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The impact of social and physical distancing measures on COVID-19 activity in England

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Abstract:

Background

Mandatory social and physical distancing measures (SPDM) were introduced in the UK on the 23rd March 2020. A multi-tiered surveillance system based on influenza surveillance, was adopted from the early stages of the COVID-19 Epidemic to monitor different stages of disease. We describe how the impact SPDM was detected through each surveillance system and how these systems may be applied to detect increases in COVID-19 activity as SPDM are eased.

Methods

Data from national population surveys, web-based indicators, syndromic surveillance, sentinel swabbing, respiratory outbreaks, secondary care admissions, and mortality indicators from the start of the epidemic to Week 20 2020 were used to identify timing of peaks in the indicator relative to the introduction of SPDM. This was compared to median time from symptom onset to different stages of illness or interactions with healthcare services.

Results

The impact of SPDM was detected within 1 week through population symptom surveys, web search indicators and through GP sentinel swabbing reported by onset date. There were detectable impacts on syndromic surveillance indicators for difficulty breathing, influenza-like illness and COVID-19 coding at 2, 7 and 12 days respectively. This was followed by hospitalisations and critical care admissions (both 12 days), laboratory positivity (14 days), deaths (17 days) and care home outbreaks (4 weeks).

Interpretation

There was a clear impact of SPDM on COVID-19 activity which was detectable within 1 week through community indicators highlighting their importance in early detection of changes in activity. Community swabbing surveillance will be increasingly important as a specific indicator when circulation of seasonal respiratory viruses increases.

The impact of social and physical distancing measures on COVID-19 activity in England

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Conflicts of interest

None declared

Funding

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Evidence before this study:

A wide range of modelling studies have been undertaken to predict the impact of social and physical distancing measures (SPDM) on COVID-19 activity and these have informed government policy internationally. Few studies have evaluated the impact of SPDM post implementation. Existing studies (in China and several European countries) focus on the impact on case detections or mortality. One study was found that evaluated the impact of SPDM in Hong Kong on influenza outpatient swab positivity and hospitalisations as a proxy for COVID-19. Each of these studies showed a clear effect of SPDM on COVID-19 activity. No studies were found evaluating the performance of surveillance systems in rapidly detecting changes in COVID-19 activity.
PubMed was searched on 9th May 2020 using the following terms ((non-pharmaceutical interventions) OR (social distancing) OR (lockdown)) AND ((COVID-19) OR (Coronavirus) OR (SARS-CoV-2) OR (2019-nCoV)). 477 articles were scanned. Reference lists of relevant articles and a database of emerging COVID-19 literature maintained by Public Health England were also used to identify further articles. 9 studies were found that evaluated the impact of SPDM post implementation.

Added value of this study:

We demonstrate a clear impact of mandatory SPDM detected through surveillance indicators at all stages of illness including symptom monitoring, contacts with healthcare services, hospitalisations at different levels of care and mortality monitoring. In the context of low levels of circulation of other respiratory viruses, regular population surveys, web search monitoring and syndromic surveillance were sensitive measures for rapidly detecting changes in COVID-19 activity, with some of these indicators detecting changes within 1 week of mandatory SPDM. Sentinel GP swabbing was the earliest confirmed COVID-19 specific indicator for detecting changes in disease activity.

Implications of all the available evidence

Confirmed case numbers and mortality rates are clearly vital to monitoring changes in COVID-19 activity, however, these are not early indicators. As countries relax SPDM, the focus will be on detection of any increases in transmission as soon as possible. Monitoring symptoms (e.g. fever or cough) through weekly population surveys and syndromic surveillance (influenza-like illness) have an important role to play in early detection of changes in activity, however, interpretation of these indicators is likely to become more challenging as circulation of influenza and other respiratory viruses increases. Community testing accompanied by robust mechanisms for capturing data on positivity rates, test indications and epidemiological characteristics of the population tested are therefore critical to early detection of changes in activity.

Introduction

The UK was one of the earliest countries in Europe to experience importations of COVID-19 with the first cases detected at the end of January 2020 (1, 2). Following a steady increase in case numbers during March 2020, the government introduced a range of measures to limit transmission in the community. On 12 March 2020 (week 11) individuals with a continuous cough or fever were advised to self-isolate for 7 days, school trips abroad were cancelled and at risk groups were advised to avoid cruises. On 16 March (week 12) the government advised against non-essential travel and contact with others, including advising on home working. Enforceable social and physical distancing measures (SPDM) were then introduced from Monday 23 March 2020 (week 13), including: school closures except for children of critical workers and vulnerable children; requiring people to stay at home, except for very limited purposes; closing certain businesses and venues; stopping all gatherings of more than two people in public (3).

Reducing the level of contact between individuals is intended to reduce the effective reproduction number (Re) below one so that the epidemic declines. It was anticipated that social distancing interventions would first impact on the number of exposures to confirmed cases, which would in turn impact on the number of new infections, presentations to healthcare services and fatalities. The expected time from introduction of measures to detectable impact on surveillance indicators is estimated based on the incubation period and typical time from onset of symptoms to the different stages of illness that individuals may experience (Figure 1).

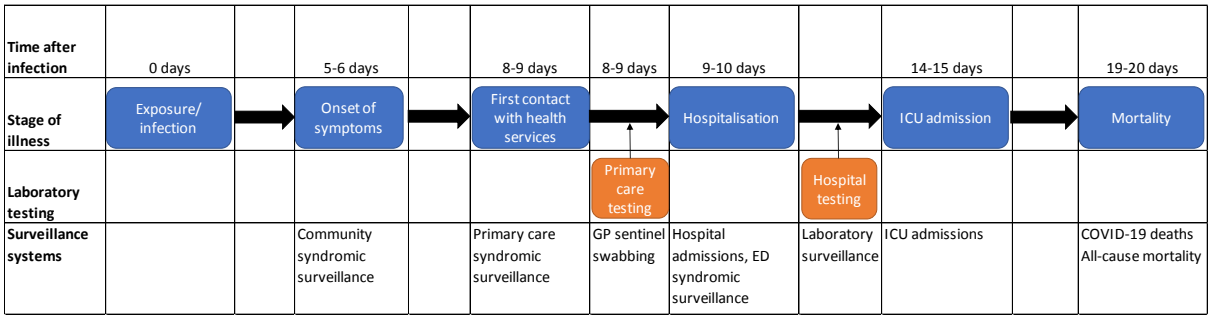

Figure 1: Average time from infection with SARS-COV-2 to different stages of illness that cases may experience

1.Incubation period as reported by the World Health Organization (4); time from onset to first contact with health services based on UK FluSurvey COVID-19 collection; time from onset to hospitalisation and ICU admission based on COVID-19 Hospitalisation in England Surveillance System; time from symptom onset to death based on UK FF100 study (5).

The Public Health England (PHE) COVID-19 surveillance systems are predominantly built upon existing surveillance systems for influenza and aim to monitor the burden of COVID-19 at different points in the course of illness and at different levels of care. These include seroprevalence surveys to estimate rates of infection; population surveys, web searches and syndromic surveillance to detect symptomatic infection in the community; sentinel swabbing to detect confirmed cases among those presenting to primary care; hospital surveillance of confirmed cases at different levels of care; surveillance of deaths among confirmed COVID-19 cases as well as excess all-cause mortality; finally serosurveillance and mass testing are also underway to detect asymptomatic infection (Supplementary Figure 1).

Survey evidence suggests that SPDM in the UK have substantially reduced contact levels (6). Here we report the impact of SPDM on COVID-19 activity in England, how this impact manifested in the various surveillance systems and how the surveillance systems may be applied to detect increases in COVID-19 activity as SPDM are eased.

Methods

Data from a range of PHE surveillance systems are used to assess the impact of the SPDM by comparing the timing of peaks in activity to the expected lags from the introduction on the measures based on the time from infection to different stages of illness as outlined in Figure 1. The surveillance systems used are described below – further details are available elsewhere (7, 8). Data up to week 20 2020 are considered.

Community and primary care surveillance

Indicators of infection in the community are based primarily on surveillance of respiratory symptoms through population surveys of self-reported symptoms, frequency of web searches on COVID-19 symptoms and reporting of respiratory syndromes during first contact with health services including primary care services and contacts with the National Health Service (NHS) telephone and internet medical advice line (NHS 111).

Population surveys

Flusurvey, part of the European wide influenzanet initiative, is a weekly web based symptom survey with around 4,500 participants which was originally set up during the 2009 influenza H1N1 pandemic (9). Participants are asked a series of questions about respiratory symptoms, exposure risk and healthcare seeking behaviour. We report rates of fever or cough as an indicator of COVID-19 activity in the community.

Web search queries

A web-based syndromic surveillance system has been developed by V. Lampos et al. (10) using daily search query frequency statistics obtained from the Google Health Trends API. This unsupervised model focuses on search queries about COVID-19 symptoms as identified by the FF100 questionnaire, as well as generic queries about "coronavirus" (e.g. "covid-19"). The search query frequency time series has been standardised and weighted based on symptom frequency as reported in the UK FF100 study (5). In addition, queries about the symptom of anosmia as well as generic queries about COVID-19 (e.g. "coronavirus") were incorporated. Frequency of searches for symptoms is compared with a baseline calculated from historical daily data from October 2011 to September 2019. Confidence intervals for the baseline are calculated in order to identify a departure from expected in the current time period. A time series with minimised news media effect is also provided.

Syndromic surveillance

PHE's Real Time Syndromic Surveillance Team coordinate daily collection and analysis of respiratory syndromic indicators at different levels of care including NHS 111 calls, General Practice (GP) in hours and out of hours contacts, ambulance dispatch calls and emergency department (ED) visits (11). Clinical indicators are also collected by the Royal College of General Practitioners (RCGP) Research and Surveillance Centre (RSC) (12). The COVID-19 epidemic has led to changes in guidance on where the public should seek health care in England as well as changes to coding of respiratory syndromes through electronic health record systems both of which have had artefactual impacts on

syndromic surveillance indicators. New COVID-19 specific syndromic indicators have recently been developed to monitor activity through NHS 111, ED and GP systems (11).

Primary care sentinel virology swabbing

Sentinel nasal swabbing of patients contacting primary care with ILI or lower respiratory tract infection (LRTI) symptoms was initially conducted through 100 practices in the RCGP RSC network, though this network was subsequently expanded to 300 to provide improved coverage. This system has been expanded and modified so that participants undertake a self-swab, sent via post, of both nostrils to adapt to recommendations that symptomatic patients do not attend their GP and to practices operating telephone and/or video consultations. Onset date is collected through the patient completed sample request form and positivity is reported by symptom onset date. RCGP RSC practices get feedback about data quality, including via a dashboard.(13) Of particular importance to the network is reliable recording of influenza-like illness (ILI).

Respiratory outbreaks

Data on respiratory outbreaks by setting (e.g. care homes, schools) is collected through the public health management system (HPZone) used by local health protection teams.

Secondary care

Acute NHS hospital trusts are asked to report aggregate data on daily new hospitalisations and critical care (ICU/HDU) admissions for COVID-19 to the COVID-19 Hospitalisations in England Surveillance System (CHESS).

During the period of SPDM, most laboratory testing for COVID-19 occurred in hospitals therefore rates of laboratory confirmed cases also provide an indication of activity in hospital. Testing in PHE and NHS laboratories is reported to PHE through the Second Generation Surveillance System (SGSS) (14), this system has been adapted to capture negative as well as positive results. Number of positive cases or rates per 100,000 population will be influenced by testing capacity as well as disease activity. Positivity rates (as a proportion of all tests) will be less influenced by testing capacity and provides a more reliable measure of disease activity, though could still be influenced by changes in policy on which groups are eligible for testing.

Mortality

Mortality surveillance includes data on deaths among laboratory confirmed COVID-19 cases (which will primarily be hospitalised cases) and excess all-cause mortality. Daily excess all-cause mortality is estimated using deaths data from the General Register Office which is delay corrected and compared to a 5 year baseline. Weekly excess all-cause mortality is estimated using the EuroMomo model (15).

Ethics

The surveillance collections included here are approved as Health Protection, under Regulation 3 of The Health Service (Control of Patient Information) Regulations 2002.

Results

Infection in the community

Population surveys and web search queries

The incubation period for COVID-19 is on average 5-6 days (range 1-14 days) (4), therefore assuming the SPDM had an immediate impact on exposure, and that a relatively large proportion of reported symptoms are due to COVID-19, we would expect to start seeing an impact on self-reported symptoms within a week of the measures being introduced. This is in line with reporting of fever or cough via FluSurvey which began to decline in week 13 (Figure 2) and Google searches for COVID-19 symptoms which began to decline from 28th March, 5 days after (Supplementary Figure 2), suggesting that SPDM have had a rapid effect on rates of symptomatic infection. We also see a reduction in visits to general practice.

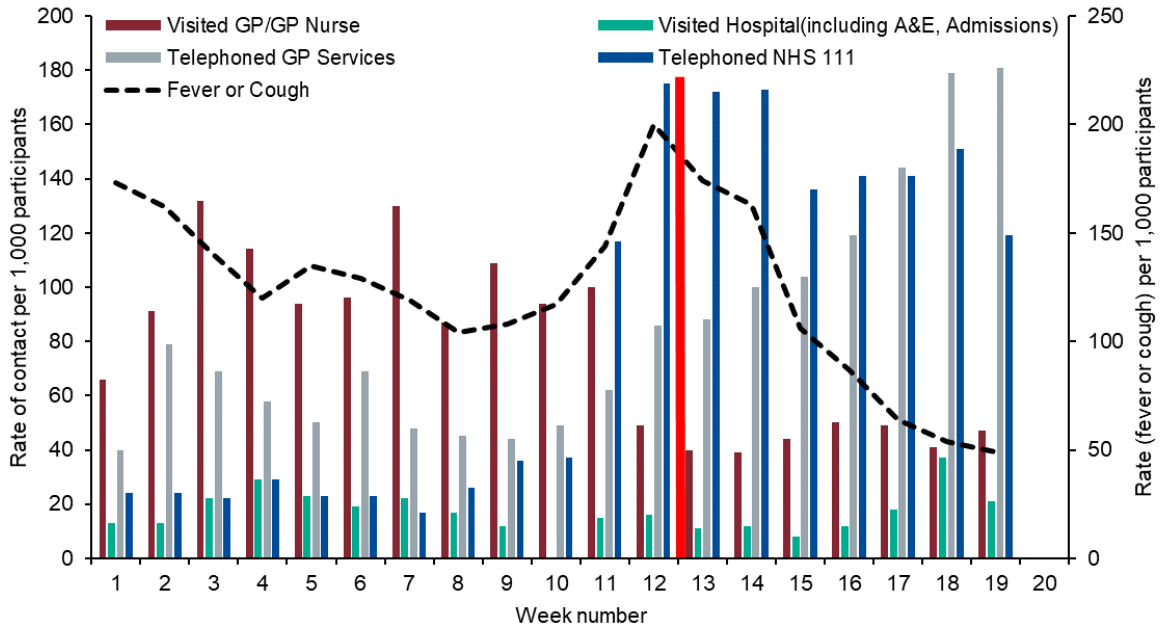

Figure 2: Rate of fever or cough among FluSurvey participants and their contact with different healthcare services, week 09 to 18. Red vertical line indicates introduction of mandatory SPDM

Syndromic surveillance

FluSurvey responses suggest that earliest contact with health services was among those who called NHS 111 (median 2 days) suggesting that we would expect to see an early impact on NHS 111 calls if SPDM are effective (Supplementary Table 1). However, changes in national coding and clinical pathways within the NHS 111 telephony system (introduced to support the triage of potential COVID-19 patients) resulted in callers with COVID-19 symptoms no longer being reported through existing NHS 111 respiratory syndromic surveillance call pathways. This resulted in a rapid drop in reported NHS 111 calls through these existing respiratory surveillance indicators (Supplementary Figure 3). These changes in reporting coincided with the introduction of SPDM, therefore the impact on NHS 111 contacts is not clear. New syndromic surveillance indicators for 'potential COVID-19' calls and completed NHS 111 online assessments were developed and are now in place (Supplementary Figure 4).

Current guidance recommends remote consultations for suspected COVID-19 cases in primary care (16). The majority of phone calls to GP practices reported through FluSurvey were within the first week of (median 5 days; Supplementary Table 1). Allowing for the incubation period, we would therefore expect to see an impact on GP contacts from 1-2 weeks after the introduction of SPDM. Changes to clinical coding and guidance on where the public should seek care have impacted on GP in hours syndromic surveillance indicators. A new surveillance indicator was developed to capture consultations using new codes for suspected, tested, exposed and confirmed COVID-19 consultations. This indicator began to decline 12 days after the mandatory SPDM were introduced (Figure 3). GP out of hours (OOH) syndromic indicators have been relatively unaffected by changes to guidance and clinical coding. OOH syndromic data suggest that rates of contacts for influenza like illness (ILI) and difficulty breathing/wheeze/asthma began to decline from 7 days and 2 days after the introduction of mandatory SPDM respectively. However, contacts for the less specific acute respiratory infection indicator peaked in week 11 which precedes the introduction of mandatory SPDM, though this peak was at much lower levels compared to the winter peak (Figure 3).

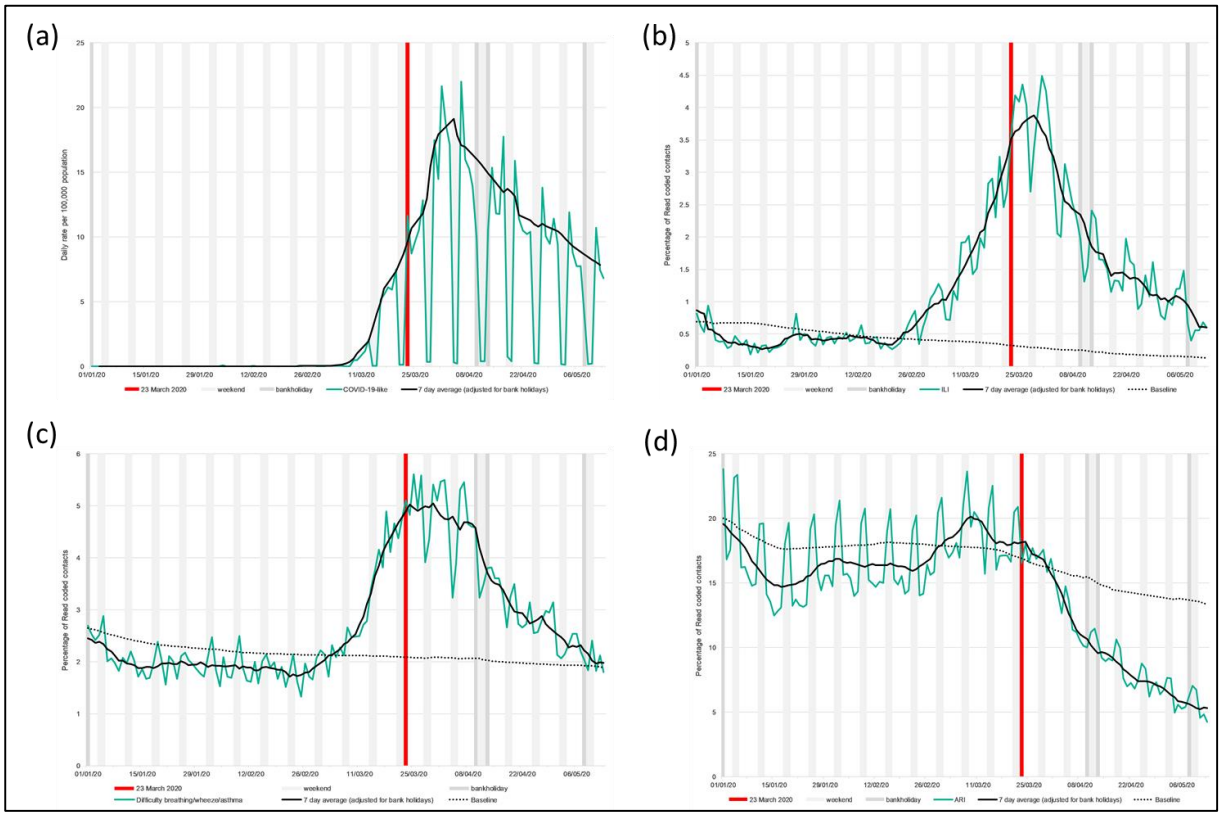

Figure 3: (a) COVID-19 GP diagnosis code indicator per 100,000 population (includes consultations using new codes for suspected, tested, exposed and confirmed COVID-19); (b) GP out of hours, daily contacts, as a percentage of the total contacts with a diagnosis code for influenza-like Illness (ILI) (c) GP out of hours, daily contacts, as a percentage of the total contacts with a diagnosis code for difficulty breathing/wheeze/asthma (d) GP out of hours, daily contacts, as a percentage of the total contacts with a diagnosis code for acute Respiratory Infection (ARI), (and 7-day moving averages). Red vertical lines indicate introduction of mandatory SPDM.

The median time to ED visit among FluSurvey participants was 4 days. We would therefore expect an impact of SPDM on ED attendances within 1-2 weeks. ED attendances with a COVID-19 related primary diagnosis code and for acute respiratory infections began to decline from day 14 and day 13 after mandatory SPDM respectively (Supplementary Figure 5).

Primary care sentinel swabbing

It is anticipated that an impact on positivity of primary care sentinel swabs by symptom onset date would occur within one incubation period of the implementation of SPDM. There was a decline in the rate of increase in positivity from week 12 to week 13 and positivity rates peaked in week 14, which is concordant with an impact of social distancing (Figure 4).

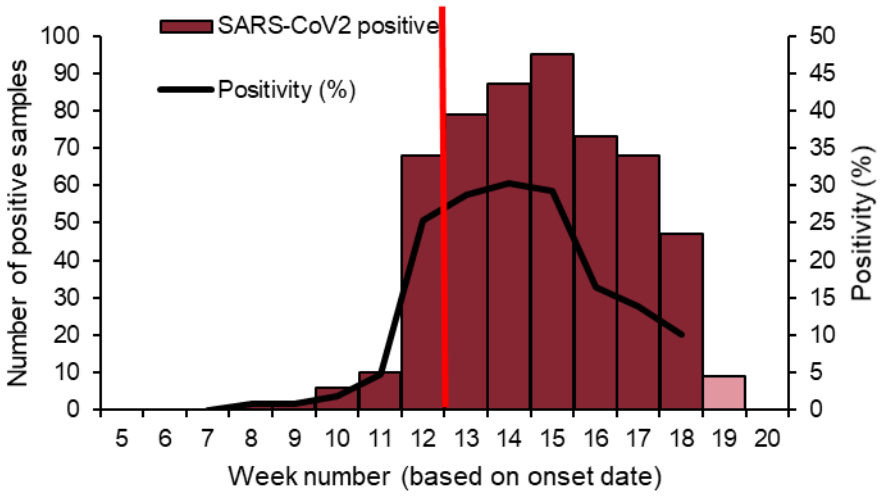

Figure 4: Overall positivity (%) of GP sentinel swabs (weekly) and number of SARS-CoV-2 positive samples. Red vertical line indicates introduction of mandatory SPDM.

Respiratory outbreaks

The number of reported acute respiratory infection outbreaks has increased dramatically since week 12, the majority of which have been suspected or confirmed COVID-19 outbreaks in care homes. Outbreaks began to decline from week 16, however the number of outbreaks remain high into week 18 suggesting that SPDM may have less of an impact or a more delayed impact on outbreaks in residential settings.

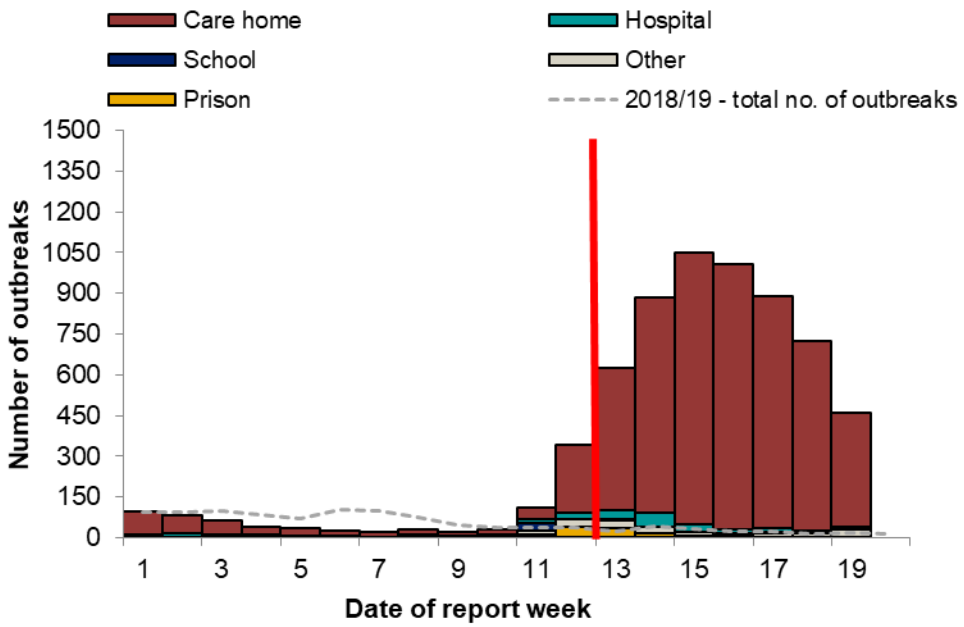

Figure 5: Number of acute respiratory outbreaks by institution. Red vertical line indicates introduction of mandatory SPDM.

Secondary care

Acute hospital trusts are asked to report data on hospitalisations (lower level of care) and critical care (ICU/HDU) admissions to the COVID-19 Hospitalisations in England Surveillance System (CHESS). In the individual level data, the median time from onset to hospital admission was 4 days (IQR 1-8 days) and the median time from onset to ICU admission was 9 days (IQR 4 5o 12 days). Allowing for the incubation period, we would therefore expect to see an effect of SPDM on hospitalisations from around 1-2 weeks and ICU admissions from around 2 weeks after they were introduced. Both hospital admission rates and ICU admission rates began to decline from 4th April 2020 (end of week 14) and have since continued to decline (Figure 6). Similarly, positivity rates through laboratory reports began to decline from 6th April 2020 (start of week 15) (Supplementary Figure 6).

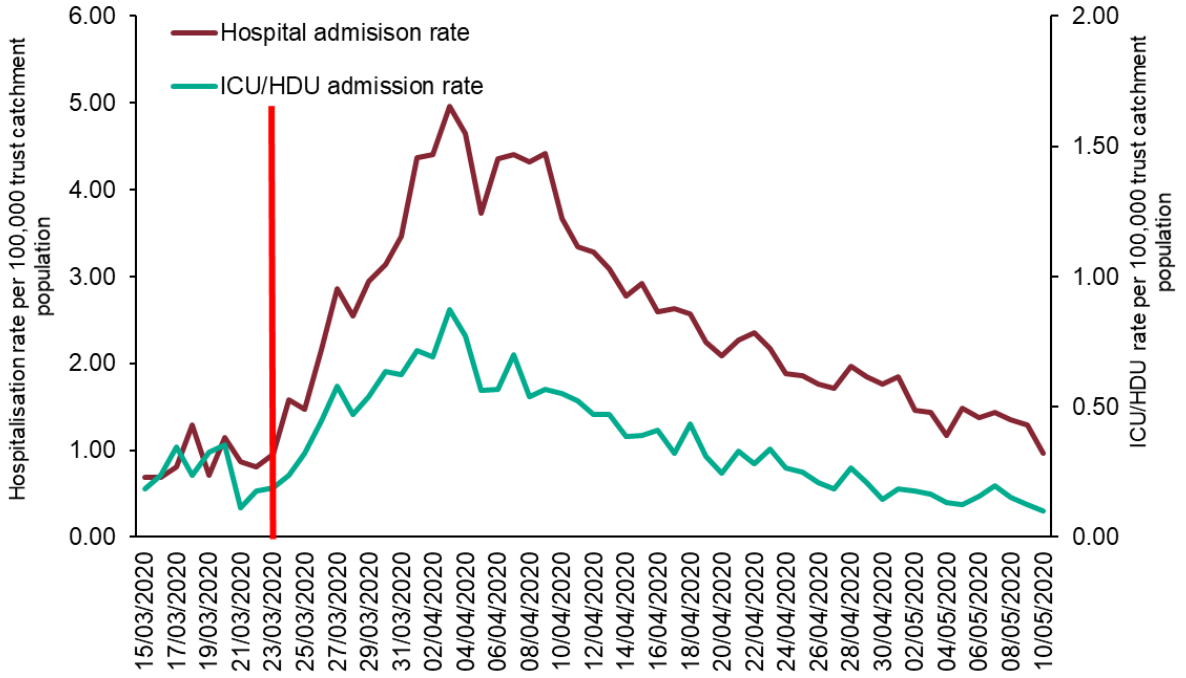

Figure 6: Daily hospital admission rate and critical care (ICU/HDU) admission rate. Red vertical line indicates introduction of mandatory SPDM.

Mortality

Enhanced surveillance data on 25 deaths among the first few hundred cases (FF100) in the UK indicates a median of 13 days between symptom onset and death (IQR 7-19 days) (5). Factoring in the incubation period we would therefore expect to see an effect of SPDM on mortality rates after 2-3 weeks. Both deaths among COVID-19 confirmed cases and excess all-cause mortality began to decline from 9th April 2020 (week 15), which is consistent with an impact of social distancing (Figure 7 and Supplementary Figure 7).

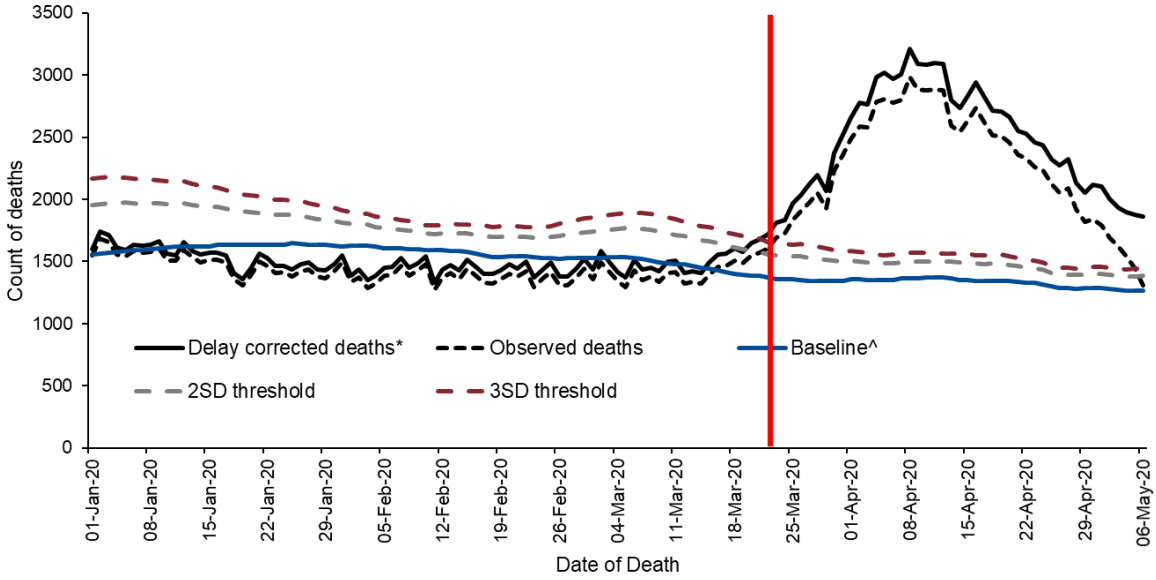

Figure 7: All cause mortality, all ages. Red vertical line indicates introduction of mandatory SPDM.

Summary of time to detectable impact

Time from the introduction of mandatary SPDM to date of first detectable impact in each of the surveillance systems is summarised in Table 1.

Table 1: Time from the introduction of mandatary SPDM to date of first detectable impact in each surveillance system

Surveillance system	Indicator	Frequency	Date of first detectable impact	Week of first detectable impact	Time to first detectable impact
Population symptom survey	Self-reported fever or cough	Weekly	-	Week 13	<1 week
Symptom web searches	Searches for COVID-19 symptoms	Daily	28th March	Week 13	5 days
Syndromic	GP in hours COVID-19 indicator[1]	Daily	4th April	Week 14	12 days
	GP out of hours ILI consultations	Daily	30th March	Week 14	7 days
	GP out of hours difficulty breathing consultations	Daily	25th March	Week 13	2 days
	GP out of hours ARI consultations	Daily	10th March	Week 11	-12 days
	ED COVID-19 indicator[2]	Daily	6th April	Week 15	14 days
	ED ARI attendances	Daily	5th April	Week 14	13 days
Primary care virology	GP sentinel swab positivity	Weekly	-	Week 13	<1 week

Outbreaks	Acute respiratory infection outbreaks	Weekly	-	Week 16	4 weeks
Secondary care	Hospital admissions	Daily	4th April	Week 14	12 days
	Critical care admissions	Daily	4th April	Week 14	12 days
	Laboratory positivity rates	Daily	6th April	Week 15	14 days
Mortality	Deaths among confirmed cases	Daily	9th April	Week 15	17 days
	Excess all-cause mortality	Daily	9th April	Week 15	17 days

1..Indicator includes consultations using new codes for suspected, tested, exposed and confirmed COVID-19. 2. with a COVID-19 related primary diagnosis code

Discussion

There is considerable evidence that the mandatory SPDM have had a clear impact on COVID-19 activity in England, which is discernible through a multitiered surveillance system. This was first detectable as a reduction in self-reported symptoms and presentations to community healthcare services with relevant syndromes, followed by reductions in hospitalisations and critical care admissions and subsequently reductions in deaths among COVID-19 confirmed cases and all-cause mortality. The timing of these reductions is generally in-line with the expected intervals between infection and the respective outcome measures (Figure 1).

Some of the impacts may have started earlier than would have been anticipated if as a result of the mandatory SPDM. This may reflect an impact of the earlier government advice on isolation of people displaying possible COVID-19 symptoms and reducing contacts with others, changes in behaviour independent of formal guidance, or may reflect the distribution in timing between infection and different outcomes (a proportion of individuals will have shorter incubation periods and present earlier to healthcare services) (17). The effect of the SPDM on acute respiratory infection outbreaks in care homes, has so far been less marked. Investigations are currently underway to gain a greater understanding of the factors influencing transmission in care homes. The SPDM introduced may have a more limited impact in residential settings where infection may be introduced by staff movements, or to a lesser extent following hospital discharges or care home transfers, and where it may be difficult to contain transmission through infection, prevention and control measures, once an infection is introduced (18). Furthermore, there may be delays in reporting from care homes.

A large number of modelling studies have been undertaken to predict the impact of SPDM on COVID-19 activity and these have informed government policy around the world (19-22). Conversely, few studies have evaluated the impact of these measures and the effectiveness of surveillance systems in detecting changes in disease activity. These studies have focussed on an impact on detected confirmed cases, primarily through testing in secondary care, and the impact on deaths among confirmed cases, again primarily in hospital. A clear impact of social distancing measures on these outcomes has been observed in China and several European countries (23-26). In Hong Kong the impact on influenza detected through sentinel outpatient swab positivity and hospitalisations

has also been assessed as a proxy for COVID-19, again SPDM were associated with declines in each of these (27).

The ability of surveillance systems to rapidly detect changes in COVID-19 activity is fundamental as countries begin to consider relaxation of SPDM. Our findings highlight the importance of symptom surveys in the population and syndromic surveillance as early indicators of COVID-19 activity. Nevertheless, existing indicators used in these systems are not specific to COVID-19. In the UK, the 2019/2020 influenza season was relatively early which is likely to have increased the specificity of symptomatic and syndromic surveillance indicators. These measures are likely to be much harder to interpret when other seasonal respiratory viruses are circulating. COVID-19 specific indicators of community transmission, including sentinel swabbing, will therefore be increasingly important. Moving to postal nasal self-swabbing has been successfully adopted and overcomes many infection control concerns. However, the recent push to offer wider access to SARs-CoV-2 testing based on patient demand, risks undermining the consistency of the surveillance based on primary care consultations, the potential to test for a range of respiratory viruses, access to linked information on vaccination, and the central source of specimens for further characterisation.

Some elements of the surveillance have been difficult to interpret because of changes in care pathways and coding. In particular, this has impacted on syndromic surveillance systems which have now been enhanced to capture new COVID-19 clinical codes and activity including NHS 111 calls and online assessments, GP attendances, emergency department attendances and ambulance calls. Attendances at GP surgeries have been reduced in favour of telephone consultations to maintain effective infection control. This impacted on the existing programme of primary care sentinel swabbing. To overcome this, self-sampling by post was initiated. Further expansion of this network continues to monitor the impact of any relaxation of restrictions. Furthermore, to date there is limited surveillance data available on asymptomatic infection. Current evidence suggests that a large proportion of infections result in mild disease or asymptomatic infection. A cross-sectional swabbing of 948 London residents organised by PHE at the end of March identified 18 individuals positive for SARS-CoV-2 of which 4 (22%) had not reported any symptoms in the preceding 2 weeks (unpublished PHE data). These may represent people who are genuinely asymptomatic, those who are pre-symptomatic or those who remain PCR positive more than two weeks after infection. Asymptomatic infection will not be captured through community-based syndromic surveillance systems or sentinel swabbing of patients presenting to healthcare and will rely on repeat population-based swabbing and seroprevalence estimates. Serum samples for serosurveillance have been collected since the early stages of the COVID-19 epidemic including residual samples from regional laboratories, samples from the RCGP RSC practices collected from patients presenting for other routine bloods and a prospective population based collection in children and young adults. These are being tested and may provide a better understanding of the impact of SPDM on overall rates of infection.

This report demonstrates a clear impact of the SPDM on COVID-19 activity in England which was first detectable through community indicators within a week of the introduction of mandatory measures. We also highlight the importance of community surveillance indicators for monitoring early changes in disease activity. Nevertheless, non-specific community indicators will become more difficult to interpret as circulation of other respiratory viruses increases. Syndromic surveillance indicators and

population surveys should therefore be accompanied by community testing and case-based surveillance with robust mechanisms for capturing data on positivity rates, test indications and epidemiological characteristics of the population tested. Consistent, uninterrupted COVID-19 surveillance will be critical in monitoring the pandemic, inform the triggers for different phases and the impact of relaxing SPDM and other interventions such as immunisation, as they come in to play.

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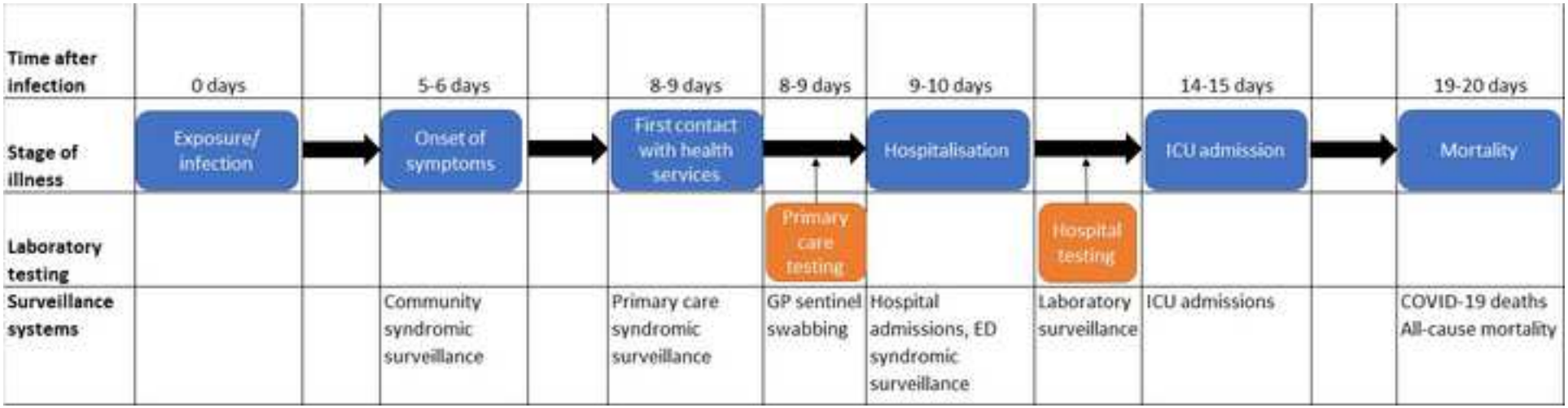
Figure 1



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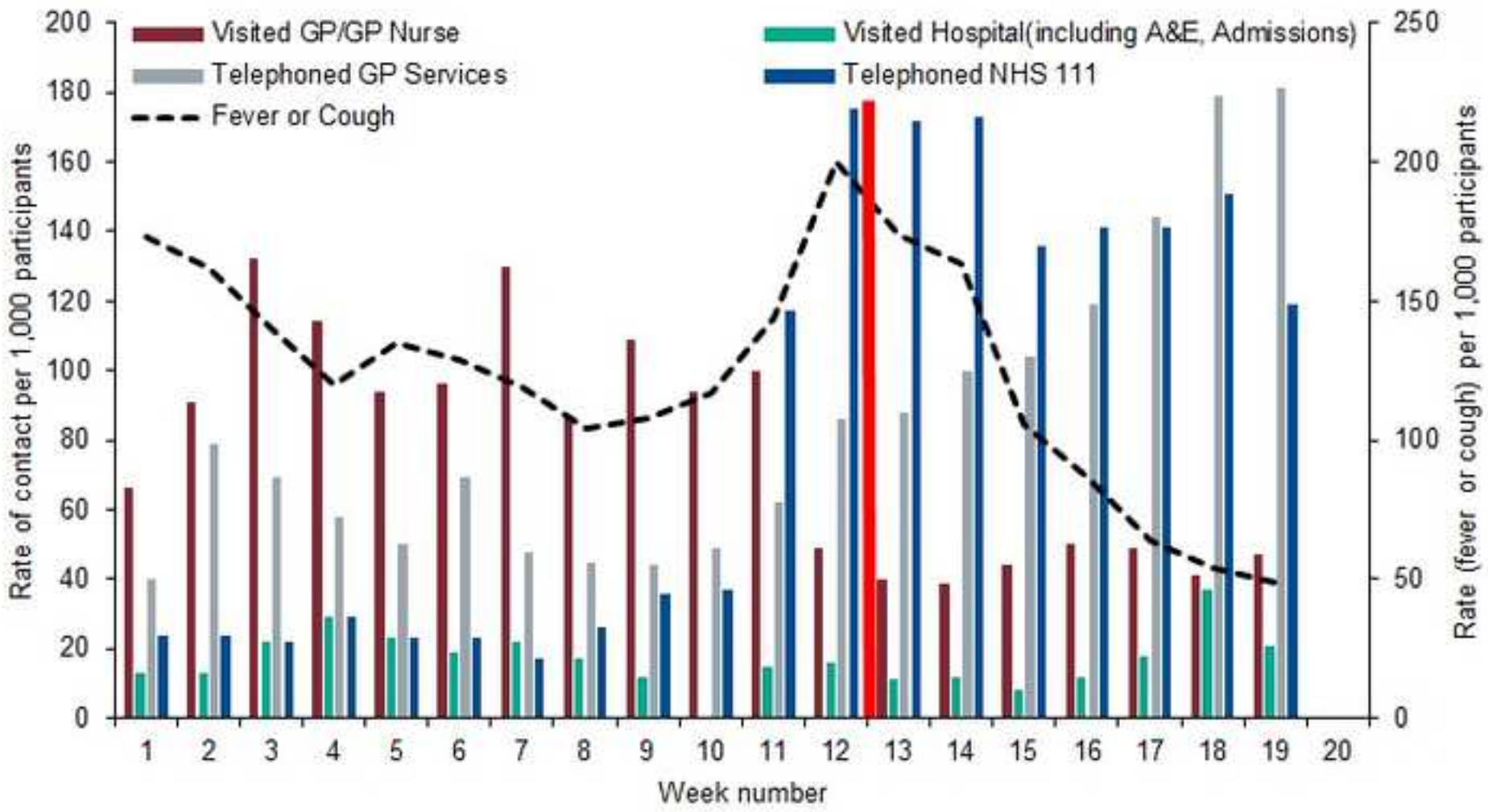

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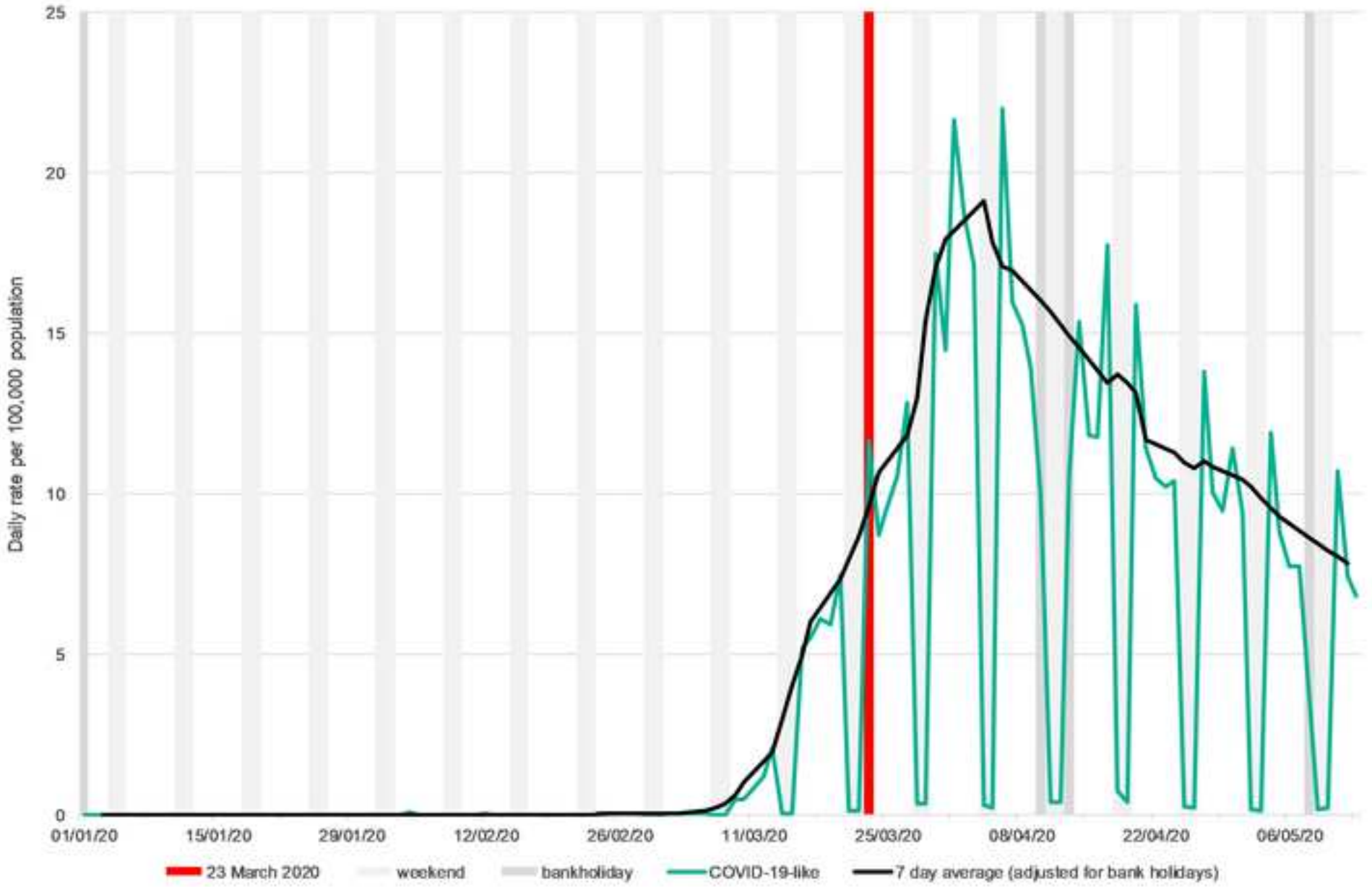

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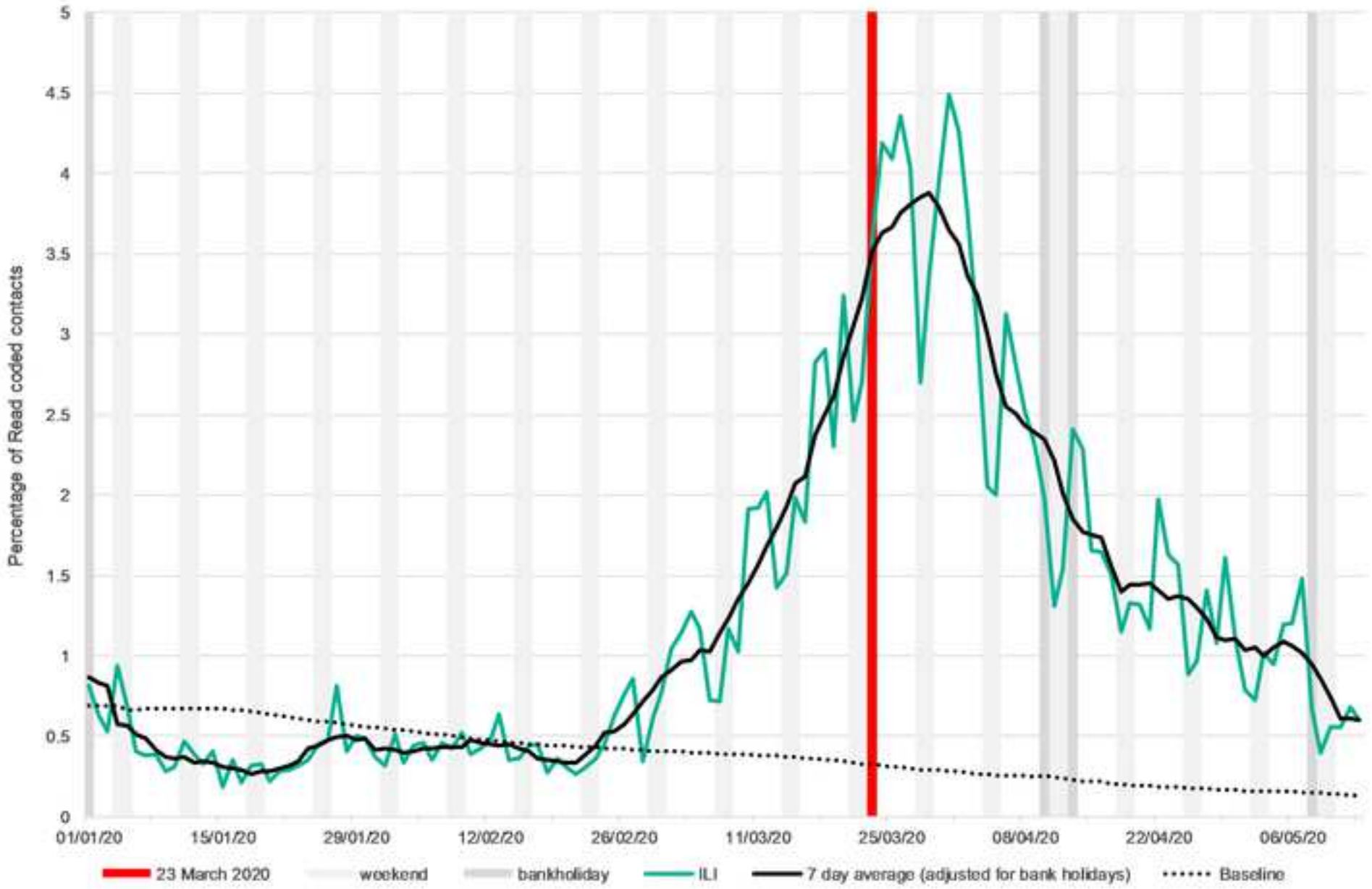

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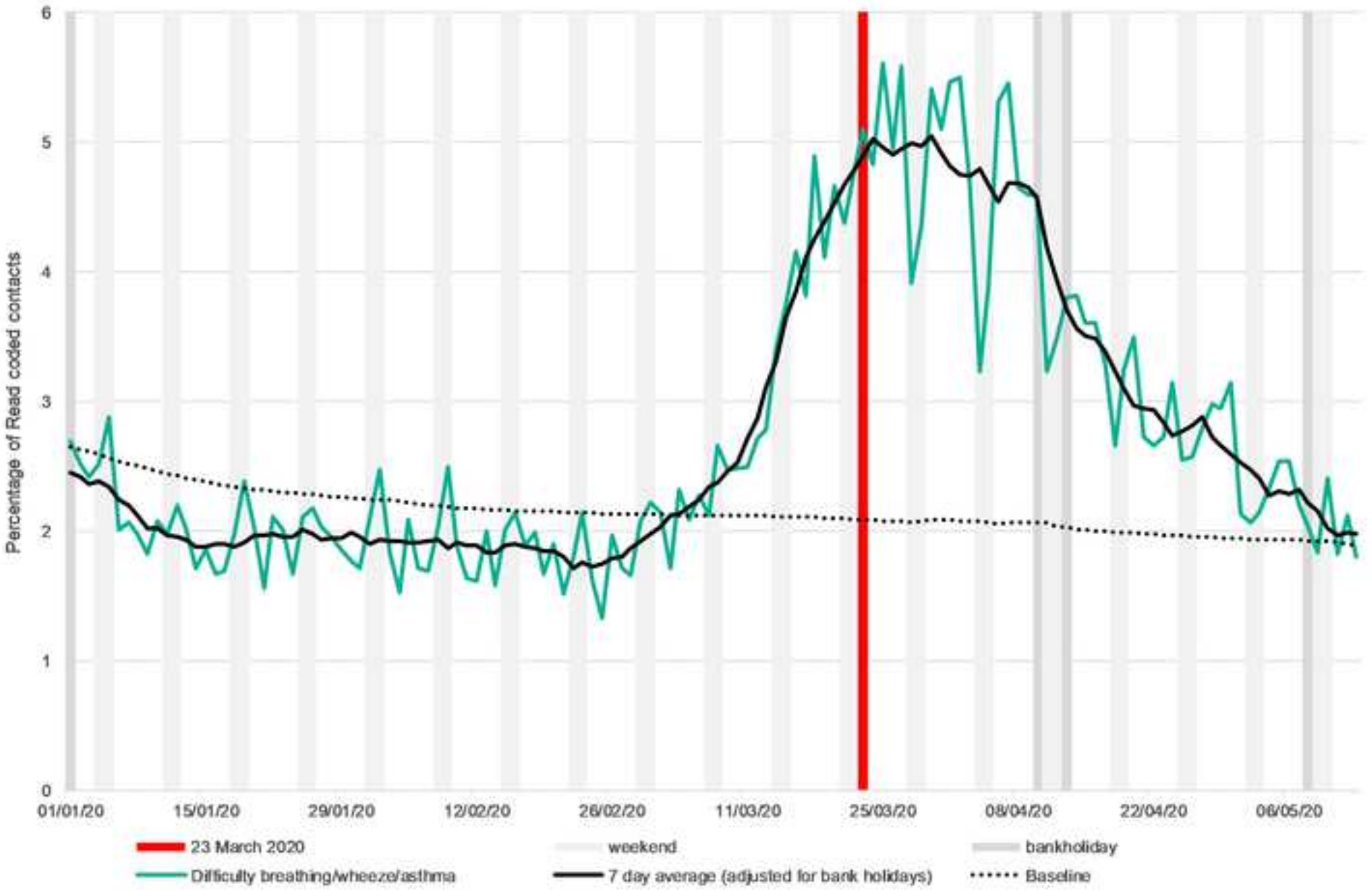

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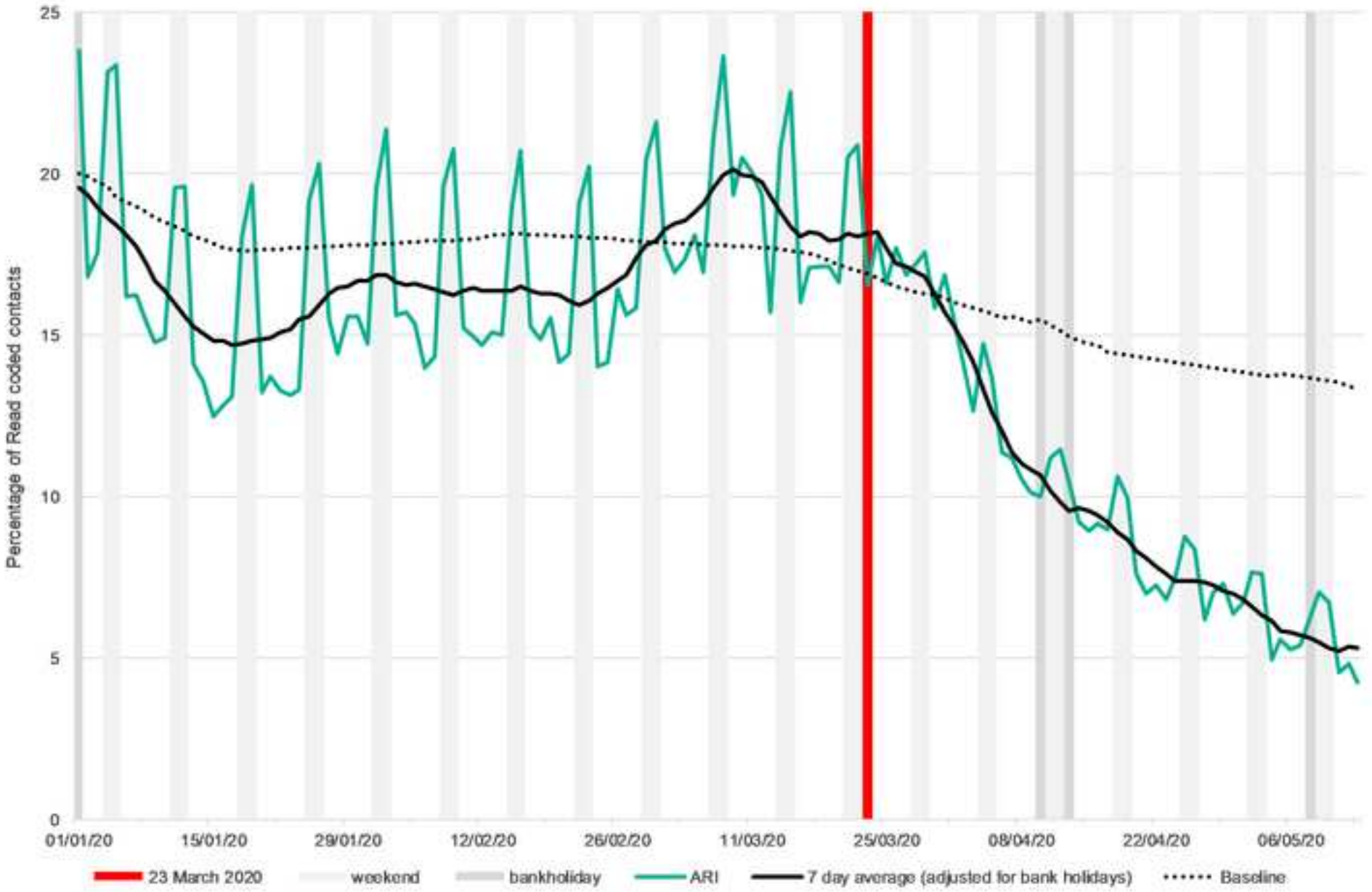

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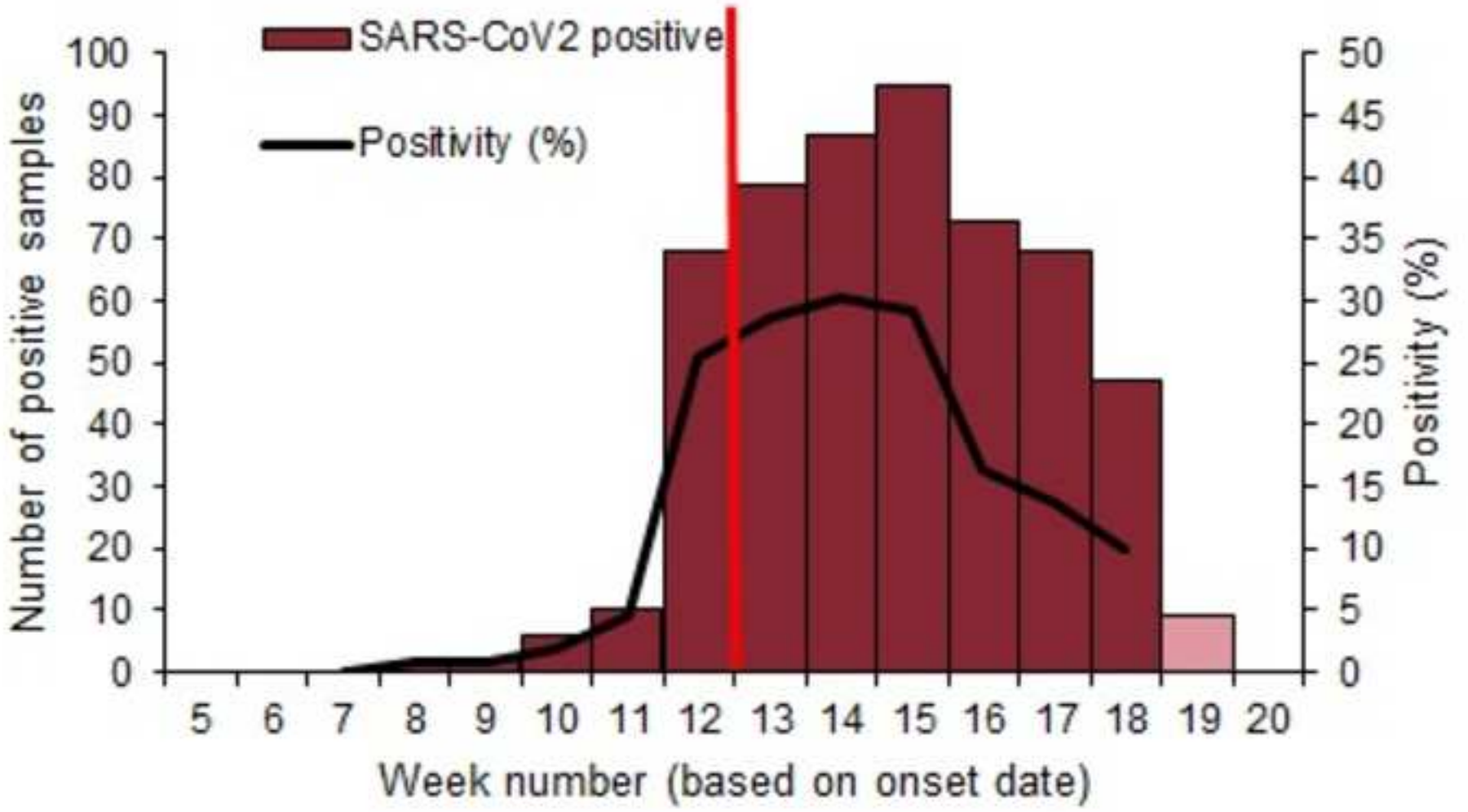

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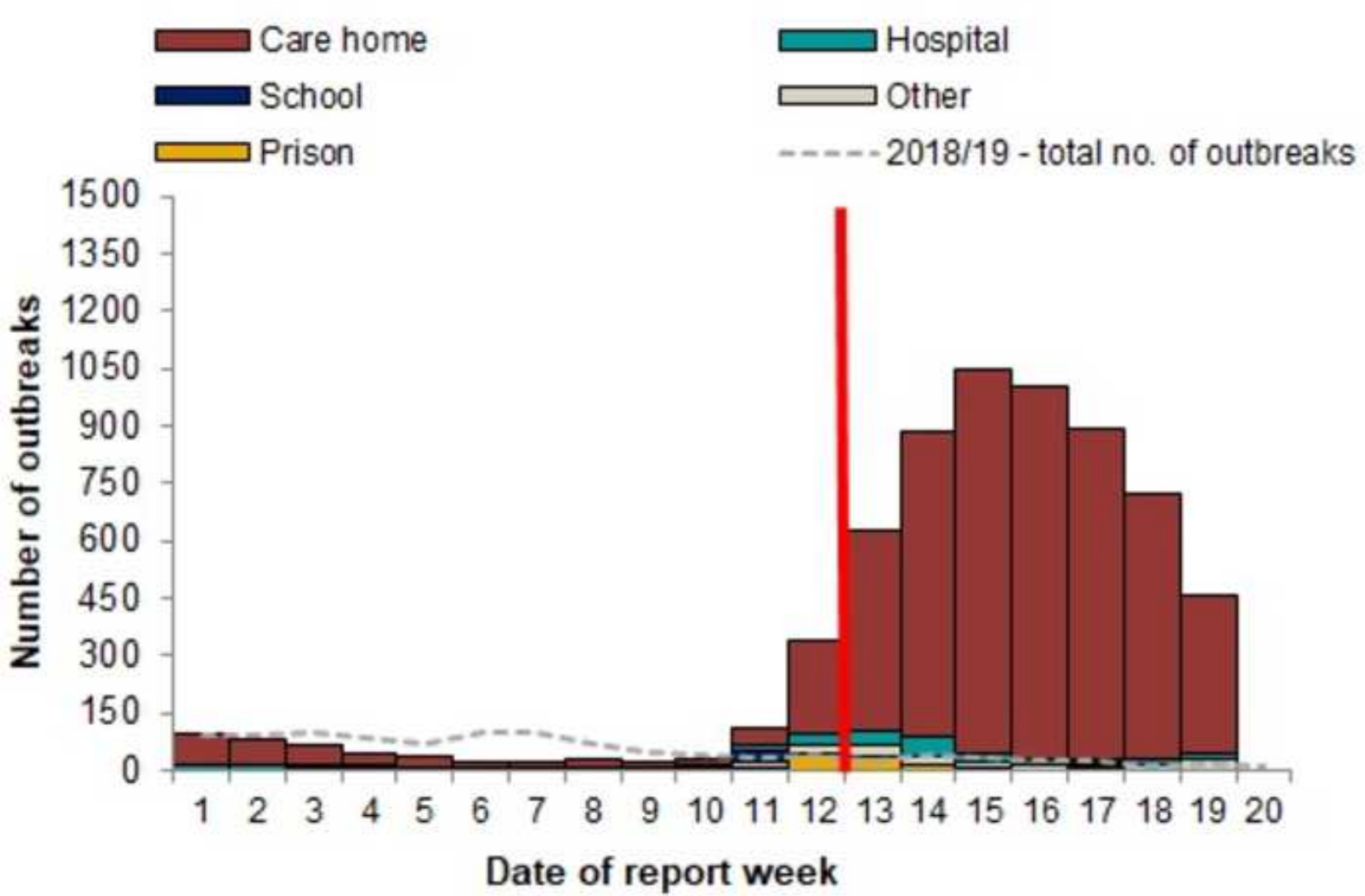

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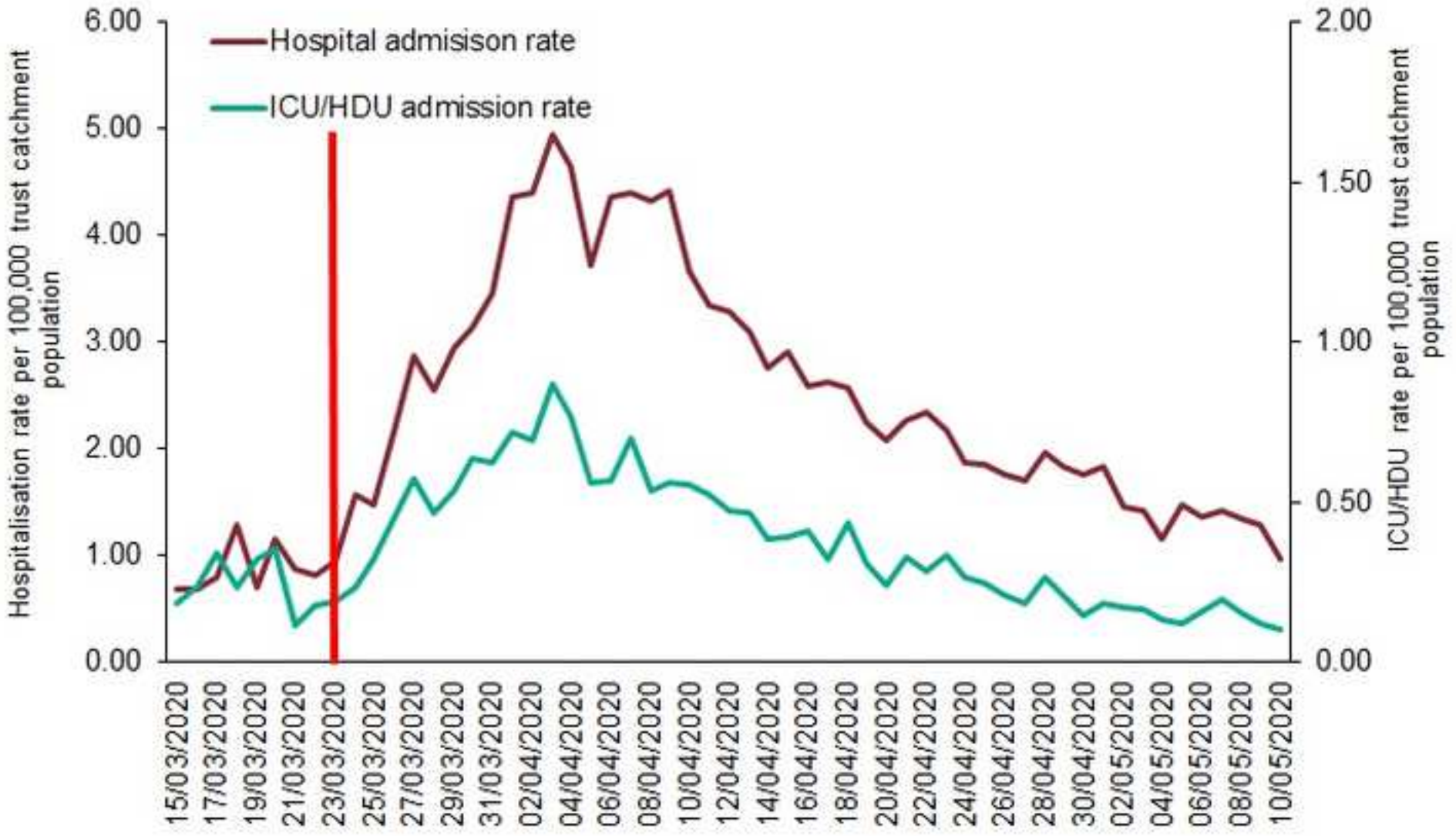

Figure 7

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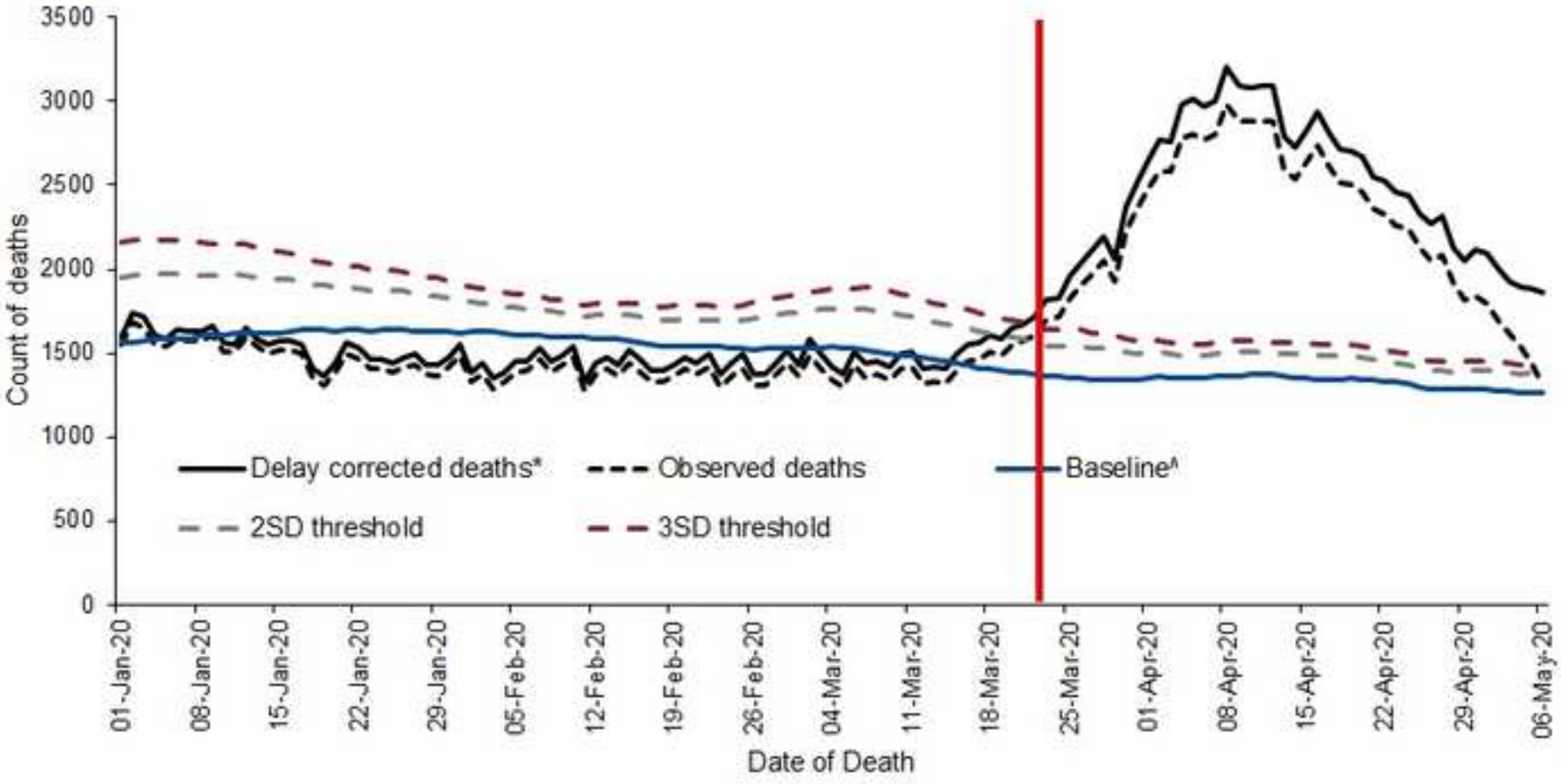


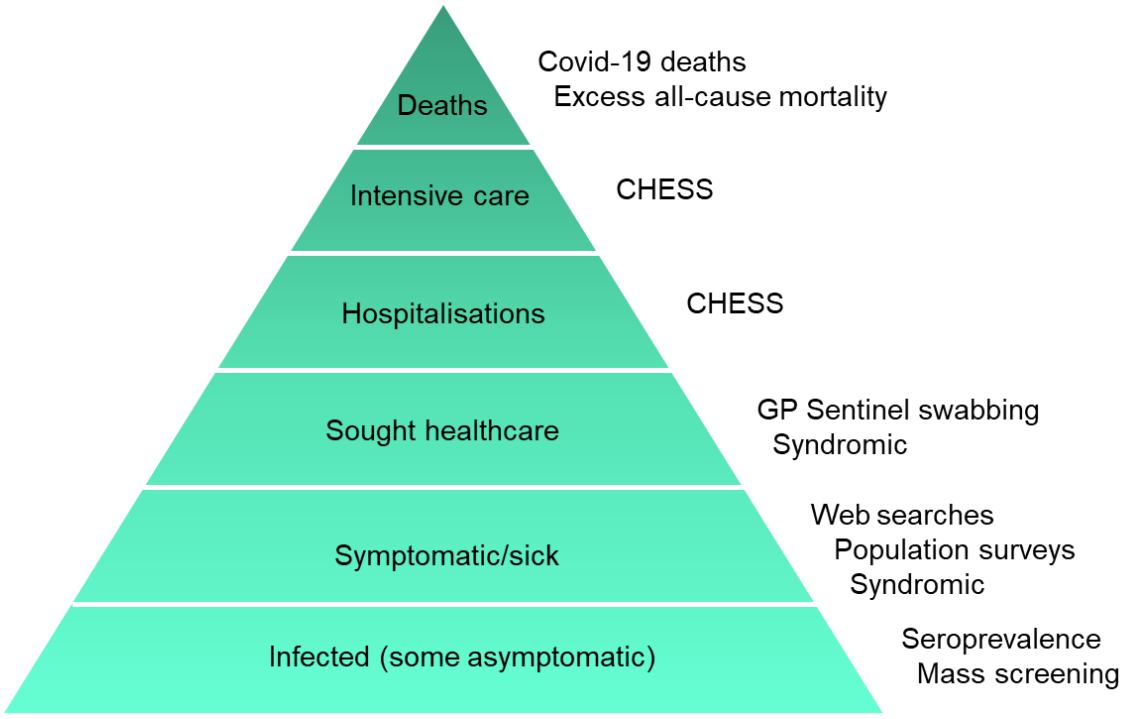
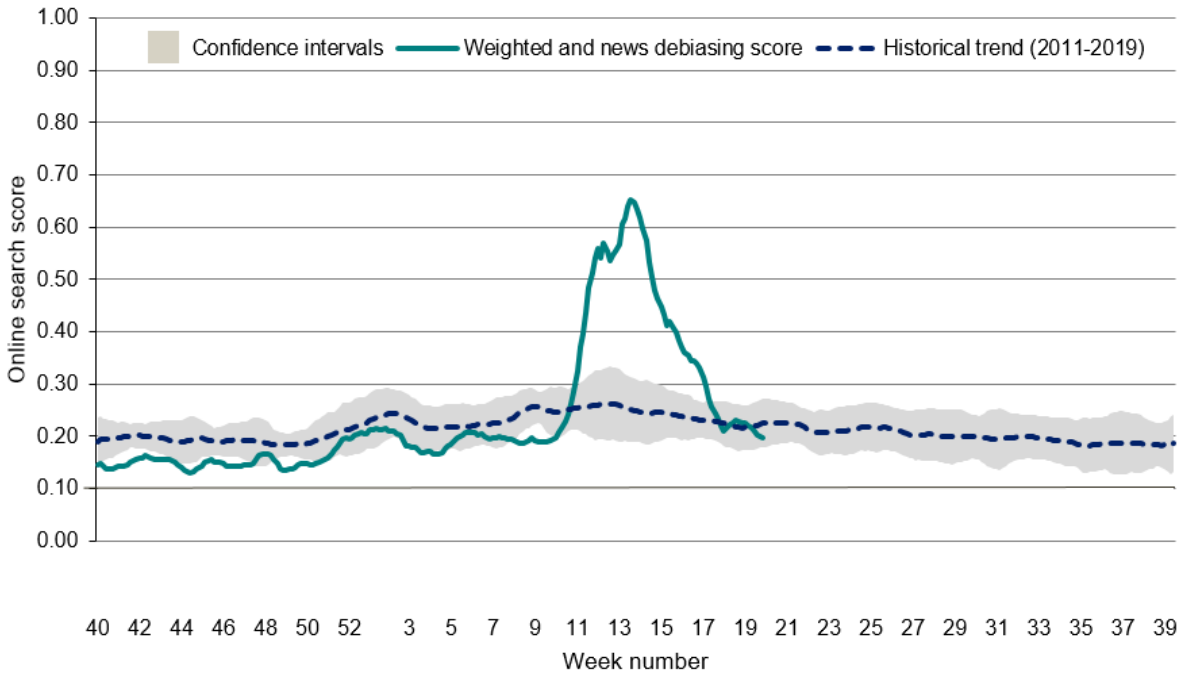


Figure 1: COVID-19 Surveillance Pyramid

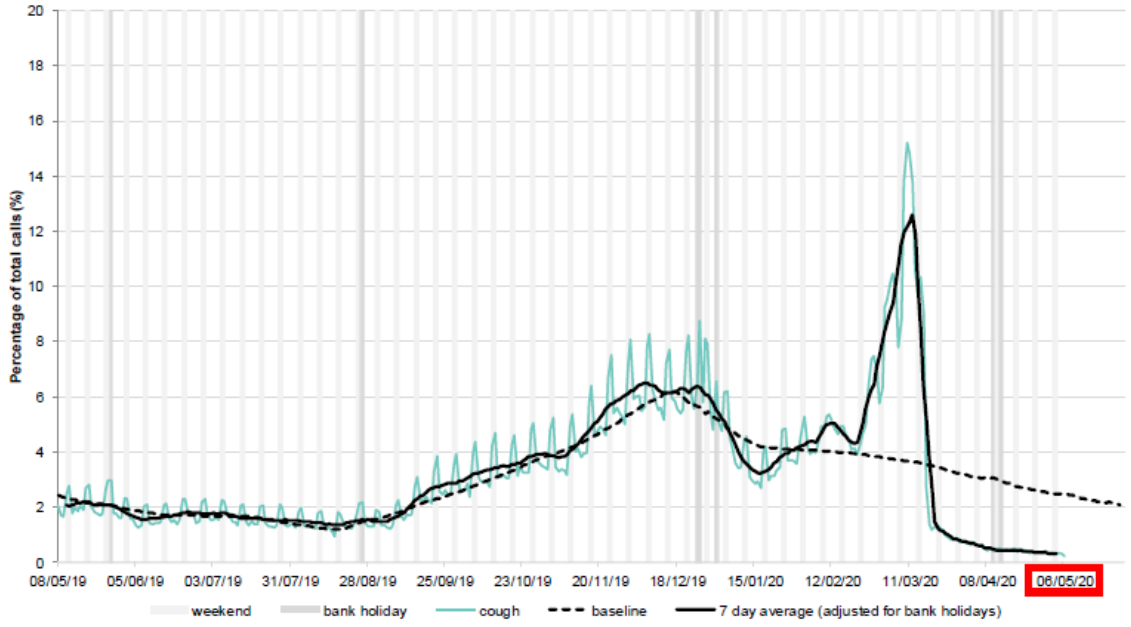
CHESS = COVID-19 Hospitalisations in England Surveillance System

Supplementary Figure 2: Standardised Google search score for COVID-19 symptoms, with weighted score for media-de-biasing and historical trend, England



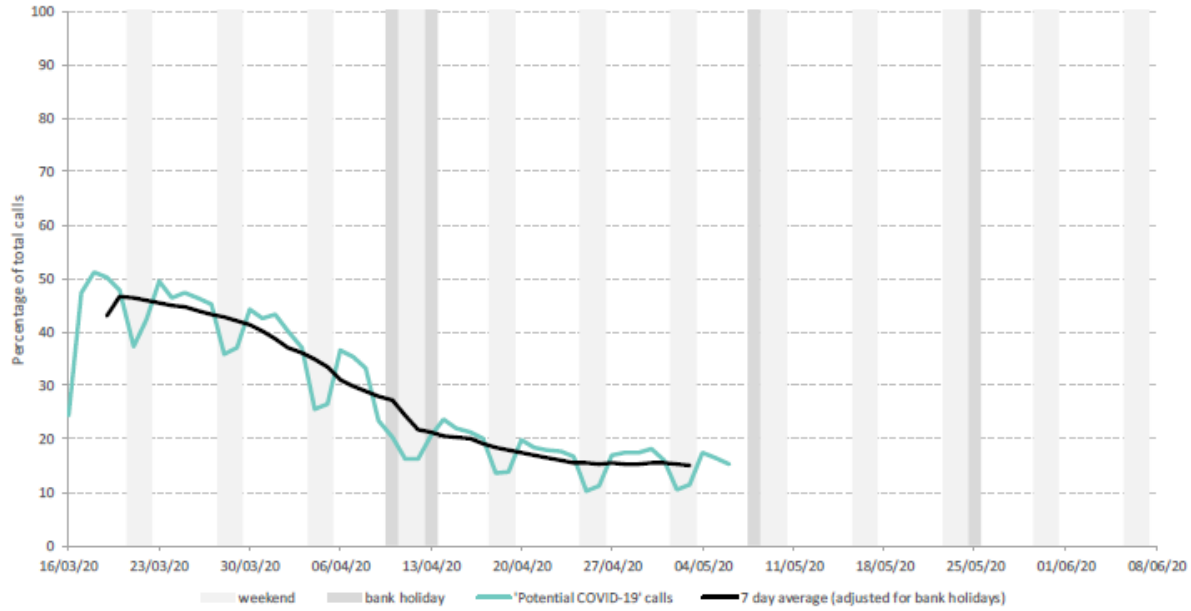
Supplementary Table 1: Time from symptom onset to first contact with health services (FluSurvey)

Time from symptom onset to contact	**Percentage accessing Health Service**					
	Visited			**Called**		
	GP	**Hospital Admission**	**ED**	**GP Reception**	**GP/Nurse**	**NHS111**
Same day	2.4	17.3	18	10	6.7	24.9
1 day	4.6	9.3	11.6	10.4	7	16.4
2 days	5.1	6.7	7.6	6.8	6.8	10.7
3 days	6.7	4	6.4	7.8	11.1	9.2
4 days	7.1	0	5.8	7.4	6.8	6.5
5-7 days	18.4	24	20.4	14.9	17.3	12.2
More than 7 days	52	33.3	29.1	40.8	41.4	16.8
don't know/can't remember	3.5	5.3	1.2	1.9	2.9	3.3
Total Number of respondent	**963**	**75**	**172**	**309**	**781**	**920**



Supplementary Figure 3: NHS 111 cough, daily calls, as a percentage of all calls (and 7-day moving average)

(a)



(b)

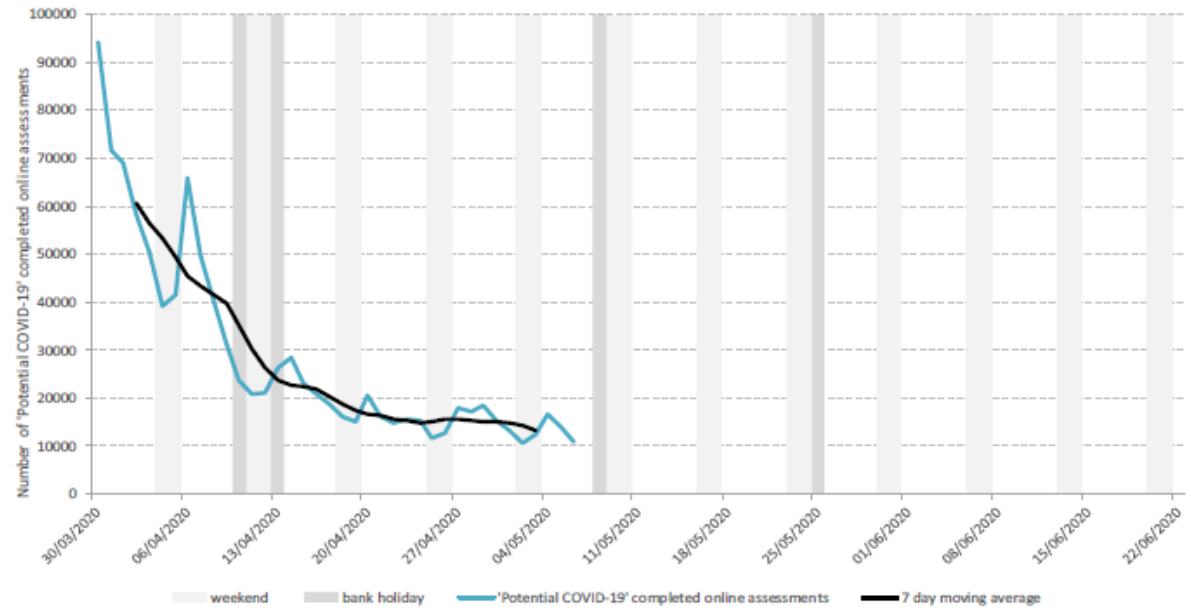
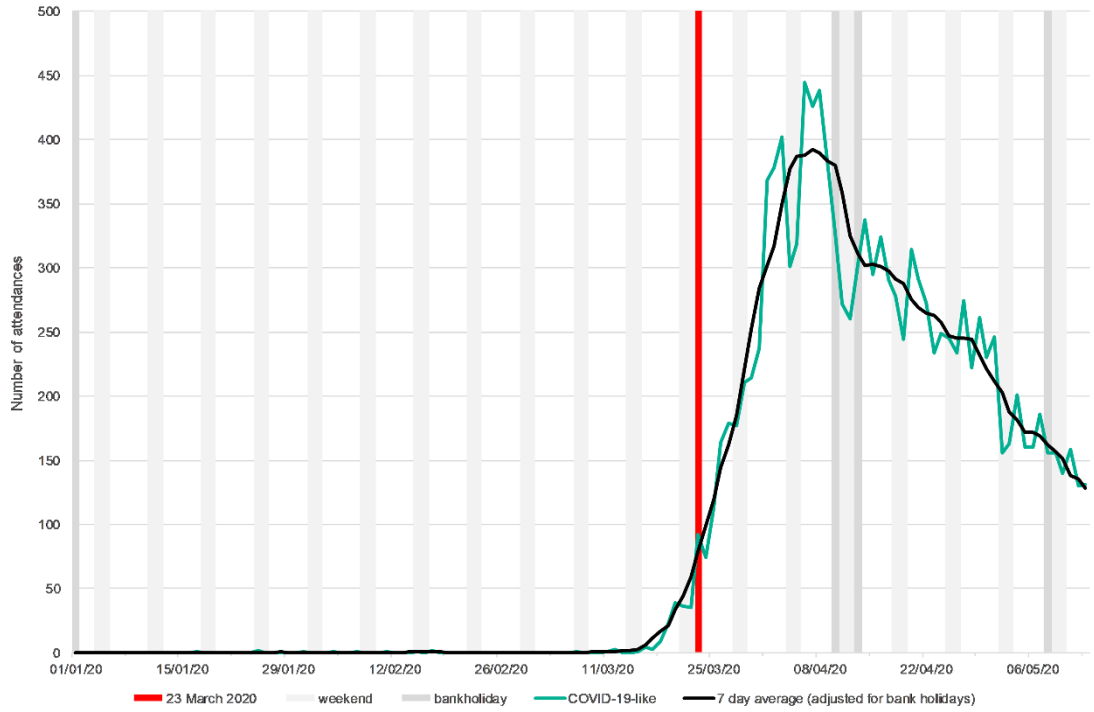


Figure 4: NHS 111 'potential COVID-19' (a) completed calls and (b) online assessments which have a 'potential COVID-19' final disposition (and 7-day moving average)

(a)



(b)

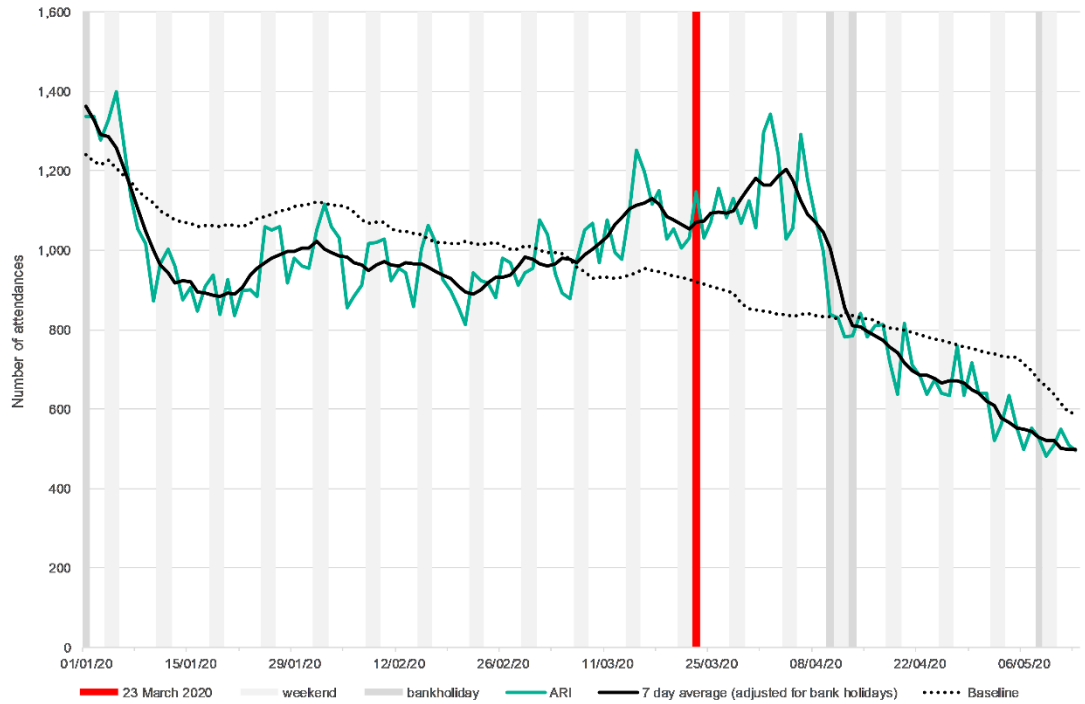


Figure 5: (a)ED COVID-19-like, daily attendances, as the number of attendances with a COVID-19 related primary diagnosis code (and 7-day moving average); (b) ED acute respiratory infection (ARI), daily attendances, as the number of attendances with an ARI related primary diagnosis code (and 7-day moving average)

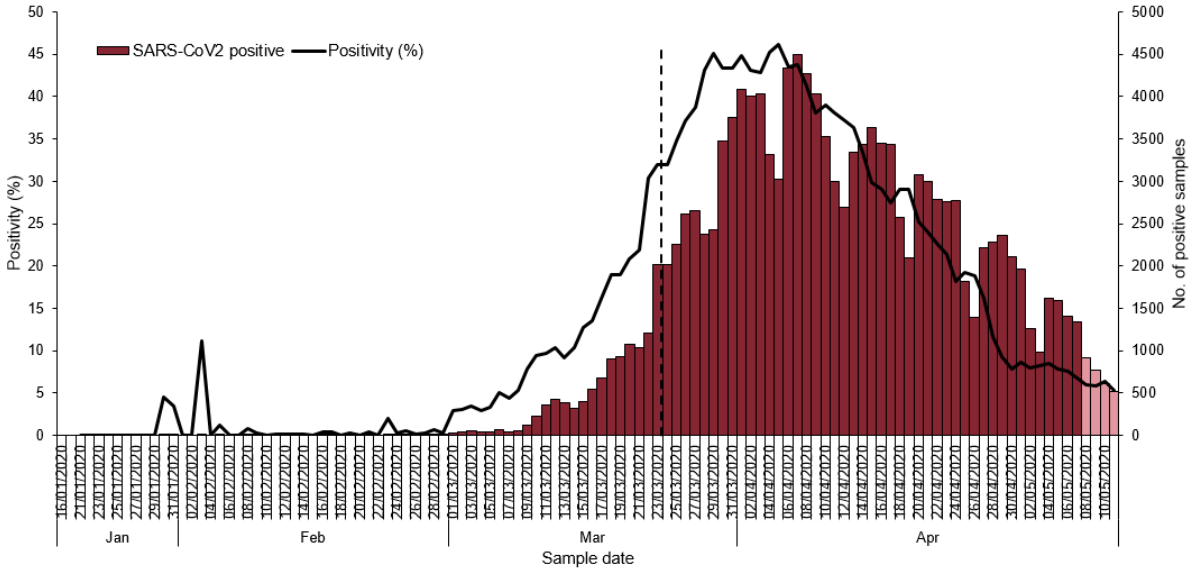


Figure 6: Overall positivity (%) (daily) and number of SARS-CoV-2 positive samples (SGSS)

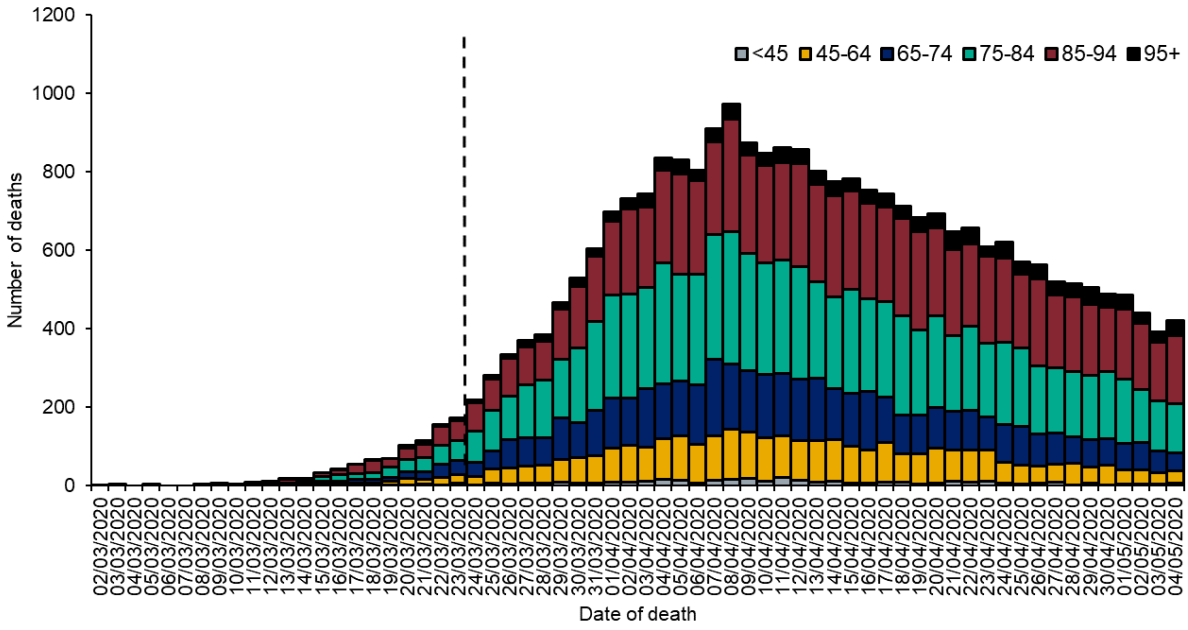


Figure 7: Cumulative number of deaths among COVID-19 confirmed cases by date of death and age group