation (expected incidence rate) of general practice throughout the pandemic period as an extrapolation of the previous help-seeking. Dividing the observed incidence rate by the adjusted expected incidence rate gave the adjusted IRR, which we plotted as curves according to groups of related remuneration codes. We calculated the change due to the pandemic by subtracting the expected number of contacts from the observed number of contacts after March 11th 2020 and presented the results (i.e., overall effect) as percentage of the expected number of consultations.

Finally, to see if changes in contact patterns were evenly distributed within subsets of the population, we looked for modifications of the pandemic effect within each of our covariates. This was done by using fully adjusted Poisson models; one for each covariate, and each with an interaction term for the covariate in question. Results were presented in a forest plot. Stata 16 (StataCorp LP, College Station, TX, USA) was used for all analyses.

RESULTS

Contact patterns varied between the pre-pandemic period and the pandemic period, and variations in adjusted numbers were seen for both daytime and OOH general practice (Table 1). Figure 1 presents the total number of contacts for the basic services and shows the same overall picture as seen in Figure 2. A population description is presented in Supplementary table 3.

[Insert Table 1 and Figure 1 here]

Figure 2 presents the contact rate relative to the rate predicted by the model during the pandemic. The clinic consultations showed an initial drop of 25% (IRR=0.75 in March 2020), but this number increased to above pre-pandemic levels soon thereafter (IRRs ranging from 0.98 to 1.29); this was mainly due to extended telephone consultations (proportion ranging from 27% to 46% of all clinic contacts) and VCs (ranging from 1% to 4%) (Figure 2). A similar pattern was seen for preventive care consultations. Regular telephone consultations peaked at the start of the pandemic (IRR=1.28 in March), dropped for a few months, and ended around pre-pandemic levels (IRRs ranging from 0.99 to 1.07). Home visits remained mostly below the pre-pandemic levels (IRRs ranging from 0.81 to 1.01), as did conversational therapy. Email consultations significantly increased during the pandemic (IRRs ranging from 1.12 to 1.42).

At the OOH general practice services, clinic consultations dropped considerably in the first three months (IRRs ranging from 0.38 to 0.68). The number remained mostly below pre-pandemic levels (IRRs ranging from 0.62 to 1.06), even though VCs were used in up to 24% of all clinic consultations. The number of home visits kept below that of the pre-pandemic level (IRR ranging from 0.54 to 0.79), whereas the number of regular telephone consultations stayed above (IRRs ranging from 1.07 to 1.45).

[Insert Figure 2 here]

As seen in table 2, daytime GP contacts increased by 9.9% in the pandemic period, relative to what was to be expected. This increase was driven primarily by clinic consultations (8.6%) and e-mail consultations (24.2%). Contact with OOH primary care increased by 4.3%, which was mainly due to regular telephone consultations (21.5%) with large decreases in clinic consultations (-25.9%) and home visits (-29.4%).

[Insert Table 2 here]

The overall effects shown in table 2 were not distributed equally across patient groups. Figure 3 and 4 present the impact of the pandemic on daytime general practice contacts during the pandemic compared to before the pandemic for patient groups. Across all type of contacts, consultation rates of vulnerable patients i.e., those being older, being unemployed/retired, having lower educational level, lower income level, experiencing existing comorbidity, were more adversely affected by the pandemic than the healthy and more affluent patients. Compared to older patients, children aged 0-10 years experienced the largest adverse impact on clinic consultations in daytime and contacts OOH. Patients from suburban and rural areas also experienced a larger adverse impact than patients from urban areas.

[Insert Figure 3 and 4 here]

DISCUSSION

Summary

At the start of the lockdown in March 2020, the number of clinic consultations declined steeply. This was quickly followed by a countertrend towards and even above pre-pandemic levels, which was prompted mainly by the introduction of extended telephone consultations and VCs (most distinct at OOH). In general, the largest decrease in contacts was seen for the most vulnerable patients.

Strengths and limitations

We used a large dataset, including all general practice contacts in Denmark and various patient characteristics. The results of this study are generalisable to other countries with a similar setting using GP gatekeeping and free of charge for the patient. Data based on regular coding is useful for research purposes, but some reservations may exist about their validity.¹⁵ The economic incentive to register services contributes to completeness, in particular for regular remuneration codes. The reliability of the GPs' use of the hastily implemented COVID-19 remuneration codes is unknown, and the GPs might have had varying practices. Therefore, possible misclassification of contact types cannot be ruled out. We explored whether the contact rate was lower for certain patient groups during the pandemic compared to the pre-pandemic period, but the study design did not allow us to assess whether this was due to a lower level of illness, reluctance to contact (due to fear of infection or overburdening the health services), or reduced accessibility and availability of general practice. We used hospital-based data to calculate comorbidity, using the list of diagnoses from the Charlson Comorbidity Index. This may have led to underestimation of comorbidity,¹⁸ as this list is limited and as patients with mild chronic diseases are often treated solely in general practice.

Comparison with existing literature

Several other studies have also reported lower use of general practice^{9, 10, 14} and rapid increases in virtual care during the early phases of the COVID-19 pandemic.^{7, 10, 14, 19-21} The reported decrease varies from 16% to 79% for in-clinic consultations in the daytime,^{7, 9, 10, 14, 22} where we found a monthly decrease of up to 22% for daytime clinic consultations and up to 47% for OOH clinic consultations. The share of virtual care (video and telephone) varied considerably between the studies, ranging from 19% to 90% of all consultations^{7, 9-11, 14, 19}, whereas our study showed that up to 48% of all daytime consultations and up to 24% of all OOH clinic consultations were conducted as virtual care. However, when we added regular telephone consultations to video consultations and extended telephone consultations, this percentage increased to 38% of all daytime

contacts and 75% of all OOH contacts. Several studies also found a countertrend in the total number of visits, which led to an average of near-pre-pandemic levels.^{14, 23}

We saw the largest relative decrease in contacts among vulnerable patients, but other studies have reported opposite findings.¹⁰ A Canadian study found that the patient groups with the highest care needs, including older patients and patients with high morbidity levels, maintained high levels of care.¹⁰ Likewise, British GPs and nurses have been shown to keep a focus on vulnerable patients.⁹ Most governments and public authorities have encouraged the population to limit the contacts to the healthcare services and change their help-seeking behaviour. Anxiety in the population to contract COVID-19 at a health centre may have contributed to the decrease in contacts.¹³ Vulnerable patients may have had an even more restrictive behaviour compared to other patient groups. The pandemic caused postponement of most chronic disease monitoring, health checks, preventive care, and screening activity, as these were not deemed 'essential'.^{14, 24} Additionally, the shift towards virtual care may have altered the contact patterns, in particular for older patients and patients with multiple chronic health problems.^{8, 12, 13, 25, 26}

Finally, children aged 0-10 years experienced the most severe adverse impact on daytime clinic consultations and OOH contacts. Social isolation due to lockdown measures, such as the closing of schools and day care facilities, in combination with social distancing resulted in a decline of non-COVID infectious diseases, in particular respiratory tract infections in children.²⁷ Several studies found a prominent decrease in antibiotics prescribing for children aged 0 to 11 years during the COVID-19 pandemic.²⁸⁻³⁰ Furthermore, patients with respiratory tract infections were kept out of waiting rooms, which most likely affected children most.

Implications for research and/or practice

Several studies have indicated concerns that the management of patients with chronic illness may lag behind.^{13, 14, 24} Some of the lost contacts are likely to be related to medically unnecessary or non-urgent short-term health problems, as well as to a lower incidence of non-COVID infections due to lockdown measures

and social distancing, whereas others may have caused delayed diagnosis and treatment of medical problems or delayed management of chronic illness.^{10, 14} As this might have led to increased morbidity and mortality unrelated to COVID-19,³¹ future research should address the (long-term) effects of the pandemic on vulnerable patient groups. Furthermore, ways to support vulnerable patient groups in use of virtual care should be investigated.

FUNDING

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ETHICAL APPROVAL

Approval from an ethics review board is not required for registry-based studies according to Danish law. The project is listed in the record of processing activities at the Research Unit for General Practice in Aarhus in accordance with the provisions of the General Data Protection Regulation (GDPR).

COMPETING INTERESTS

The authors declare that they have no competing interests.

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Not applicable.

DATA SHARING

The data are not publicly available. All data analysed in the study were de-identified and stored on a secure server at Statistics Denmark. The data sets are available after formal application to Statistics Denmark.

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TABLES

Table 1. Unadjusted number of contacts with general practice (daytime and OOH) in the pre-pandemic and pandemic period.

	Prepandemic	Pandemic	Difference	Change in total no. of contacts	RIR ²

	(per person year)			(n, in tens of thousands)	
Daytime general practice					
Clinic consultations ¹	3.25	3.13	-0.12	-44.69	-0.04
- Regular in-clinic	3.25	2.13	-1.12	-416.41	-0.35
- Extended telephone	0.00	0.95	0.95	352.76	
- Video	0.00	0.05	0.05	18.96	
Regular telephone consultations	1.73	1.51	-0.22	-81.29	-0.13
Home visits	0.08	0.09	0.01	3.81	0.13
Email consultations	1.24	1.65	0.41	151.53	0.33
Preventive care consultations ³	0.07	0.07	0.00	-0.76	-0.03
- Regular in-clinic	0.07	0.06	0.00	-0.97	-0.04
- Extended telephone	0.00	0.00	0.00	0.16	
- Video	0.00	0.00	0.00	0.04	
Conversational therapy	0.06	0.05	-0.01	-2.85	-0.13
- Regular in-clinic	0.06	0.04	-0.02	-5.87	-0.26
- Extended telephone	0.00	0.00	0.00	0.44	
- Video	0.00	0.01	0.01	2.58	
Out-of-hours general practice					
Clinic consultations ¹	0.15	0.11	-0.05	-13.12	-0.30
- Regular in-clinic	0.15	0.08	-0.07	-19.88	-0.45
- Video	0.00	0.02	0.02	6.76	

Regular telephone consultations	0.26	0.31	0.05	15.34	0.21
Home visits	0.04	0.03	-0.01	-3.91	-0.35

¹During the pandemic, clinic consultations could be provided as regular in-clinic consultations, extended telephone consultations (separate remuneration code), or video consultations (separate remuneration code).
²RIR represents the relative incidence rate reduction. ³Preventive care consultations include prenatal appointments and preventive childcare.

Table 2. Adjusted overall effect of pandemic on contacts with general practice (daytime and OOH)

	Predicted contacts ¹	Observed contacts	Difference	Overall effect
	(n, in tens of thousands)			(%)
Daytime general practice	2,187.6	2,404.43	216.8	9.9
Clinic consultations ²	1,068.5	1,160.4	92.0	8.6
- Regular in-clinic	1,068.5	788.7	-279.7	-26.2
- Extended telephone	0	352.8	352.8	NA
- Video	0	19.0	19.0	NA
Regular telephone consultations	550.8	560.7	9.9	1.8
Home visits	35.8	32.4	-3.4	-9.6
Email consultations	491.4	610.4	119.0	24.2
Preventive care consultations ²	24.2	24.3	0.1	0.4
- Regular in-clinic	24.2	24.1	-0.1	-0.4
- Extended telephone	0	0.2	0.2	NA
- Video	0	0.0	0	NA

Conversational therapy ²	24.9	19.5	-5.4	-21.6
- Regular in-clinic	24.9	16.5	-8.4	-33.7
- Extended telephone	0	0.4	0.4	NA
- Video	0	2.6	2.6	NA
Out-of-hours general practice	115.2	120.2	5.0	4.3
Clinic consultations	41.9	31.1	-10.9	-25.9
- Regular in-clinic	41.9	24.3	-17.6	-42.0
- Video	0	6.8	6.8	NA
Regular telephone consultations	73.4	89.1	15.8	21.5
Home visits	10.4	7.3	-3.0	-29.4
¹ Prediction based on data from 2017-2019, adjusted for patient characteristics, month, and year. ² Includes regular face-to-face in-clinic consultation, extended telephone consultation, and video consultation. ³ As video consultations and extended telephone consultations were first introduced at the start of the COVID-19 pandemic, the model could not predict such outcomes.				

FIGURE LEGENDS

Figure 1. Number of remuneration codes used per person year from 1 January 2017 to 31 October 2020.

Remuneration codes were added stepwise for the pandemic period: 1) regular remuneration codes, 2) + extended telephone consultation (daytime only), 3) + video consultations. For readability, we focused on 2020.

Figure 2. Relative number of contacts (observed contacts/expected contacts) based on a prediction model that includes patient characteristics and a linear time trend based on 2017-2019 data.

Remuneration codes are added stepwise for the pandemic period: 1) regular remuneration codes, 2) + extended telephone consultation (daytime only), 3) + video consultations.

Figure 3. Adjusted incidence rate ratios (IRR) for the impact of the pandemic on daytime general practice contacts during the pandemic compared to before the pandemic for patient characteristics, stratified on basic type of contacts.

In daytime, the number of clinic consultations increased by 8.6%, regular telephone consultations increased by 1.8%, home visits decreased by 9.6%, email consultations increased by 24.2%, preventive care consultations increased by 0.4%, and conversational therapy decreased by 21.6%. All percentages are adjusted for patient characteristics, month, and year (see table 2). For example, patients aged 40 years and older experienced a smaller increase in daytime clinic consultations compared to the pre pandemic period than the 30-39 year olds.

Clinic consultations included regular in-clinic consultations, extended telephone consultations, and video consultations. Comorbidity: number of diagnoses included in Charlson Comorbidity Index.

Figure 4. Adjusted incidence rate ratios (IRR) for the impact on out-of-hours general practice contacts during the pandemic compared to before the pandemic for patient characteristics, stratified on type of contact. *Out-of-hours, the number of clinic consultations decreased by 25.9%, regular telephone consultations increased by 21.5%, and home visits decreased by 29.4%. All percentages were adjusted for patient characteristics, month, and year (see table 2). For example, patients aged 0-10 years experienced a larger decrease in clinic consultations with OOH compared to the pre pandemic period than the 30-39 year olds.*

Clinic consultations included regular in-clinic consultations and video consultations. Comorbidity: number of diagnoses included in Charlson Comorbidity Index.

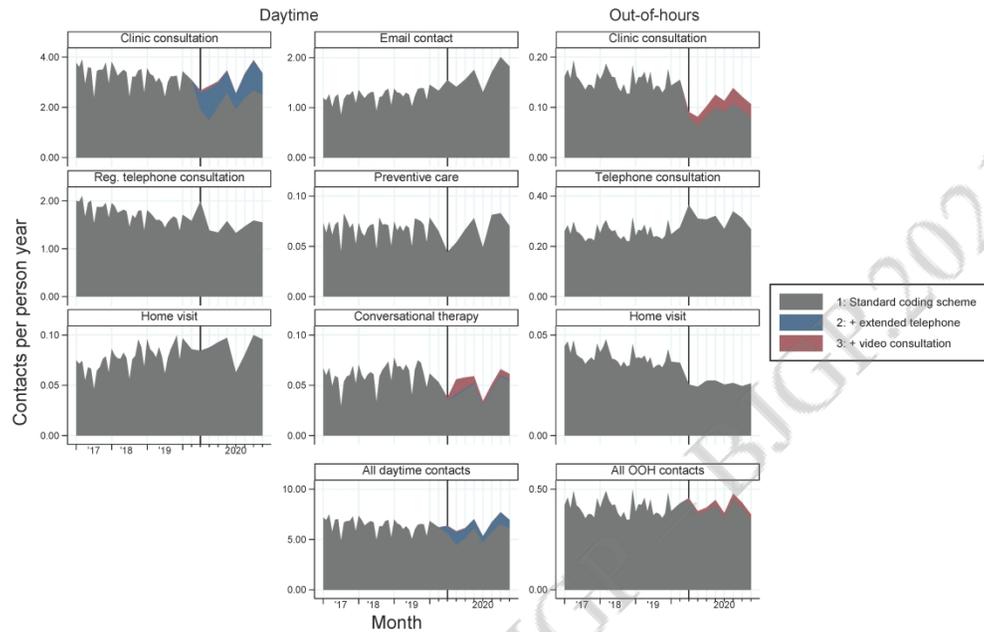


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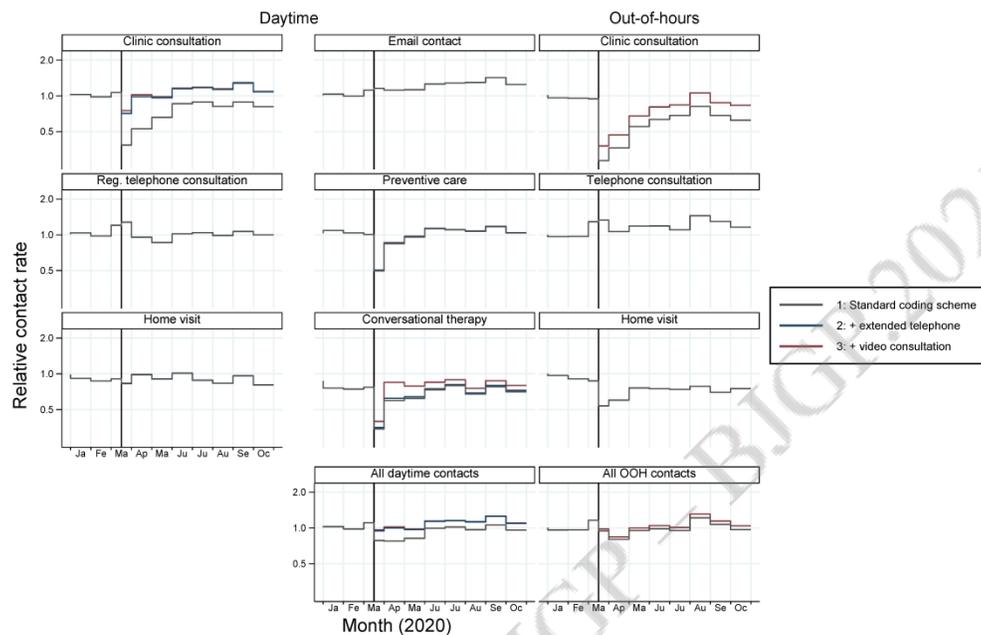


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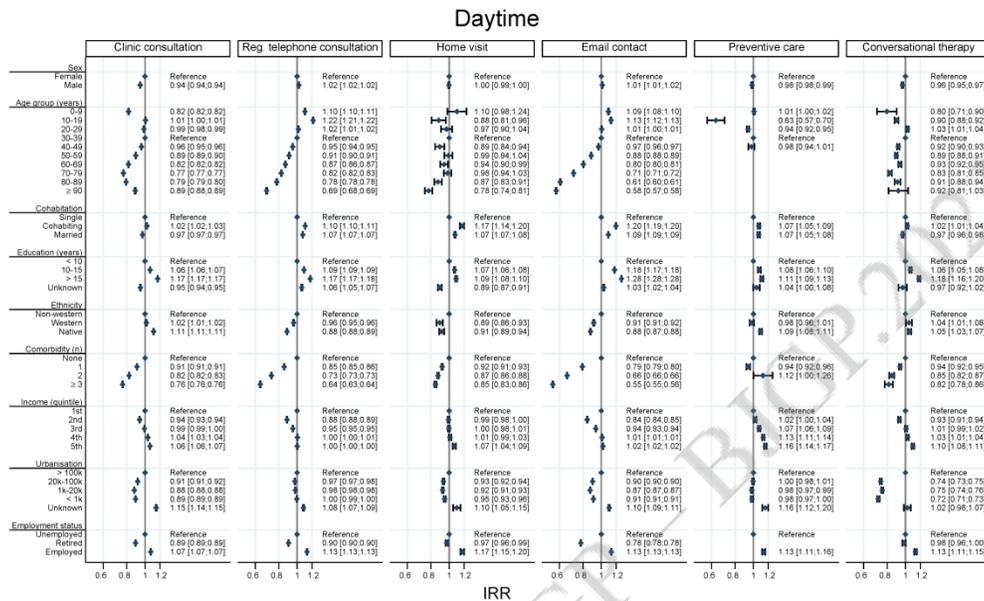


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Out-of-hours

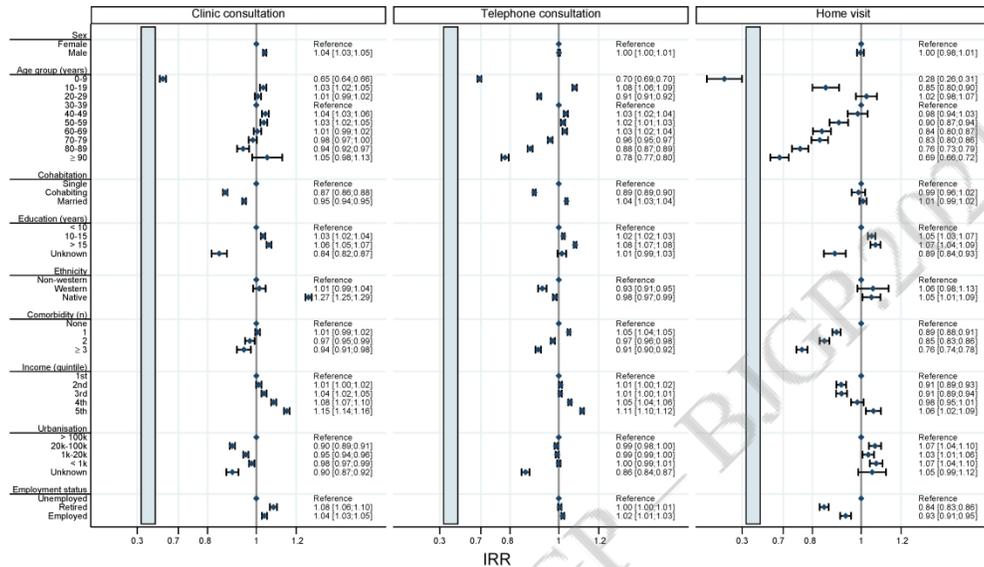


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