

Impact of COVID-19 pandemic on emergency department attendances for young people

Folasade Solanke,¹ Stephanie Easton,^{1,2} Anna Selby,^{1,2} David James,² Graham Roberts ^{1,2,3,4}

► Additional supplemental material is published online only. To view, please visit the journal online (<http://dx.doi.org/10.1136/archdischild-2021-323389>).

¹Faculty of Medicine, University of Southampton, Southampton, UK

²Department of Child Health, University Hospital Southampton NHS Foundation Trust, Southampton, UK

³David Hide Asthma and Allergy Research Centre, St Mary's Hospital, Newport, UK

⁴NIHR Southampton Biomedical Research Centre, University Southampton NHS Foundation Trust, Southampton, UK

Correspondence to

Professor Graham Roberts, University of Southampton Faculty of Medicine, Southampton, UK; g.c.roberts@soton.ac.uk

Received 16 October 2021
Accepted 8 April 2022
Published Online First
12 May 2022

ABSTRACT

Introduction There are concerns that the COVID-19 pandemic is having an indirect negative impact on young people. We aimed to assess the impact of the pandemic on emergency department (ED) presentations and admissions.

Design We analysed ED presentations and admissions from a 5-year period (April 2016–February 2021). An interrupted time series analysis was used to estimate the presentations and admissions that would have been seen in year 5 without the pandemic using the data from years 1 to 4. These estimations were used to calculate the difference between the expected and the observed presentations and admissions during the pandemic year.

Results There were 166 459 presentations over 5 years. There was a 38.1% (95% CI 33.9% to 42.3%) reduction in presentations during the pandemic with no variation by sex, age, deprivation or ethnicity. Largest reductions were associated with children being home schooled rather than with lockdowns. For admissions, there was a 23.4% (17.4% to 29.4%) reduction, less for 5–17 year age group. Infection and asthma/wheeze presentations reduced by around 60% with smaller reductions for mental health and trauma. There was no change for surgical presentations, burns/scolds or allergic reactions. There was an increase in females aged 11–17 years presenting with mental health issues during the pandemic.

Conclusions During the pandemic, there was a substantial reduction in both ED presentations and admissions. The differential impact on specific presentations suggests this was due to the impact of social distancing and reduced social mixing rather than widening of health inequality or increased barriers to care.

Trial registration number NCT04893122.

INTRODUCTION

The COVID-19 infection was initially identified in Wuhan, China in December 2019, with cases of pneumonia of unknown origin.¹ The first reported cases of COVID-19 in the UK were identified at the end of January 2020.² The WHO declared the COVID-19 pandemic on 11 March 2020.¹ COVID-19 gives rise to respiratory symptoms accompanied by other syndromic features, with older individuals disproportionately affected.³ The UK government introduced social distancing and national lockdown measures from March 2020 (box 1).⁴

The impact COVID-19 has on older members of society is well documented.³ Children, adolescents

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Children, adolescents and young adults are largely not particularly unwell with COVID-19. A decrease in paediatric emergency presentations was seen in the first few months of the pandemic. Concern has been expressed that reduced presentations may lead to harm, especially with serious medical and surgical pathologies.

WHAT THIS STUDY ADDS

⇒ There was a large reduction in presentations and admissions during the pandemic with no variation by sex, age, deprivation or ethnicity. Larger reductions were seen for infection and with no change for surgical presentations suggesting this was driven by social distancing and reduced social mixing. There was an increase in females aged 11–17 years presenting with mental health issues during the pandemic.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ We need to understand how the use of different emergency care pathways changed to help future public health messaging to sign post the most appropriate pathway. We need to understand which pandemic interventions were most important in reducing infectious disease presentations; some might be appropriately continued after the pandemic. We need to understand how to support the mental health of female adolescents, particularly around their exposure to digital media.

and young adults however are largely not particularly unwell with COVID-19.⁵ There are potential indirect impacts of the pandemic on children with possible social, economic, psychological and medical affects. Adolescents and young adults are another vulnerable group, especially in terms of mental health problems.⁶ The Office for National Statistics has documented a general rise in symptoms of depression.⁷ Parents have had to make the decision as to whether their child sufficiently unwell to need to be taken to hospital during the pandemic. Barriers to presentation to hospital may



© Author(s) (or their employer(s)) 2022. No commercial re-use. See rights and permissions. Published by BMJ.

To cite: Solanke F, Easton S, Selby A, et al. *Arch Dis Child* 2022;**107**:e1.

Box 1 Key dates during the pandemic in the UK⁴

First COVID-19 case in UK: 29 January 2020.
 COVID-19 pandemic declared by The WHO: 11 March 2020.
 First national lockdown: 26 March–15 June 2020.*
 Online school learning: from 24 March with phased reopening from 1 June 2020.
 School summer holiday: 23 July–1 September 2020.
 Return to in-school learning for all students: 3 September–18 December 2020.
 Second national lockdown (continuation of normal schooling): 5 November–2 December 2020.*
 Christmas school holiday: 19 December 2020–3 January 2021
 Third national lockdown: 6 January 2021–11 April 2021.*
 Restart of online school learning: 6 January 2021–7 March 2021.

*Date when non-essential shops were allowed to open.

include societal restrictions, problems with local transport and illness and shielding in the family. A decrease in paediatric emergency presentations was seen in the few months following the onset of the pandemic in March 2020 in different UK hospitals.^{8 9} This decrease in paediatric emergency presentations and healthcare utilisation is potentially harmful, especially with serious medical and surgical pathologies.^{10 11}

In this study, we explored the impact of COVID-19 on emergency presentations in 0–24 year olds over the first year of the pandemic in a large emergency department (ED) and regional mixed major trauma centre. The two key objectives were first to assess the impact on overall ED presentations and hospital admissions and second to assess the impact of the pandemic on a number of specific medical, surgical, trauma and mental health conditions.

METHODS

Study design and participants

We undertook a retrospective observational study using an anonymised database of patients who presented to University Hospital Southampton NHS Foundation Trust in the UK.

Participants were patients aged 0–24 complete years who had presented to University Hospital Southampton NHS Foundation Trust over a 5-year period from 1 April 2016. There were no exclusion criteria. The dataset was fully anonymised prior to analysis. Further details are in the online supplement.

Outcomes

The primary outcome was attendance to ED in Southampton. This was defined as being booked into the ED admission system or onto the paediatric assessment unit admission system before September 2019. The secondary outcome was admission to University Hospital Southampton NHS Foundation Trust.

Population subgroups

We planned subgroup analyses by different presentations based on diagnostic labels in the ED: respiratory infection (eg, bronchiolitis, pneumonia and croup); asthma or wheeze (merged given that they are potentially overlapping diagnoses); gastrointestinal infections (eg, gastroenteritis and vomiting); general surgical presentations; mental health (eg, overdose, self-harm); traumatic/accidental injuries (focused on head injuries, fractures and sprains/ligament injuries); burns/scalds; and allergy/anaphylaxis. These groups were not intended to cover all presentations.

It was hypothesised that infectious disease, wheeze/asthma (most exacerbations are driven by viral infections),^{12 13} trauma and allergy presentations would fall while there would be no change in surgical presentations and an increase in mental health presentations.

Statistical analysis

The data for presentation and admission were initially assessed graphically. Overall numbers of presentations and admissions were reviewed for each week from April 2016 to February 2021. Data were compared by sex, age, ethnicity, deprivation and specific presentations.

An interrupted time series analysis was undertaken to assess the impact of the pandemic on attendances and admissions using Stata V.16 (Stata Corporation). This approach was used to estimate the number of ED presentations that would have been seen had there not been a pandemic (the counterfactual) based on the previous 4 years of data. This approach controls for long-term trends. The primary analysis focused on presentations.

We additionally undertook subgroup analyses on the different sex, age subgroups, ethnicity, deprivation and specific presentations. The analysis was repeated for admission data. The time series forecast enabled us to estimate the difference between the expected attendances/admissions (counterfactual) and observed ones during the pandemic period. This was presented as absolute and relative difference (95% CIs). A p value of less than 0.05 was taken to indicate statistical significance.

As a secondary analysis, we estimated the expected number of presentations and admissions using the average of the preceding 2 years on the basis that this minimised the impact of any long-term trends. We used this to assess whether the impact of the pandemic was similar for each subgroup for each presentation. This was assessed with a χ^2 analysis to highlight overall differences.

It has been suggested that 24 or more time points have more than 80% power to detect an effect size of 1 or greater, with a minimum of 8 time points per period needed for sufficient power in estimating regression coefficients.¹⁴

Ethical and research governance

The study was registered at clinicaltrials.gov.

RESULTS

Participants

A total of 1 664 59 patients aged 0–24 years presented to University Hospital Southampton NHS Foundation Trust from 1 April 2016 to 25 February 2021. Of these, 86 164 (52%) were male, and 137 411 (83%) patients were of white ethnicity. The largest group of patients presenting to ED were in age groups 0–4 years, accounting for 57 166 (34%) presentations followed by those aged 18–24 years, accounting for 52 447 (32%) presentations (online supplemental table S1). **Table 1** shows the patient demographics for patients presenting over the 5-year period, before and during the pandemic. There were less than 200 COVID-19 cases in the study group during the study period. Details for those admitted are shown in online supplemental table S2.

Weekly presentations and admissions before and during the pandemic

Figure 1 shows the weekly ED presentations and admissions by sex, age subgroup, deprivation decile subgroup and ethnicity during the year before and during the pandemic. In mid-March 2020, there is an obvious substantial reduction in the number of

Table 1 Summary of participants presenting to emergency department

	Prepandemic				Pandemic					
	Year 1	Year 2	Year 3	Year 4	Year 5					
All	35 806	100.0	35 059	100.0	35 407	100.0	36 827	100.0	23 360	100.0
Males	18 656	52.1	18 375	52.4	18 488	52.2	19 022	51.7	11 623	49.8
Females	17 144	47.9	16 681	47.6	16 913	47.8	17 799	48.3	11 725	50.2
0–4 years	12 251	34.2	12 121	34.6	12 485	35.3	12 629	34.3	7 680	32.9
5–10 years	5 361	15.0	5 331	15.2	5 578	15.8	6 051	16.4	3 483	14.9
11–17 years	6 515	18.2	6 263	17.9	6 485	18.3	7 061	19.2	4 718	20.2
18–24 years	11 679	32.6	11 344	32.4	10 859	30.7	11 086	30.1	7 479	32.0
Low deprivation	9 963	28.0	9 770	28.1	9 711	27.6	10 317	28.2	6 691	28.8
Moderate deprivation	13 316	37.4	13 487	38.7	13 624	38.7	13 932	38.1	9 026	38.8
High deprivation	12 285	34.5	11 561	33.2	11 828	33.6	12 310	33.7	7 538	32.4
White ethnicity	30 017	83.8	29 428	83.9	29 515	83.4	29 629	80.5	18 822	80.6
Non-white ethnicity	3 938	11.0	3 715	10.6	3 791	10.7	4 318	11.7	2 597	11.1
Admitted	6 870	19.1	6 706	19.0	7 246	20.6	7 568	20.7	5 293	22.8
Discharged	28 936	80.3	28 353	80.5	28 161	79.9	29 259	80.1	18 067	77.8
Own transport	22 636	71.5	22 652	73.2	23 201	74.7	27 244	77.5	17 965	76.9
Ambulance	7 094	22.4	6 860	22.2	7 092	22.8	7 271	20.7	5 150	22.0
Public transport	1 612	5.1	1 210	3.9	653	2.1	546	1.6	165	0.7
Other arrival mode	301	1.0	218	0.7	108	0.3	109	0.3	80	0.3
Self or carer referral	23 741	66.4	23 970	68.4	25 668	72.5	28 883	78.4	17 138	74.1
Emergency and hospital referral	4 213	11.8	3 174	9.1	2 144	6.1	1 455	4.0	488	2.1
National Health Service (NHS) 111	2 905	8.1	3 254	9.3	3 189	9.0	2 689	7.3	3 327	14.4
General Practitioner (GP) referral	3 817	10.7	3 768	10.7	3 801	10.7	3 056	8.3	1 731	7.5
Other referral pathway	1 077	3.0	893	2.5	605	1.7	744	2.0	439	1.9
Trauma	5 874	16.4	5 874	16.8	6 820	19.3	6 144	16.7	3 523	15.1
Surgical	2 163	6.0	1 806	5.2	1 524	4.3	1 658	4.5	1 541	6.6
Respiratory infections	1 212	3.4	3 152	9.0	4 373	12.4	4 853	13.2	1 872	8.0
Asthma/wheeze	815	2.3	1 078	3.1	1 434	4.1	1 023	2.8	2.5%	815
Mental health	756	2.1	1 392	4.0	1 926	5.4	1 926	5.2	1 441	6.2
Burns/scalds	485	1.4	407	1.2	389	1.1	446	1.2	379	1.6
Allergy	310	0.9	335	1.0	296	0.8	295	0.8	219	0.9
Gastrointestinal infections	286	0.8	618	1.8	1 056	3.0	1 199	3.3	473	2.0

Data are number (column percentage).

Year 1: 1 April 2016–31 March 2017 (365 days); year 2: 1 April 2017–31 March 2018 (365 days); year 3: 1 April 2018–31 March 2019 (365 days); year 4: 1 April 2019–12 March 2020 (347 days); year 5: 13 March 2020–26 February 2021 (351 days). Information about sex and ethnicity not available for all patients. Other arrival mode includes custodial services, police and unknown. NHS 111 also includes NHS Direct and other NHS advice. Other referral pathway includes custodial services, police service, planned review and unknown. Trauma just covers head injuries, fractures and soft tissue injuries. A comparison with Southampton local authority demographic data is given in online supplemental table S1.

presentations and admissions, irrespective of sex, age subgroup, deprivation decile subgroup and ethnicity.

Predicting presentations and admissions had the pandemic not occurred

Figure 2 shows a graphical representation of the number of presentations and admissions at different time points comparing the year before (prepandemic) and the year of the pandemic. It also shows the estimated presentations and admissions assuming the pandemic had not occurred. These time series forecasts allow seasonal variation and long-term trends (eg, increasing presentations over time) to be taken into account. The largest drops in presentations are seen with national lockdowns combined with home schooling. ED presentations return to their expected levels when schools reopened in September 2020. There was not such a marked reduction in activity in the second period of lockdown (box 1) until children stopped school the start of the Christmas holiday.

Estimated impact of the pandemic on presentations and admissions

Based on the time series analyses forecast of the ED presentations had there not been a pandemic, there were 38.1% (95% CI 33.9% to 42.3%) fewer ED presentations during the pandemic year (table 2). Similar reductions were seen for each gender, age, deprivation decile and ethnicity subgroup. This reduction was most dramatic in infectious disease ED presentations: respiratory infections: 59% (95% CI 46.5% to 72.5%), asthma/wheeze: 55.9% (95% CI 45.7% to 66.2%) and gastrointestinal infections: 64.1% (95% CI 54.8% to 73.5%). Smaller reductions were seen for mental health (30.3% (95% CI 24.0 to 42.5%)) and trauma (33.3% (95% CI 24.0 to 42.5%)) presentations. For surgical presentations, burns/scalds and allergy/anaphylaxis, observed presentation numbers were similar to estimated ones (table 2).

For admissions, a 23.4% (95% CI 17.4% to 29.4%) reduction was seen during the pandemic (year 5) compared with numbers

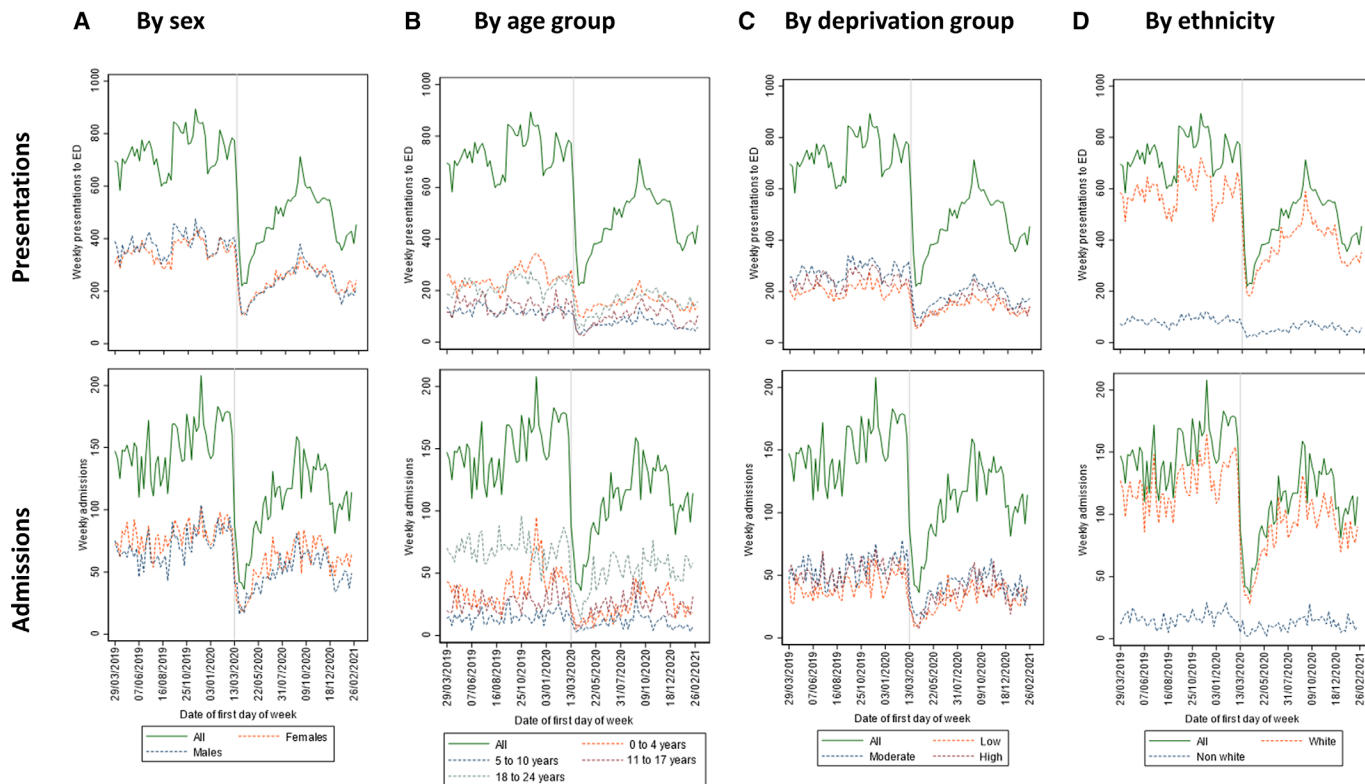


Figure 1 Weekly presentations and admissions before and during the pandemic. Presentations to emergency department and admissions by week for 1 year before (year 4) and after (year 5) the start of the pandemic (marked with grey line). Data presented for all and then split by (A) sex, (B) age group, (C) deprivation decile and (D) ethnicity.

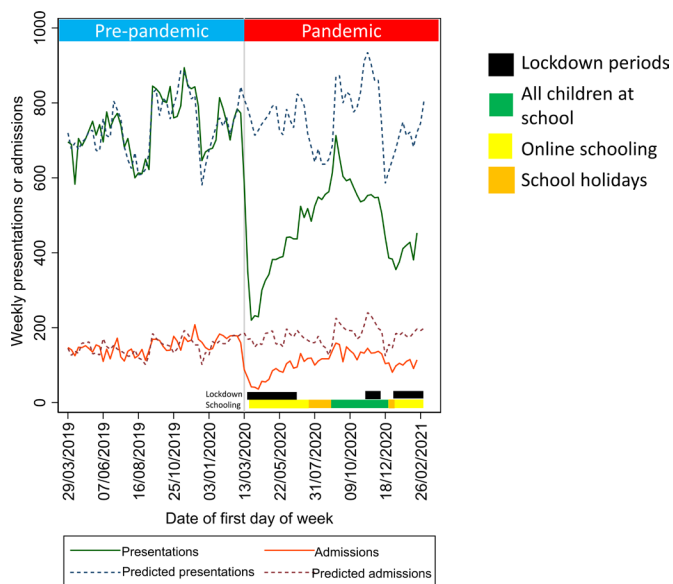


Figure 2 Observed presentations to emergency department and admissions with estimated activity had the pandemic not occurred. Time series analysis fitted to data from first 4 years and then used to estimated activity in pandemic year 5 assuming the pandemic had not occurred (dotted lines). The time series approach models trend (long-term changes), cycle (aperiodic oscillations around the trend), seasonal (increased presentations in autumn and winter) and random noise. Green line represents presentations, and red line represents admissions. During the prepandemic year (year 4), the estimated line is seen to be a close but not exact fit with the observed data. Time series models presented in online supplemental figures S2 and S7.

estimated by the time series analysis (table 2). No significant reduction was seen for school age (5–17 years) children nor those from low deprivation households (table 2). There were dramatic reductions in infection driven admissions (respiratory infections 60.7% (95% CI 46.0 to 75.5%), asthma/wheeze 42.6% (95% CI 29.6 to 55.8%)). There were also smaller reductions in mental health admissions (28.5% (95% CI 19.9 to 37.1%)) (in part due to access to next day community psychiatry assessment during the pandemic preventing some admissions) and trauma (44.8% (95% CI 35.8 to 53.8%)) admissions. Surgical admission were not significantly reduced during the pandemic (table 2). There were too few admissions to see the possible impact of the COVID-19 pandemic on gastrointestinal infections, burns/scalds and allergy/anaphylaxis related admissions.

In our secondary analysis, we found that the impact was different between subgroups for some presentations when expected pandemic year 5 presentations and admissions were calculated as an average of the previous years and compared with the observed data. Specifically, for mental health presentations, there was an increase (26.6%) in presentations for the 11–17 year age group, while they were similar or reduced for the other age groups during the pandemic year (25.0%, 7.5% and 29.8% reductions for 0–4, 5–10 and 18–24 year age groups, respectively, $p < 0.001$) (online supplemental table S7). Additionally, while there was a large reduction in males presenting with mental health problems, there was a similar number of female presentations (31.5% vs 1.3% reductions, respectively, $p < 0.001$) (online supplemental table S7). Further analysis confirmed that females in the 11–17 year group who were more likely to present with mental health problems during the pandemic (online supplemental table S19, figure S1). Similar differences in admissions for mental health problems were seen

Table 2 Summary of observed (A) presentations and (B) for pandemic year 5 and estimated presentations if there had not been a pandemic

A. Presentations	Observed		Estimated had there not been a pandemic		Absolute difference		Relative difference
	Pandemic (year 5)	Percentage	Pandemic (year 5)	Percentage	Mean	95% CI	
All	23 360	100.0	37 740	100.0	-14 380	-12 784 to -15 977	
Males	11 623	49.8	19 581	51.9	-7958	-7062 to -8855	
Females	11 725	50.2	18 318	48.5	-6593	-5815 to -7371	
0 to 4 years	7680	32.9	13 100	34.7	-5420	-4749 to -6092	
five to 10 years	3483	14.9	6282	16.6	-2799	-2435 to -3163	
eleven to 17 years	4718	20.2	7859	20.8	-3141	-2638 to -3643	
18 to 24 years	7479	32.0	11 337	30.0	-3858	-3261 to -4456	
White ethnicity	18 822	80.6	30 546	80.9	-11 725	-10 438 to -13 012	
Non-white ethnicity	2597	11.1	4384	11.6	-1690	-1424 to -1957	
Low deprivation	6691	28.6	11 583	30.7	-4892	-4416 to -5367	
Moderate deprivation	9026	38.6	14 388	38.1	-5362	-4746 to -5979	
High deprivation	7538	32.3	12 495	33.1	-4957	-4358 to -5556	
Respiratory infections	1872	8.0	4624	12.3	-2752	-2150 to -3354	
Asthma/wheeze	579	2.5%	1313	3.5	-737	-600 to -869	
Gastrointestinal infections	473	3.3	1198	3.2	-768	-656 to -880	
Surgical	1541	6.6	1535	4.1	6	167 to -156	
Mental health	1441	6.2	2066	5.5	-625	-495 to -754	
Trauma	3523	16.7	5281	14.0	-1758	-1269 to -2247	
Burns/scalds	379	1.6	390	1.0	-11	45 to -68	
Allergy	219	0.9	262	0.7	-43	3 to -89	

B. Admissions	Observed		Estimated had there not been a pandemic		Absolute difference		Relative difference
	Pandemic (Year 5)	Percentage	Pandemic (year 5)	Percentage	Mean	95% CI	
All	5293	100.0	6911	100.0	-1618	-1203 to -2033	
Males	2447	47.3	3510	50.8	-1063	-853 to -1273	
Females	2842	52.7	3678	53.2	-836	-595 to -1078	
0-4 years	1146	26.1	1566	22.7	-420	-277 to -562	
5-10 years	501	10.0	525	7.6	-24	45 to -93	
11-17 years	1145	17.9	1195	17.3	-50	88 to -187	
18-24 years	2501	46.1	3606	52.2	-1105	-868 to -1341	
White ethnicity	4260	88.2	5924	85.7	-1664	-1317 to -2012	
Non-white ethnicity	567	11.8	797	11.5	-218	-142 to -294	
Low deprivation	1518	27.8	1597	23.1	-79	92 to -250	
Moderate deprivation	2045	37.4	2981	43.1	-936	-756 to -1116	
High deprivation	1694	34.8	2893	41.9	-1200	-1062 to -1338	
Respiratory infections	359	6.8	913	13.2	-554	-420 to -689	
Asthma/wheeze	314	5.9	547	7.9	-233	-162 to -305	
Gastrointestinal infections	69	1.3	-	-	-	-	
Surgical	764	14.4	659	9.5	-96	194 to -1	
Mental health	771	14.6	1078	15.6	-307	-214 to -400	
Trauma	355	6.7	643	9.3	-288	-230 to -346	
Burns/scalds	8	0.2	-	-	-	-	
Allergy	59	1.1	-	-	-	-	

Data are counts (percentages). Differences represent absolute (table) and relative (figure) differences (95% CIs) between estimated presentations or admissions had there not been a pandemic and observed presentations or admissions. Estimates are based on the time series analysis data from years 1-4. Year 5: 13 March 2020-25 February 2021 (50 weeks). Some admission estimates missing as there were insufficient admission each week to generate a time series equation. Time series models are presented in online supplemental figure S21-S11, S20-S24.

(online supplemental table S20). There was also a smaller reduction for the 18-24 year age group for respiratory infections presentations than other groups (26.8% vs 63.2%, 67.2% and 45.3% for 0-4, 5-10 and 11-17 year age groups, respectively, $p < 0.001$) (online supplemental table S3). For admissions, there were smaller reductions for both the 11-17 and 18-24 year age groups than for other age groups (1.3% and 25.2% vs 63.9% and 67.2% for 0-4, and 5-10 year age groups, $p < 0.001$) (online supplemental table S11). Lastly, for accident and trauma presentations, there was a much larger reduction in presentations for the 18-24 age group compared with other age groups (56.2% vs 29.3%, 44.6% and 47.4% for the 0-4, 5-10 and 11-17 year age groups, respectively, $p < 0.001$) (online supplemental table S8);

these differences were not seen in the admission data (online supplemental table S16).

DISCUSSION

During the COVID-19 pandemic, there was a substantial reduction in the number of ED presentations for children, adolescents and young adults, irrespective of sex, age, deprivation decile and ethnicity. There was a smaller reduction in admissions. Reduction in presentations were associated with each national lockdown, with a large increase coinciding with the return to in person schooling in September 2020. The reductions were most evident in infectious disease-related presentations such

as respiratory infections and asthma/wheeze. There were also reductions in the overall presentation and admission rates of mental health and trauma-related attendances. However more females aged 11–17 years presented with mental health problems during the pandemic. This contrasted with surgical presentations which were similar to previous years.

Other studies considering the impact of the pandemic on ED presentations and admissions

Other studies have documented pandemic-related reductions in presentations and admissions, both in the UK and globally.^{8–11} Compared with the previous year, there was a similar 60% decrease in weekly paediatrics ED presentations during the first weeks of the first UK lockdown in Manchester.¹¹ Similar reductions were seen in Oxfordshire where infectious disease related presentations also showed the greatest reductions.¹⁵ Reductions in communicable disease presentations have also been observed in other countries.¹⁶ This contrasts with acute surgical presentations that have been hardly affected by the pandemic.¹⁷

There has been a concern that the reduction in presentations might have impacted on the timely access of patients to medical care.¹⁰ One study focusing on the initial few weeks of the pandemic in UK and Ireland found that only 6.5% of presentations to children's EDs were delayed.¹¹ Of those that were delayed, there was a low rate of admissions and low probability of harm for overall outcomes.¹¹ Reassuringly, other studies have shown greater reduction of presentation for lower acuity cases than higher acuity cases over 6 months of the pandemic period, with patients presenting if deemed necessary.^{9, 17} The lack of change in surgical presentations in our and other studies suggests patients are presenting when their condition is critical.¹⁶ Concern has been raised about the potential for poverty to lead to inequity in access to medical care during the pandemic,¹⁸ and there are also reports relating harm to poverty and ethnicity.^{19, 20} We found no evidence that either deprivation or ethnicity affected the presentations or admission during the first year of the pandemic within a free at the point of delivery national health service.

Possible explanations to changes in ED presentations and admissions

There are many possible reasons for the reduction in ED presentations and admissions. Families may have a higher threshold for their children to self-present due to the pandemic's stay at home instruction. The pattern of healthcare access behaviour may have switch from accessing face-to-face services to using virtual 111 and GP telephone services.²¹ However, this highlights the need for clear governmental messaging that critically unwell young people should still seek ED care even in a national emergency.

Social distancing and reduced mixing have led to a reduction in all infectious conditions reducing the number of infection-related ED presentations during the pandemic.^{15, 17} This may explain some of the reduction in asthma and wheeze presentations^{22, 23} as most are driven at least in part by viral infections.^{12, 13} The large reduction in pollution levels associated with stay at home rules may have also reduced the number of pollution-related exacerbations.^{24, 25}

Although there was a small reduction in mental health presentation, they were increased for females aged 11–17 years. This may potentially have been due to less face-to-face interactions with friends resulting in loneliness and worsened mental health²⁴ or due to changing between online and face-to-face schooling.²⁵ Loneliness is associated with being female and

older adolescence,²⁴ potentially explaining the sex difference. There are big differences in digital use between adolescent males and females with boys spending more time gaming, while girls spent more time on smartphones, social media and texting in general.²⁶ Greater digital media use has been associated with lower well-being.

Strengths and limitations of the study

The study analysed a very large number of patient episodes from a large emergency department. Southampton is demographically representative of the UK population in ethnic diversity and socioeconomic status. We were able to take into account the long-term trends and look for potential changes in coding practices, seasonality and variation from year to year in weather. There are a few weaknesses in this study including that we only used ED diagnostic codes, which may not always be accurate. There were limited numbers to enable a detailed analysis of all the subgroups.

SUMMARY AND CONCLUSIONS

ED attendances reduced substantially over the pandemic, particularly for conditions related to infection. Reassuringly, there was little change in surgical conditions suggesting that patients were appropriately presenting to hospital. It is important to continue to inform the public as to when to present to hospital, GP or NHS 111 for different types of care according to acuity. The increase in mental health presentations in young females is concerning, and consideration needs to be given as to how to support these adolescents, especially around the increased exposure to digital media during the pandemic.

Correction notice This article has been corrected since it was first published. Table 2 has been updated so that it reflects what was originally submitted by the authors.

Acknowledgements We would like to acknowledge Khatija Omer for her support in providing the routine data for this analysis. Also to Louise Roberts (15 year old) for her comments on the protocol, her interpretation of the data and feedback on the draft manuscript.

Contributors FS and GR conceived the study and developed the protocol with the help of the other authors. DJ provided the data. FS, AS and GR analysed the data. All the authors contributed for to the interpretation of the analysis and drafting and revising the manuscript. All authors approved of the final version of the manuscript and agree to be accountable for the work. GR acts as guarantor for the paper and accepts full responsibility for the work and the conduct of the study, had access to the data, and controlled the decision to publish.

Funding This work was supported by The University of Southampton Faculty of Medicine. GR is supported by the National Institute of Health Research Southampton Biomedical Research Centre.

Competing interests None declared.

Patient consent for publication Not applicable.

Ethics approval This study used anonymised routine clinical data from NHS patients, being assessed and approved by Health Research Authority (21/HRA/1441). This was also assessed and approved by the University of Southampton Faculty of Medicine research ethics committee.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No data are available. Data are not available for sharing due to lack of ethical permission.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

This article is made freely available for personal use in accordance with BMJ's website terms and conditions for the duration of the covid-19 pandemic or until otherwise determined by BMJ. You may download and print the article for any lawful, non-commercial purpose (including text and data mining) provided that all copyright notices and trade marks are retained.

ORCID iD

Graham Roberts <http://orcid.org/0000-0003-2252-1248>

REFERENCES

- World Health Organisation. Rolling updates on coronavirus disease (COVID-19), 2021. Available: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen> [Accessed 16 October 2021].
- Wright O. *Coronavirus: how the UK dealt with its first Covid case*. England: BBC, 2021. <https://www.bbc.co.uk/news/uk-england-55622386#:~:text=It's%20exactly%2012%20months%20since,Covid%2D19%20in%20the%20UK.&text=On%2023%20January%20%2D%20the%20day,world%20to%20enter%20coronavirus%20lockdown>
- Shahid Z, Kalayanamitra R, McClafferty B, et al. COVID-19 and older adults: what we know. *J Am Geriatr Soc* 2020;68:926–9.
- Institute for government. *Timeline of UK coronavirus lockdowns, March 2020 to March 2021*. London, 2021.
- Tuna Toptan SC, Hoehl S. *Pediatrics and COVID-19. Coronavirus disease - COVID-19*. Cham: Springer, 2021: 1318. 197–208.
- National Health Service. Children and young people's mental health services, 2019. The NHS long term plan. Available: <https://www.longtermplan.nhs.uk/online-version/chapter-3-further-progress-on-care-quality-and-outcomes/a-strong-start-in-life-for-children-and-young-people/children-and-young-peoples-mental-health-services/> [Accessed 16 Oct 2021].
- Office of National Statistics. Coronavirus and depression in adults, Great Britain: June 2020. Coronavirus and depression in adults, Great Britain [Internet], 2020. Available: <https://www.ons.gov.uk/peoplepopulationandcommunity/wellbeing/articles/coronavirusanddepressioninadultsgreatbritain/june2020> [Accessed 16 Oct 2021].
- Isba R, Edge R, Jenner R, et al. Where have all the children gone? Decreases in paediatric emergency department attendances at the start of the COVID-19 pandemic of 2020. *Arch Dis Child* 2020;105:704–1.
- Dann L, Fitzsimons J, Gorman KM, et al. Disappearing act: COVID-19 and paediatric emergency department attendances. *Arch Dis Child* 2020;105:810–1.
- Lazzerini M, Barbi E, Apicella A, et al. Delayed access or provision of care in Italy resulting from fear of COVID-19. *Lancet Child Adolesc Health* 2020;4:e10–11.
- Roland D, Harwood R, Bishop N, et al. Children's emergency presentations during the COVID-19 pandemic. *Lancet Child Adolesc Health* 2020;4:e32–3.
- Ramsahai JM, Hansbro PM, Wark PAB. Mechanisms and management of asthma exacerbations. *Am J Respir Crit Care Med* 2019;199:423–32.
- Makrinioti H, Custovic A, Hasegawa K, et al. The role of interferons in preschool wheeze. *Lancet Respir Med* 2021;9:9–11.
- Ewusie JE, Soobiah C, Blondal E, et al. Methods, applications and challenges in the analysis of interrupted time series data: a scoping review. *J Multidiscip Healthc* 2020;13:411–23.
- Charlesworth JEG, Bold R, Pal R. Using ICD-10 diagnostic codes to identify 'missing' paediatric patients during nationwide COVID-19 lockdown in Oxfordshire, UK. *Eur J Pediatr* 2021;180:3343–57.
- Silvagni D, Baggio L, Lo Tartaro Meragliotta P, et al. Neonatal and pediatric emergency room visits in a tertiary center during the COVID-19 pandemic in Italy. *Pediatr Rep* 2021;13:168–76.
- Irvine MA, Portales-Casamar E, Goldman RD. An interrupted time-series analysis of pediatric emergency department visits during the coronavirus disease 2019 pandemic. *Pediatr Emerg Care* 2021;37:325–8.
- Cheng TL, Moon M, Artman M, et al. Shoring up the safety net for children in the COVID-19 pandemic. *Pediatr Res* 2020;88:349–51.
- Sharma S, Wong D, Schomberg J, et al. COVID-19: differences in sentinel injury and child abuse reporting during a pandemic. *Child Abuse Negl* 2021;116:104990.
- Abrams EM, Greenhawt M, Shaker M, et al. The COVID-19 pandemic: adverse effects on the social determinants of health in children and families. *Ann Allergy Asthma Immunol* 2022;128:19–25.
- Marshall M, Howe A, Howsam G, et al. COVID-19: a danger and an opportunity for the future of general practice. *Br J Gen Pract* 2020;70:270–1.
- Guignon OL, Morpew T, Ehwerhemuepha L, et al. Evaluating the impact of coronavirus disease 2019 on asthma morbidity: a comprehensive analysis of potential influencing factors. *Ann Allergy Asthma Immunol* 2021;127:91–99.
- Ulrich L, Macias C, George A, et al. Unexpected decline in pediatric asthma morbidity during the coronavirus pandemic. *Pediatr Pulmonol* 2021;56:1951–6.
- Cooper K, Hards E, Moltrecht B, et al. Loneliness, social relationships, and mental health in adolescents during the COVID-19 pandemic. *J Affect Disord* 2021;289:98–104.
- Schwartz KD, Exner-Cortens D, McMorris CA, et al. COVID-19 and student well-being: stress and mental health during Return-to-School. *Can J Sch Psychol* 2021;36:166–85.
- Twenge JM, Martin GN. Gender differences in associations between digital media use and psychological well-being: evidence from three large datasets. *J Adolesc* 2020;79:91–102.

Impact of the COVID-19 pandemic on emergency department attendances and admissions for children, adolescents and young adults

Folasade Solanke¹, Stephanie Easton^{1,2}, Anna Selby^{1,2}, David James², Graham Roberts¹⁻⁴

Affiliations

1. University of Southampton Faculty of Medicine, Southampton;
2. Child Health, University Hospital Southampton NHS Foundation Trust, Southampton;
3. NIHR Southampton Biomedical Research Centre, University Hospital Southampton NHS Foundation Trust, Southampton;
4. David Hide Asthma and Allergy Research Centre, St Mary's Hospital, Newport, Isle of Wight.

Address for correspondence: Graham Roberts, Paediatric Allergy and Respiratory Medicine (Mailpoint 805), Southampton University Hospital NHS Foundation Trust, Tremona Road, Southampton SO16 6YD, United Kingdom. E-mail: g.c.roberts@soton.ac.uk. Tel. 02381206160.

Online supplementary material

Contents

Introduction	3
Methods	3
Table S1: Summary of participants attending emergency department and people living in Southampton local authority.	5
Table S2: Summary of participants admitted to hospital.	6
Table S3: Respiratory infection presentations divided by population subgroups.	7
Table S4: Asthma and wheeze presentations divided by population subgroups.	8
Table S5: Gastrointestinal infection presentations divided by population subgroups.	9
Table S6: Surgical presentations divided by population subgroups.	10
Table S7: Mental health presentations divided by population subgroups.	11
Table S8: Accidental injury and traumatic presentations divided by population subgroups.	12
Table S9: Burns and scalds presentations divided by population subgroups.	13
Table S10: Allergy and anaphylaxis presentations divided by population subgroups.	14
Table S11: Respiratory infection admissions divided by population subgroups.	15
Table S12 Asthma and wheeze admissions divided by population subgroups.	16

Table S13 Gastrointestinal infection admissions divided by population subgroups.	17
Table S14: Surgical admissions divided by population subgroups.	18
Table S15: Mental health admissions divided by population subgroups.	19
Table S16: Accidental injury and trauma admissions divided by population subgroups.	20
Table S17: Burns and scalds admissions divided by population subgroups.	21
Table S18: Allergy and anaphylaxis admissions divided by population subgroups	22
Table S19: Mental health presentations divided by sex and age group.	23
Table S20: Mental health admissions divided by sex and age group.	24
Table S21: Diagnostic labels included in each group presentation	25
Figure S1: Weekly mental health presentations before and during the pandemic in the 11-17 and 18-24 year age groups for (a) males and (b) females.	26
Figure S2. Weekly presentations for all.	27
Figure S3. Weekly presentations for (a) males and (b) females.	28
Figure S4. Weekly presentations for (a) 0-4 years, (b) 5-10 years, (c) 11-17 years and (d) 18-24 years.	29
Figure S5. Weekly presentations and admissions by (a) white ethnicity and (b) non-white ethnicity.	30
Figure S6. Weekly presentations by (a) high deprivation, (b) moderate deprivation and (c) low deprivation.	31
Figure S7. Weekly admissions for all.	32
Figure S8. Weekly admissions for (a) males and (b) males.	33
Figure S9. Weekly admissions for (a) 0-4 years, (b) 5-10 years, (c) 11-17 years and (d) 18-24 years.	34
Figure S10. Weekly admissions by (a) white ethnicity and (b) non-white ethnicity.	35
Figure S11. Weekly admissions by (a) high deprivation, (b) moderate deprivation and (c) low deprivation.	36
Figure S12. Weekly respiratory infection presentations.	37
Figure S13. Weekly asthma and wheeze presentations.	38
Figure S14. Weekly gastrointestinal infection presentations.	39
Figure S15. Weekly surgical presentations.	40
Figure S16. Weekly mental health presentations.	41
Figure S17. Weekly accidental injury and trauma presentations.	42
Figure S18. Weekly burn/scold presentations.	43
Figure S19. Weekly allergy presentations.	44
Figure S20. Weekly respiratory infection admissions	45
Figure S21. Weekly asthma and wheeze admissions	46
Figure S22. Weekly surgical admissions.	47
Figure S23. Weekly mental health admissions.	48
Figure S24. Weekly accidental injury and trauma admissions.	49
References	50

Introduction

The WHO defines the determinates of health as the social, economic and physical environment and the person's individual characteristics and behaviours.¹ Different factors can impact on the types of presentation to the Emergency Department (ED), with patterns of presentation correlating with biopsychosocial factors. These factors could include location, genetics, education level and gender. Emergency attendances for children, adolescents and young adults can occur for various reasons such as accidental injury resulting in trauma or medical illness and fever. Traumatic presentations in children are associated with socioeconomic deprivation and males, showing a bimodal age distribution peaking in pre-schoolers and adolescents.² Paediatric ED usage is higher in infants, with presentation reducing as age increases per year during the first five years of life.³ Mental health presentations such as self-harm to the ED are frequently seen in older adolescents and young adults with the greatest severity of self-harm in those between 18 and 25 years old.⁴

Methods

Study design and participants

Date of birth was substituted with age in complete years. Postcode data was substituted with the decile of index of multiple deprivation via the Office of National Statistics (ONS) small area codes.⁵ Presentation dates were merged into week of presentation. Prior to September 2019, some children and adolescents were referred to a paediatric assessment unit by their general practitioner rather than to ED. Data from the paediatric assessment unit was merged with the ED data for this analysis. From September 2019, all those aged under 18 accessed the hospital via the Children's ED. Data for a five year period was included in the study to check that these pathway changes had not altered any long-term trajectories. Data management and anonymisation was undertaken using Microsoft excel version 2008 within the hospital information technology system.

Population subgroups

Different subgroups were considered *a priori* to assess whether the impact of the pandemic was similar across the entire population. Participants were divided into the following age groups: 0-4, 5-10, 11-17 and 18-24 complete years of age. This was based on the developmental trajectory of children and adolescents and their expected emergency department usage: 0-4 years – pre-schoolers who are frequently presented to the emergency department; 5-10 years – primary school children who are less likely to be unwell; 11-17 years – adolescents who are developing their independence, are relatively well but have more adolescent presentations; 18-24 years – young adults who are usually independent but frequently use the emergency department of their healthcare. Additional subgroups were male/female sex, ethnicity (white versus non-white given the predominant white population) and deprivation (divided into high [decile of index of multiple deprivation 1-3], moderate [4-7] and low [8-10]).⁵

For tables and figures, ED presentations were divided into five time periods: Year 1: 01/04/2016 to 30/03/2017 (52 weeks); Year 2: 31/03/2017 to 29/03/2018 (52 weeks); Year 3: 30/03/2018 to 28/03/2019 (52 weeks); Year 4: 29/03/2019 to 12/03/2020 (50 weeks); Year 5: 13/03/2020 to 25/02/2021 (50 weeks). Year 5 included the first year of the pandemic in the United Kingdom with the Prime Minister saying that all non-essential contact and travel should stop on 16th March 2020.

Statistical analysis

A seasonal Holt Winters time series approach was used,⁶ this models the weekly data according to trend (long term change in presentations which invalidate a simple average of the preceding years), cycle (aperiodic oscillations around the trend), seasonal (increased presentations in autumn and winter) and random noise. The seasonal Holt Winters time series was used data from years 1 to 4 to estimate the number of presentations and admissions that would have occurred during year 5 had the pandemic not occurred. The primary analysis focused on presentations. Given the numbers, we were able to analyse the data as one week blocks to capture the granularity of the week to week changes in attendance while controlling for the regular pattern of differing numbers of patients presenting to ED on different days of the week.

The validity of the time series forecast was assessed in two ways. Firstly, the residual (difference) between the time series forecast and the observed data for each week pre-pandemic was reviewed to ensure it was minimal. Secondly the time series analysis was repeated using the observed data for years 1-3 to forecast year 4 data; the year 4 forecast and observed data were then compared. Where necessary the time series approach was altered to optimise the fit.

It has been suggested that 24 or more time points have more than 80% power to detect an effect size of 1 or greater, with a minimum of 8 time points per period needed for sufficient power in estimating regression coefficients.⁷ Five years of presentation data provides 260 time points, 50 of which were after the pandemic began. With approximately 500 attendance and 100 admissions per week block for primary analysis, this was expected to provide at least 80% power for primary analysis.

As a secondary analysis, we estimated the expected number of presentations and admissions using the average of the preceding two years on the basis that this minimised the impact of any long-term trends. We used this to assess whether the impact of the pandemic was similar for each subgroup for each presentation. This was assessed with a chi squared analysis to highlight overall differences.

	ED total sample		Southampton local authority (only 0-24 years)		Southampton local authority (all population)	
All usual residents	166,459	100%	86,135	100%	236,882	100%
Total child and young people ages	166,459	100%	86,135	100%	86,135	100%
Males	86,164	52%	44,154	51%	119,453	50%
Females	80,262	48%	41,981	49%	117,429	50%
0 to 4 years	57,166	34%	15,407	18%	15,407	18%
5 to 10 years	25,804	16%	14,057	16%	14,057	16%
11 to 17 years	31,042	19%	16,685	19%	16,685	19%
18 to 24 years	52,447	32%	39,986	46%	39,986	46%
Low deprivation (8-10)	46,452	28%			29*	20%
Moderate deprivation (4-7)	63,385	38%			68*	46%
High Deprivation (1-3)	55,522	33%			51*	34%
White ethnicity	137,411 ^x	83%	70,408	82%	203,528	86%
Non-white ethnicity	18,359 ^x	11%	15,727	18%	33,354	14%
Mixed/multiple ethnic groups	3,781 ^x	2%	3,597	4%	5,678	2%
Asian/Asian British	8,531 ^x	5%	8,920	10%	19,892	8%
Black/African/Caribbean/Black British	2,436 ^x	1%	2,053	2%	5,067	2%
Other ethnic group	3,611 ^x	2%	1,157	1%	2,717	1%

Table S1: Summary of participants attending emergency department and people living in Southampton local authority. Emergency Department (ED) sample relates to the data set included in this study. These are compared with 0-24 year olds in Southampton local authority and all the population in that area. Local authority data from Office of National Statistics (https://www.nomisweb.co.uk/census/2011/data_finder, <https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/datasets/mappingincomeanddeprivationatlocalauthoritylevel>, accessed 14th June 2021). Deprivation data is not available for each age group. *Represents number of areas in Southampton in each deprivation group. ^xInformation about ethnicity not available for all patients. Non-white ethnicity represents: mixed/multiple ethnic groups; Asian/Asian British; Black/African/Caribbean/Black British; and Other ethnic group.

	Pre-pandemic								Pandemic	
	Year 1		Year 2		Year 3		Year 4		Year 5	
All	6,870	100.0%	6,706	100.0%	7,246	100.0%	7,568	100.0%	5,293	100.0%
Males	3,284	47.8%	3,129	46.7%	3,493	48.2%	3,582	47.3%	2,447	46.3%
Females	3,586	52.2%	3,576	53.3%	3,751	51.8%	3,983	52.7%	2,842	53.7%
0 to 4 years	2,041	29.7%	1,730	25.8%	1,884	26.0%	1,975	26.1%	1,146	21.7%
5 to 10 years	622	9.1%	606	9.0%	648	8.9%	755	10.0%	501	9.5%
11 to 17 years	1,028	15.0%	1,056	15.7%	1,142	15.8%	1,352	17.9%	1,145	21.6%
18 to 24 years	3,179	46.3%	3,314	49.4%	3,572	49.3%	3,486	46.1%	2,501	47.3%
High Deprivation	2,404	35.4%	2,195	33.0%	2,424	33.8%	2,612	34.8%	1,694	32.2%
Moderate deprivation	2,582	38.0%	2,660	40.0%	2,820	39.3%	2,803	37.4%	2,045	38.9%
Low deprivation	1,809	26.6%	1,790	26.9%	1,924	26.8%	2,083	27.8%	1,518	28.9%
White ethnicity	5,801	88.3%	5,764	90.0%	6,137	89.9%	6,223	88.2%	4,260	88.3%
Non-white ethnicity	770	11.7%	639	10.0%	692	10.1%	833	11.8%	567	11.7%
Own transport	3,417	51.7%	3,555	54.5%	3,915	55.8%	4,525	60.5%	3,140	59.3%
Ambulance	2,851	43.1%	2,695	41.3%	2,921	41.6%	2,797	37.4%	2,094	39.6%
Public transport	294	4.4%	220	3.4%	155	2.2%	131	1.8%	37	0.7%
Other arrival mode	53	0.8%	51	0.8%	28	0.4%	27	0.4%	22	0.4%
Self or carer referral	4,588	66.9%	4,918	73.3%	5,829	80.4%	6,026	79.6%	3,990	75.8%
Ambulance and hospital referral	1,105	16.1%	677	10.1%	217	3.0%	161	2.1%	92	1.7%
NHS 111 service	561	8.2%	561	8.4%	671	9.3%	552	7.3%	644	12.2%
General Practitioner referral	384	5.6%	375	5.6%	389	5.4%	647	8.5%	429	8.2%
Other referral pathway	223	3.3%	175	2.6%	140	1.9%	182	2.4%	107	2.0%

Table S2: Summary of participants admitted to hospital. Admission is defined as being in hospital for more than four hours. Data are number (column percentage). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). Information about sex and ethnicity not available for all patients. Other arrival mode includes custodial services, police and unknown. NHS 111 also includes NHS Direct and other NHS advice. Other referral pathway includes custodial services, police service, planned review and unknown. Trauma just covers head injuries, fractures and soft tissue injuries

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic					Pandemic							Year 5	Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number presentations	1212	100%	3152	100%	4373	100%	4853	100%	1872	100%	4613	100%		-2741	-59.4%
Males	678	56%	1,734	55%	2,452	56%	2,653	55%	985	53%	2553	55%	<0.05	-1568	-61.4%
Females	534	44%	1,418	45%	1,921	44%	2,200	45%	887	47%	2061	45%		-1174	-57.0%
0 to 4 years	1,016	84%	2,420	77%	3,278	75%	3,463	71%	1,242	66%	3371	73%	<0.001	-2129	-63.2%
5 to 10 years	120	10%	349	11%	501	11%	651	13%	189	10%	576	12%		-387	-67.2%
11 to 17 years	76	6%	154	5%	212	5%	293	6%	138	7%	253	5%		-115	-45.3%
18 to 24 years	0	0%	229	7%	382	9%	446	9%	303	16%	414	9%		-111	-26.8%
Low deprivation	361	30%	913	29%	1,144	26%	1,315	27%	517	28%	1230	27%	0.102	-713	-58.0%
Moderate deprivation	475	39%	1,204	38%	1,591	36%	1,842	38%	736	39%	1717	37%		-981	-57.1%
High Deprivation	374	31%	1,029	33%	1,602	37%	1,663	34%	614	33%	1633	35%		-1019	-62.4%
White ethnicity	1,007	83%	2,579	82%	3,538	81%	3,790	78%	1,468	78%	3664	79%	0.877	-2196	-59.9%
Non-white ethnicity	163	13%	407	13%	593	14%	720	15%	260	14%	657	14%		-397	-60.4%

Table S3: Respiratory infection presentations divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of presentations between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated presentations assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic					Pandemic							Year 5	Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number presentations	813	100%	1,077	100%	1,434	100%	1,023	100%	579	100%	1229	100%		-650	-52.9%
Males	409	50%	640	59%	888	62%	626	61%	365	63%	757	62%	0.555	-392	-51.8%
Females	404	50%	437	41%	546	38%	397	39%	214	37%	472	38%		-258	-54.6%
0 to 4 years	350	43%	614	57%	948	66%	604	59%	348	60%	776	63%	0.272	-428	-55.2%
5 to 10 years	185	23%	201	19%	264	18%	225	22%	124	21%	245	20%		-121	-49.3%
11 to 17 years	132	16%	128	12%	131	9%	93	9%	48	8%	112	9%		-64	-57.1%
18 to 24 years	146	18%	134	12%	91	6%	101	10%	59	10%	96	8%		-37	-38.5%
Low deprivation	240	30%	293	27%	419	29%	292	29%	158	27%	356	29%	0.674	-198	-55.6%
Moderate deprivation	293	36%	407	38%	536	37%	341	33%	218	38%	439	36%		-221	-50.3%
High Deprivation	274	34%	375	35%	472	33%	380	37%	202	35%	426	35%		-224	-52.6%
White ethnicity	668	82%	887	82%	1,142	80%	808	79%	436	75%	975	79%	0.115	-539	-55.3%
Non-white ethnicity	113	14%	150	14%	220	15%	163	16%	106	18%	192	16%		-86	-44.6%

Table S4: Asthma and wheeze presentations divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of presentations between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated presentations assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic		P value (Chi squared)	Pandemic (year 5) estimated verses observed difference	
	Pre-pandemic					Pandemic					Year 5	Year 5		Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number presentations	286	100%	618	100%	1,056	100%	1,199	100%	473	100%	1128	100%		-655	-58.0%
Males	146	51%	313	51%	545	52%	587	49%	246	52%	566	50%	0.479	-320	-56.5%
Females	140	49%	305	49%	511	48%	612	51%	226	48%	562	50%		-336	-59.8%
0 to 4 years	176	62%	344	56%	582	55%	615	51%	229	48%	599	53%	<0.01	-370	-61.7%
5 to 10 years	71	25%	103	17%	229	22%	271	23%	91	19%	250	22%		-159	-63.6%
11 to 17 years	39	14%	85	14%	103	10%	125	10%	53	11%	114	10%		-61	-53.5%
18 to 24 years	0	0%	86	14%	142	13%	188	16%	100	21%	165	15%		-65	-39.4%
Low deprivation	103	36%	173	28%	286	27%	318	27%	119	25%	302	27%	0.535	-183	-60.6%
Moderate deprivation	107	37%	259	42%	429	41%	441	37%	174	37%	435	39%		-261	-60.0%
High Deprivation	73	26%	186	30%	332	31%	433	36%	173	37%	383	34%		-210	-54.8%
White ethnicity	239	84%	502	81%	793	75%	886	74%	362	77%	840	74%	0.397	-478	-56.9%
Non-white ethnicity	39	14%	82	13%	191	18%	229	19%	80	17%	210	19%		-130	-61.9%

Table S5: Gastrointestinal infection presentations divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of presentations between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated presentations assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic					Pandemic							Year 5	Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number presentations	2,163	100%	1,806	100%	1,524	100%	1,658	100%	1,541	100%	1591	100%		-50	-3.1%
Males	909	42%	882	49%	903	59%	1,011	61%	924	60%	957	60%	0.931	-33	-3.4%
Females	1,254	58%	924	51%	621	41%	647	39%	616	40%	634	40%		-18	-2.8%
0 to 4 years	280	13%	327	18%	433	28%	381	23%	374	24%	407	26%	0.117	-33	-8.1%
5 to 10 years	285	13%	271	15%	244	16%	321	19%	266	17%	283	18%		-17	-5.8%
11 to 17 years	383	18%	356	20%	318	21%	338	20%	373	24%	328	21%		45	13.7%
18 to 24 years	1,215	56%	852	47%	529	35%	618	37%	528	34%	574	36%		-46	-7.9%
Low deprivation	589	27%	534	30%	440	29%	478	29%	505	33%	459	29%	<0.05	46	10.0%
Moderate deprivation	813	38%	710	39%	621	41%	652	39%	608	39%	637	40%		-29	-4.5%
High Deprivation	743	34%	553	31%	456	30%	516	31%	423	27%	486	31%		-63	-13.0%
White ethnicity	1,824	84%	1,521	84%	1,251	82%	1,328	80%	1,224	79%	1290	81%	0.953	-66	-5.1%
Non-white ethnicity	221	10%	165	9%	158	10%	199	12%	171	11%	179	11%		-8	-4.2%

Table S6: Surgical presentations divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of presentations between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated presentations assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic		P value (Chi squared)	Pandemic (year 5) estimated verses observed difference	
	Pre-pandemic					Pandemic					Year 5	Absolute		Relative	
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total	756	100%	1,392	100%	1,926	100%	1,926	100%	1,441	100%	1,659	100%		-218	-13.1%
Males	313	41%	586	42%	733	38%	640	33%	452	31%	660	40%	<0.001	-208	-31.5%
Females	443	59%	805	58%	1,192	62%	1,285	67%	986	68%	999	60%		-13	-1.3%
0 to 4 years	18	2%	47	3%	49	3%	39	2%	36	2%	48	3%	<0.001	-12	-25.0%
5 to 10 years	30	4%	35	3%	32	2%	39	2%	31	2%	34	2%		-3	-7.5%
11 to 17 years	210	28%	400	29%	546	28%	633	33%	599	42%	473	29%		126	26.6%
18 to 24 years	498	66%	910	65%	1,299	67%	1,215	63%	775	54%	1,105	67%		-330	-29.8%
Low deprivation	138	18%	355	26%	429	22%	457	24%	400	28%	392	24%	<0.05	8	2.0%
Moderate deprivation	310	41%	562	40%	807	42%	775	40%	560	39%	685	41%		-125	-18.2%
High Deprivation	292	39%	445	32%	660	34%	670	35%	474	33%	553	33%		-79	-14.2%
White ethnicity	662	88%	1,199	86%	1,675	87%	1,642	85%	1,197	83%	1,437	87%	0.898	-240	-16.7%
Non-white ethnicity	60	8%	95	7%	116	6%	117	6%	90	6%	106	6%		-16	-14.7%

Table S7: Mental health presentations divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of presentations between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated presentations assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic					Pandemic							Year 5	Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number presentations	5,874	100%	5,874	100%	6,820	100%	6,144	100%	3,523	100%	6482	100%		-2959	-45.6%
Males	3,298	56%	3,388	58%	3,985	58%	3,595	59%	2,058	58%	3790	58%	0.971	-1732	-45.7%
Females	2,572	44%	2,486	42%	2,835	42%	2,549	41%	1,464	42%	2692	42%		-1228	-45.6%
0 to 4 years	1,563	27%	1,461	25%	1,456	21%	1,253	20%	958	27%	1355	21%	<0.001	-397	-29.3%
5 to 10 years	1,126	19%	1,127	19%	1,418	21%	1,251	20%	739	21%	1335	21%		-596	-44.6%
11 to 17 years	1,433	24%	1,542	26%	1,885	28%	1,863	30%	985	28%	1874	29%		-889	-47.4%
18 to 24 years	1,752	30%	1,744	30%	2,061	30%	1,777	29%	841	24%	1919	30%		-1078	-56.2%
Low deprivation	1,710	29%	1,734	30%	2,076	30%	1,811	29%	1,125	32%	1944	30%	0.224	-819	-42.1%
Moderate deprivation	2,123	36%	2,204	38%	2,520	37%	2,306	38%	1,313	37%	2413	37%		-1100	-45.6%
High Deprivation	2,012	34%	1,892	32%	2,177	32%	1,981	32%	1,071	30%	2079	32%		-1008	-48.5%
White ethnicity	5,056	86%	5,036	86%	5,884	86%	5,127	83%	2,916	83%	5506	85%	0.616	-2590	-47.0%
Non-white ethnicity	483	8%	529	9%	606	9%	543	9%	316	9%	575	9%		-259	-45.0%

Table S8: Accidental injury and traumatic presentations divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of presentations between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated presentations assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic					Pandemic							Year 5	Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number presentations	485	100%	407	100%	389	100%	446	100%	379	100%	418	100%		-39	-9.2%
Males	248	51%	191	47%	203	52%	242	54%	191	50%	223	53%	0.405	-32	-14.2%
Females	237	49%	216	53%	186	48%	204	46%	188	50%	195	47%		-7	-3.6%
0 to 4 years	236	49%	197	48%	186	48%	214	48%	220	58%	200	48%	<0.05	20	10.0%
5 to 10 years	55	11%	49	12%	53	14%	46	10%	33	9%	50	12%		-17	-33.3%
11 to 17 years	43	9%	45	11%	48	12%	80	18%	47	12%	64	15%		-17	-26.6%
18 to 24 years	151	31%	116	29%	102	26%	106	24%	79	21%	104	25%		-25	-24.0%
Low deprivation	145	30%	113	28%	84	22%	122	27%	91	24%	103	25%	0.654	-12	-11.7%
Moderate deprivation	166	34%	148	36%	167	43%	210	47%	163	43%	189	45%		-26	-13.5%
High Deprivation	174	36%	144	35%	137	35%	113	25%	125	33%	125	30%		0	0.0%
White ethnicity	400	82%	339	83%	295	76%	358	80%	323	85%	327	78%	0.312	-4	-1.1%
Non-white ethnicity	61	13%	45	11%	55	14%	48	11%	41	11%	52	12%		-11	-20.4%

Table S9: Burns/scalds presentations divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of presentations between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated presentations assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic					Pandemic							Year 5	Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number presentations	310	100%	335	100%	296	100%	295	100%	219	100%	296	100%		-77	-25.9%
Males	152	49%	155	46%	154	52%	137	46%	98	45%	146	49%	0.304	-48	-32.6%
Females	158	51%	180	54%	142	48%	158	54%	121	55%	150	51%		-29	-19.3%
0 to 4 years	100	32%	122	36%	103	35%	114	39%	89	41%	109	37%	<0.01	-20	-18.0%
5 to 10 years	52	17%	58	17%	55	19%	52	18%	28	13%	54	18%		-26	-47.7%
11 to 17 years	64	21%	61	18%	34	11%	44	15%	49	22%	39	13%		10	25.6%
18 to 24 years	94	30%	94	28%	104	35%	85	29%	53	24%	95	32%		-42	-43.9%
Low deprivation	111	36%	105	31%	80	27%	82	28%	66	30%	81	27%	0.437	-15	-18.5%
Moderate deprivation	108	35%	138	41%	140	47%	126	43%	87	40%	133	45%		-46	-34.6%
High Deprivation	90	29%	88	26%	74	25%	83	28%	66	30%	79	27%		-13	-15.9%
White ethnicity	252	81%	261	78%	230	78%	229	78%	160	73%	230	78%	0.397	-70	-30.3%
Non-white ethnicity	48	15%	58	17%	48	16%	45	15%	40	18%	47	16%		-7	-14.0%

Table S10: Allergy and anaphylaxis presentations divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of presentations between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated presentations assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic					Pandemic							Year 5	Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number admissions	81	100%	455	100%	713	100%	843	100%	359	100%	778	100%		-419	-53.9%
Males	45	56%	239	53%	400	56%	188	22%	188	52%	294	38%	<0.05	-106	-36.1%
Females	36	44%	216	47%	313	44%	398	47%	171	48%	356	46%		-185	-51.9%
0 to 4 years	65	80%	325	71%	466	65%	519	62%	178	50%	493	63%	<0.001	-315	-63.9%
5 to 10 years	9	11%	25	5%	50	7%	78	9%	21	6%	64	8%		-43	-67.2%
11 to 17 years	7	9%	19	4%	39	5%	38	5%	38	11%	39	5%		-1	-1.3%
18 to 24 years	0	0%	86	19%	158	22%	168	20%	122	34%	163	21%		-41	-25.2%
Low deprivation	20	25%	134	29%	179	25%	227	27%	117	33%	203	26%	<0.05	-86	-42.4%
Moderate deprivation	32	40%	174	38%	261	37%	320	38%	134	37%	291	37%		-157	-53.9%
High Deprivation	29	36%	147	32%	268	38%	293	35%	107	30%	281	36%		-174	-61.9%
White ethnicity	75	93%	396	87%	605	85%	671	80%	281	78%	638	82%	0.510	-357	-56.0%
Non-white ethnicity	4	5%	42	9%	75	11%	113	13%	47	13%	94	12%		-47	-50.0%

Table S11: Respiratory infection admissions divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of admissions between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated admissions assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic		P value (Chi squared)	Pandemic (year 5) estimated verses observed difference	
	Pre-pandemic					Pandemic					Year 5	Year 5		Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number admissions	196	100%	378	100%	620	100%	494	100%	314	100%	557	100%		-243	-43.6%
Males	94	48%	222	59%	379	61%	313	63%	214	68%	346	62%	0.074	-132	-38.2%
Females	102	52%	156	41%	241	39%	181	37%	100	32%	211	38%		-111	-52.6%
0 to 4 years	44	22%	218	58%	442	71%	319	65%	217	69%	381	68%	0.310	-164	-43.0%
5 to 10 years	52	27%	64	17%	96	15%	87	18%	58	18%	92	16%		-34	-36.6%
11 to 17 years	31	16%	35	9%	36	6%	36	7%	22	7%	36	6%		-14	-38.9%
18 to 24 years	69	35%	61	16%	46	7%	52	11%	17	5%	49	9%		-32	-65.3%
Low deprivation	50	26%	82	22%	173	28%	149	30%	85	27%	161	29%	0.703	-76	-47.2%
Moderate deprivation	73	37%	169	45%	243	39%	153	31%	111	35%	198	36%		-87	-43.9%
High Deprivation	72	37%	126	33%	200	32%	186	38%	118	38%	193	35%		-75	-38.9%
White ethnicity	171	87%	323	85%	498	80%	389	79%	240	76%	444	80%	0.612	-204	-45.9%
Non-white ethnicity	21	11%	46	12%	100	16%	78	16%	53	17%	89	16%		-36	-40.4%

Table S12: Asthma and wheeze admissions divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of admissions between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated admissions assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic								Pandemic				Year 5	Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 5	Year 5								
Total number admissions	21	100%	53	100%	106	100%	162	100%	69	100%	134	100%		-65	-48.5%
Males	12	57%	26	49%	49	46%	73	45%	42	61%	61	46%	<0.05	-19	-31.1%
Females	9	43%	27	51%	57	54%	89	55%	26	38%	73	54%		-47	-64.4%
0 to 4 years	14	67%	26	49%	61	58%	78	48%	25	36%	70	52%	<0.05	-45	-64.0%
5 to 10 years	4	19%	10	19%	20	19%	38	23%	10	14%	29	22%		-19	-65.5%
11 to 17 years	3	14%	4	8%	6	6%	13	8%	8	12%	10	7%		-2	-15.8%
18 to 24 years	0	0%	13	25%	19	18%	33	20%	26	38%	26	19%		0	0.0%
Low deprivation	7	33%	14	26%	30	28%	41	25%	14	20%	36	26%	0.472	-22	-60.6%
Moderate deprivation	6	29%	21	40%	42	40%	58	36%	31	45%	50	37%		-19	-38.0%
High Deprivation	8	38%	18	34%	32	30%	62	38%	23	33%	47	35%		-24	-51.1%
White ethnicity	20	95%	46	87%	81	76%	122	75%	56	81%	102	76%	0.438	-46	-44.8%
Non-white ethnicity	1	5%	4	8%	18	17%	31	19%	10	14%	25	18%		-15	-59.2%

Table S13: Gastrointestinal infection admissions divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of admissions between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated admissions assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic		P value (Chi squared)	Pandemic (year 5) estimated verses observed difference	
	Pre-pandemic					Pandemic					Year 5	Year 5		Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number admissions	889	100%	719	100%	671	100%	791	100%	764	100%	731	100%		33	4.5%
Males	350	39%	292	41%	353	53%	444	56%	430	56%	399	55%	0.472	32	7.9%
Females	539	61%	427	59%	318	47%	347	44%	333	44%	333	45%		1	0.2%
0 to 4 years	63	7%	54	8%	79	12%	74	9%	105	14%	77	10%	<0.05	29	37.3%
5 to 10 years	80	9%	78	11%	95	14%	128	16%	114	15%	112	15%		3	2.2%
11 to 17 years	165	19%	159	22%	158	24%	194	25%	211	28%	176	24%		35	19.9%
18 to 24 years	581	65%	428	60%	339	51%	395	50%	334	44%	367	50%		-33	-9.0%
Low deprivation	229	26%	202	28%	190	28%	222	28%	269	35%	206	28%	<0.05	63	30.6%
Moderate deprivation	345	39%	393	55%	274	41%	308	39%	283	37%	291	40%		-8	-2.7%
High Deprivation	303	34%	221	31%	200	30%	255	32%	208	27%	228	31%		-20	-8.6%
White ethnicity	775	87%	621	86%	551	82%	641	81%	617	81%	596	82%	0.837	21	3.5%
Non-white ethnicity	82	9%	60	8%	68	10%	92	12%	80	10%	80	11%		0	0.0%

Table S14: Surgical admissions divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of admissions between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated admissions assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic		P value (Chi squared)	Pandemic (year 5) estimated verses observed difference	
	Pre-pandemic					Pandemic					Year 5	Year 5		Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number admissions	318	100%	669	100%	1,038	100%	989	100%	771	100%	1014	100%		-243	-23.9%
Males	127	40%	245	37%	349	34%	296	30%	209	27%	323	32%	<0.05	-114	-35.2%
Females	191	60%	423	63%	689	66%	692	70%	560	73%	691	68%		-131	-18.9%
0 to 4 years	5	2%	11	2%	10	1%	7	1%	8	1%	9	1%	<0.01	-1	-5.9%
5 to 10 years	3	1%	7	1%	7	1%	12	1%	8	1%	10	1%		-2	-15.8%
11 to 17 years	110	35%	214	32%	327	32%	358	36%	321	42%	343	34%		-22	-6.3%
18 to 24 years	200	63%	437	65%	694	67%	612	62%	434	56%	653	64%		-219	-33.5%
Low deprivation	56	18%	176	26%	236	23%	225	23%	199	26%	231	23%	0.355	-32	-13.7%
Moderate deprivation	128	40%	269	40%	432	42%	377	38%	294	38%	405	40%		-111	-27.3%
High Deprivation	125	39%	204	30%	359	35%	375	38%	274	36%	367	36%		-93	-25.3%
White ethnicity	278	87%	589	88%	909	88%	860	87%	637	83%	885	87%	0.087	-248	-28.0%
Non-white ethnicity	20	6%	40	6%	55	5%	61	6%	58	8%	58	6%		0	0.0%

Table S15: Mental health admissions divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of admissions between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated admissions assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic					Pandemic							Year 5	Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number admissions	284	100%	342	100%	668	100%	576	100%	355	100%	622	100%		-267	-42.9%
Males	174	61%	226	66%	447	67%	375	65%	232	65%	411	66%	0.818	-179	-43.6%
Females	110	39%	116	34%	221	33%	201	35%	123	35%	211	34%		-88	-41.7%
0 to 4 years	54	19%	48	14%	90	13%	92	16%	49	14%	91	15%	0.566	-42	-46.2%
5 to 10 years	21	7%	47	14%	121	18%	107	19%	63	18%	114	18%		-51	-44.7%
11 to 17 years	45	16%	65	19%	138	21%	121	21%	88	25%	130	21%		-42	-32.0%
18 to 24 years	164	58%	182	53%	319	48%	256	44%	155	44%	288	46%		-133	-46.1%
Low deprivation	79	28%	117	34%	206	31%	176	31%	114	32%	191	31%	0.871	-77	-40.3%
Moderate deprivation	104	37%	142	42%	258	39%	217	38%	131	37%	238	38%		-107	-44.8%
High Deprivation	97	34%	81	24%	191	29%	178	31%	108	30%	185	30%		-77	-41.5%
White ethnicity	239	84%	285	83%	566	85%	498	86%	274	77%	532	86%	0.166	-258	-48.5%
Non-white ethnicity	30	11%	31	9%	51	8%	41	7%	33	9%	46	7%		-13	-28.3%

Table S16: Accidental injury and trauma admissions divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of admissions between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated admissions assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic					Pandemic							Year 5	Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number admissions	8	100%	7	100%	9	100%	11	100%	8	100%	10	100%		-2	-20.0%
Males	6	75%	5	71%	4	44%	7	64%	5	63%	6	55%	0.729	-1	-9.1%
Females	2	25%	2	29%	5	56%	4	36%	3	38%	5	45%		-2	-33.3%
0 to 4 years	3	38%	0	0%	1	11%	4	36%	2	25%	3	25%		-1	-20.0%
5 to 10 years	2	25%	2	29%	1	11%	1	9%	0	0%	1	10%	0.409	-1	-100.0%
11 to 17 years	0	0%	2	29%	0	0%	3	27%	0	0%	2	15%		-2	-100.0%
18 to 24 years	3	38%	3	43%	7	78%	3	27%	6	75%	5	50%		1	20.0%
Low deprivation	0%	2	29%	1	11%	6	55%	2	25%	4	35%	0.598	-2	-42.9%	
Moderate deprivation	4	50%	2	29%	4	44%	2	18%	4	50%	3	30%		1	33.3%
High Deprivation	4	50%	3	43%	4	44%	3	27%	2	25%	4	35%		-2	-42.9%
White ethnicity	4	50%	6	86%	6	67%	9	82%	5	63%	8	75%	0.375	-3	-33.3%
Non-white ethnicity	3	38%	1	14%	2	22%	0	0%	2	25%	1	10%		1	100.0%

Table S17: Burns and scalds admissions divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of admissions between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated admissions assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic								Pandemic				Absolute	Relative	
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 5	Year 5								
Total number admissions	75	100%	78	100%	69	100%	56	100%	59	100%	63	100%		-4	-5.6%
Males	38	51%	39	50%	26	38%	26	46%	19	32%	26	42%	0.300	-7	-26.9%
Females	37	49%	39	50%	43	62%	30	54%	40	68%	37	58%		4	9.6%
0 to 4 years	23	31%	20	26%	19	28%	11	20%	11	19%	15	24%	<0.05	-4	-26.7%
5 to 10 years	14	19%	14	18%	6	9%	9	16%	4	7%	8	12%		-4	-46.7%
11 to 17 years	7	9%	16	21%	7	10%	5	9%	20	34%	6	10%		14	233.3%
18 to 24 years	31	41%	28	36%	37	54%	31	55%	24	41%	34	54%		-10	-29.4%
Low deprivation	28	37%	28	36%	17	25%	15	27%	28	47%	16	26%	<0.05	12	75.0%
Moderate deprivation	25	33%	29	37%	33	48%	23	41%	24	41%	28	45%		-4	-14.3%
High Deprivation	22	29%	20	26%	18	26%	17	30%	7	12%	18	28%		-11	-60.0%
White ethnicity	65	87%	59	76%	53	77%	38	68%	46	78%	46	73%	0.443	1	1.1%
Non-white ethnicity	8	11%	18	23%	14	20%	12	21%	9	15%	13	21%		-4	-30.8%

Table S18: Allergy and anaphylaxis admissions divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of admissions between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated admissions assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

		Observed										Estimate had there not been a pandemic		P value (Chi squared)	Pandemic (year 5) estimated verses observed difference	
		Pre-pandemic					Pandemic								Absolute	Relative
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 5	Year 5	Year 5	Year 5	Year 5	Year 5	Year 5	Year 5	Year 5	Year 5
Male	0-4 years	10	3%	28	5%	29	4%	16	2%	18	4%	23	3%	0.813	-5	-20%
	5-10 years	18	6%	22	4%	21	3%	23	4%	15	3%	22	3%		-7	-32%
	11-17 years	69	22%	139	24%	165	22%	169	26%	119	26%	167	24%		-48	-29%
	18-24 years	216	69%	398	68%	519	71%	433	68%	303	67%	476	69%		-173	-36%
Female	0-4 years	8	2%	19	2%	20	2%	23	2%	18	2%	22	2%	<0.001	-4	-16%
	5-10 years	12	3%	13	2%	11	1%	16	1%	16	2%	14	1%		3	19%
	11-17 years	141	32%	262	33%	381	32%	465	36%	482	49%	423	34%		59	14%
	18-24 years	282	64%	512	64%	781	65%	782	61%	473	48%	782	63%		-309	-39%

Table S19: Mental health presentations divided by sex and age group. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of presentations between the age subgroups separately for male and female comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated presentations assuming no pandemic with the observed ones in year 5. Information about sex not available for all patients.

		Observed										Estimate had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
		Pre-pandemic					Pandemic							Year 5	Absolute	Relative
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
													0.57			
Male	0-4 years	2	1%	7	1%	5	1%	4	1%	6	1%	5	1%	2	33%	
	5-10 years	1	0%	4	1%	5	1%	7	1%	2	0%	6	1%	-4	-67%	
	11-17 years	37	12%	61	10%	83	11%	83	13%	58	13%	83	12%	-25	-30%	
	18-24 years	87	28%	174	30%	256	35%	203	32%	145	32%	230	33%	-85	-37%	
Female	0-4 years	3	1%	4	0%	5	0%	3	0%	2	0%	4	0%	-2	-50%	
	5-10 years	2	0%	3	0%	2	0%	5	0%	6	1%	4	0%	3	71%	
	11-17 years	73	16%	154	19%	244	20%	276	21%	264	27%	260	21%	4	2%	
	18-24 years	113	26%	263	33%	438	37%	409	32%	290	29%	424	34%	-134	-32%	

Table S20: Mental health admissions divided by sex and age group. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of admissions between the age subgroups separately for male and female comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated admissions assuming no pandemic with the observed ones in year 5. Information about sex not available for all patients.

Diagnostic label	Presentations included
Respiratory infection	Acute epiglottitis, Bronchiolitis, Bronchopneumonia, COVID-19, Croup, Cystic fibrosis, Empyema, Influenza, Lobar pneumonia, Lower respiratory tract infection, Pertussis / whooping cough, Quinsy / peritonsillar abscess, Tonsillitis, Tuberculosis, Upper respiratory tract infection
Asthma / wheeze	Asthma, Respiratory conditions - bronchial asthma, Viral wheeze
GI infections	Dysentery, Food poisoning, Infectious gastroenteritis, Infectious gastroenteritis with bloody diarrhoea
Surgical presentations	Abscess: perianal or anal, Anal fissure, Anorectal bleeding, Appendicitis, Boil / abscess, Bowel obstruction, Complication of gastrostomy (PEG tube), Concretions, Diaphragmatic hernia, Epididymitis / orchitis / epidymo-orchitis, Foreign body: alimentary tract, Foreign body: penis, Foreign body: rectum, Foreskin problem anatomical: phimosis / paraphimosis, Foreskin problem infection: balanitis / balanoposthitis, Fractured penis, Gallstones with cholecystitis, Gastrointestinal conditions - acute abdominal pain, Gastrointestinal conditions – haemorrhage, Haemorrhoids, Hydrocele, Hydronephrosis, Incisional hernia, Indwelling urinary catheter: problem related to, Inguinal hernia, Intestinal malrotation, Intussusception, Ischaemic bowel, Lower gastrointestinal haemorrhage, Malignant tumour, Oesophageal perforation, Oesophageal stricture, Perforated / ruptured bowel, Pyloric stenosis, Rectal prolapse, Renal / ureteric colic due to stone, Sphincter of Oddi dysfunction, Stoma problem, Surgical procedure complication, Testicular torsion, Torsion of hydatid of Morgagni, Umbilical hernia, Undescended testis, Upper gastrointestinal hemorrhage, Urinary retention, Urological conditions (including cystitis), Volvulus
Mental health presentations	Adjustment disorder, Alcohol (ethanol) intoxication, Alcohol dependence syndrome, Alcohol withdrawal seizure, Alcohol withdrawal syndrome, Antidepressant overdose, Anxiety disorder, Benzodiazepine overdose, Bipolar affective disorder, Delirium (acute confusion), Dementia, Dependence on opioids, Dependence on sedatives or hypnotics, Depressive disorder, Dissociative (conversion) disorder, Eating disorder, Factitious disorder, NSAID overdose, Opiate overdose, Paracetamol overdose, Personality disorder, Pseudoseizure, Psychiatric conditions, Psychotic disorder, Recreational drug use, Schizophrenia, Somatisation disorder, Somatoform pain disorder
Accidental injuries/trauma	Closed fracture: ankle, Closed fracture: carpal bones, Closed fracture: cervical spine, Closed fracture: clavicle, Closed fracture: coccyx, Closed fracture: elbow joint, Closed fracture: facial bones / mandible, Closed fracture: femur (not NoF), Closed fracture: fibula (not ankle), Closed fracture: finger, Closed fracture: foot, Closed fracture: Galeazzi (frac rad: disloc ulna), Closed fracture: hand, Closed fracture: heel, Closed fracture: hip (NoF), Closed fracture: humerus, Closed fracture: knee, Closed fracture: lumbar spine, Closed fracture: Monteggia (frac ulna : disloc rad), Closed fracture: nose, Closed fracture: patella, Closed fracture: pelvis, Closed fracture: pubic rami, Closed fracture: radius, Closed fracture: radius AND ulna, Closed fracture: rib, Closed fracture: sacrum, Closed fracture: scaphoid, Closed fracture: scapula, Closed fracture: skull, Closed fracture: sternum, Closed fracture: thoracic spine, Closed fracture: thumb metacarpal, Closed fracture: thumb phalanx, Closed fracture: tibia (not ankle), Closed fracture: tibia AND fibula (not ankle), Closed fracture: toe, Closed fracture: ulna, Head injury – concussion, Head injury - other head injury, Minor traumatic brain injury (GCS more than 12): LOC less than 30s, Minor traumatic brain injury (GCS more than 12): LOC more than 30s, Minor traumatic brain injury (GCS more than 12): no LOC, Moderate traumatic brain injury (GCS less than 13), Severe traumatic brain injury (GCS less than 9), Sprain / ligament injury: ankle joint, Sprain / ligament injury: cervical spine, Sprain / ligament injury: elbow joint, Sprain / ligament injury: finger, Sprain / ligament injury: foot, Sprain / ligament injury: hand, Sprain / ligament injury: hip joint, Sprain / ligament injury: knee joint, Sprain / ligament injury: lumbar spine, Sprain / ligament injury: shoulder joint, Sprain / ligament injury: thoracic spine, Sprain / ligament injury: thumb, Sprain / ligament injury: toe, Sprain / ligament injury: wrist joint, Sprain/ligament injury
Burns/Scalds	Burn : buttock, Burn : elbow, Burn : eye, Burn : face, Burn : finger, Burn : foot, Burn : forearm, Burn : hand, Burn : head, Burn : knee, Burn : lower leg, Burn : neck, Burn : perineum, Burn : shoulder, Burn : thigh, Burn : thumb, Burn : toe, Burn : trunk, Burn : upper arm, Burns and scalds – chemical, Burns and scalds – electric, Burns and scalds – radiation, Burns and scalds – thermal
Allergies and anaphylaxis	Allergy (including anaphylaxis), Anaphylaxis, Other allergic reaction (see free text)

Table S21: Diagnostic labels included in each group presentation

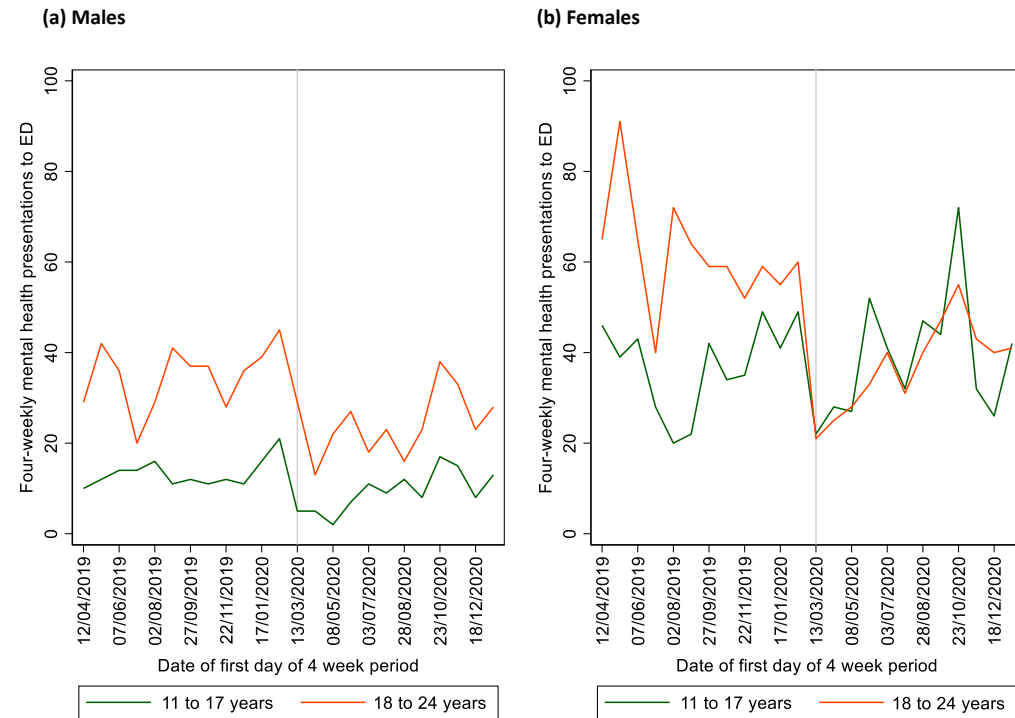


Figure S1: Four weekly mental health presentations before and during the pandemic in the 11-17 and 18-24 year age groups for (a) males and (b) females. Presentations to emergency department by four week period for one year before and after the start of the pandemic (marked with grey line). A four week period chosen due to the small number in each of these subgroups. Minimal change in presentations with the pandemic in the 11-17 year female group compared to the other females and male groups.

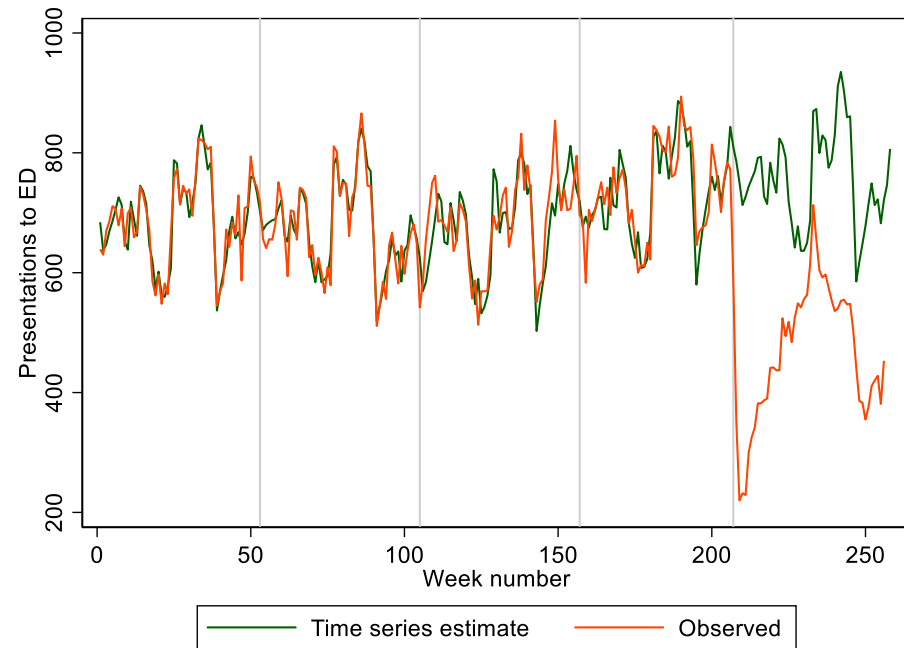
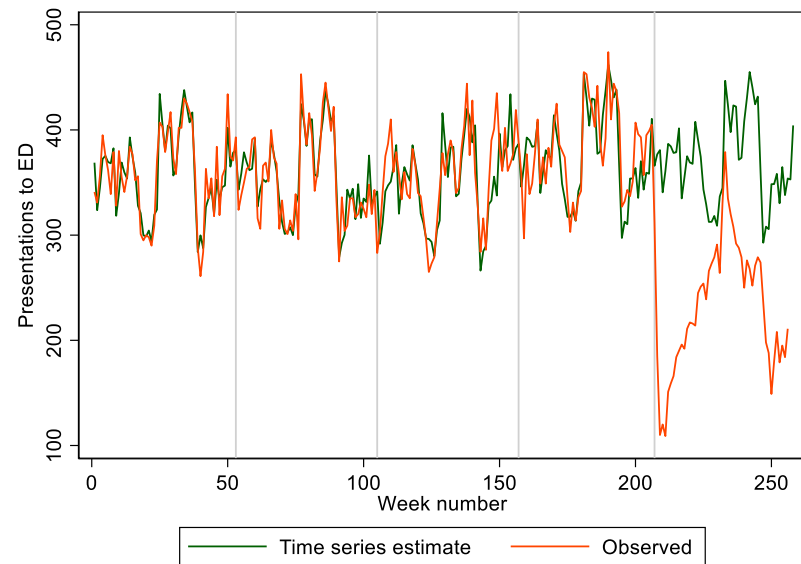


Figure S2. Weekly presentations for all. Figures represent time series and observed presentations. Seasonal Holt Winters time series approach was used with data from weeks 1 to 206 (years 1 to 4) were used to estimate the presentations in year 5 had the pandemic not occurred. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

(a) Males



(b) Females

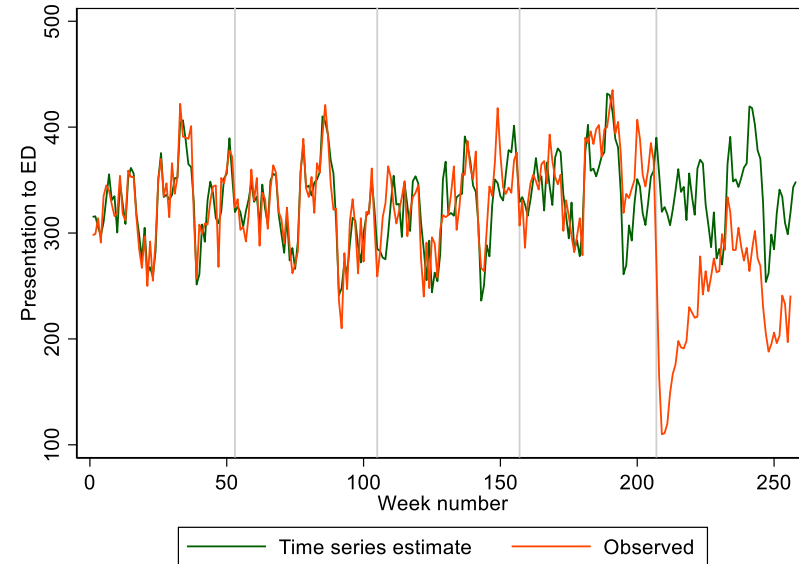


Figure S3. Weekly presentations for (a) males and (b) females. Figures represent time series and observed presentations by sex. Seasonal Holt Winters time series approach was used with data from weeks 1 to 206 (years 1 to 4) were used to estimate the presentations in year 5 had the pandemic not occurred. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 4: weeks 157 to 206; year 5: weeks 207 to 256.

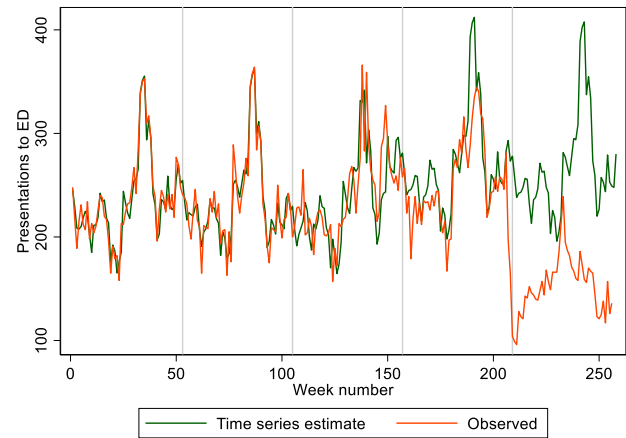
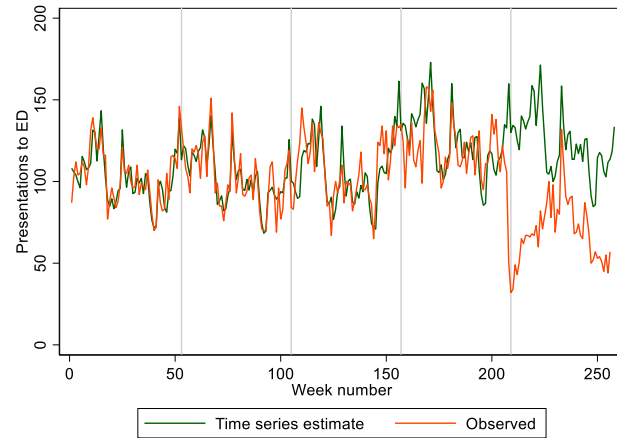
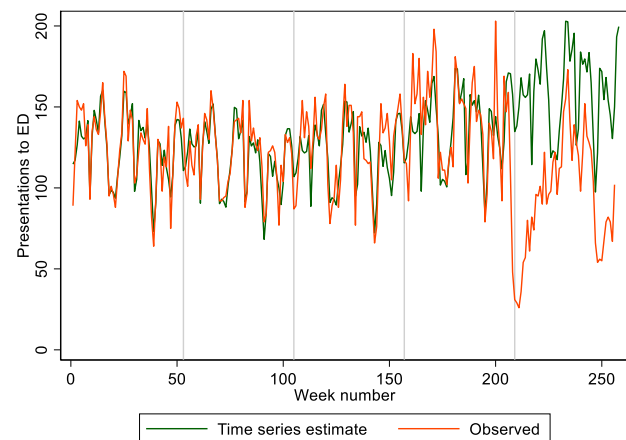
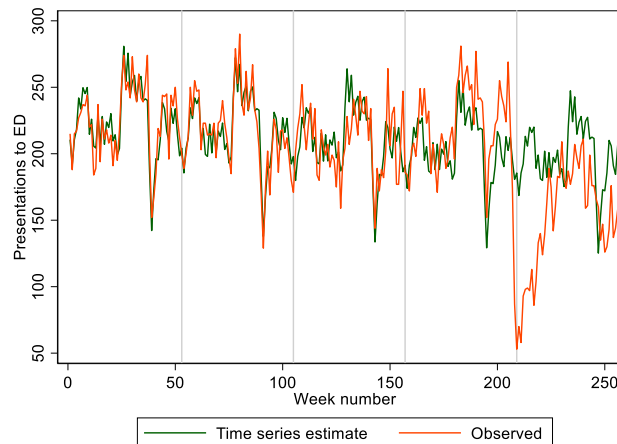
(a) 0-4 years**(b) 5-10 years****(c) 11-17 years****(d) 18-24 years**

Figure S4. Weekly presentations for (a) 0-4 years, (b) 5-10 years, (c) 11-17 years and (d) 18-24 years. Figures represent time series and observed presentations by sex. Seasonal Holt Winters time series approach was used with data from weeks 1 to 206 (years 1 to 4) were used to estimate the presentations in year 5 had the pandemic not occurred. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 4: weeks 157 to 206; year 5: weeks 207 to 256.

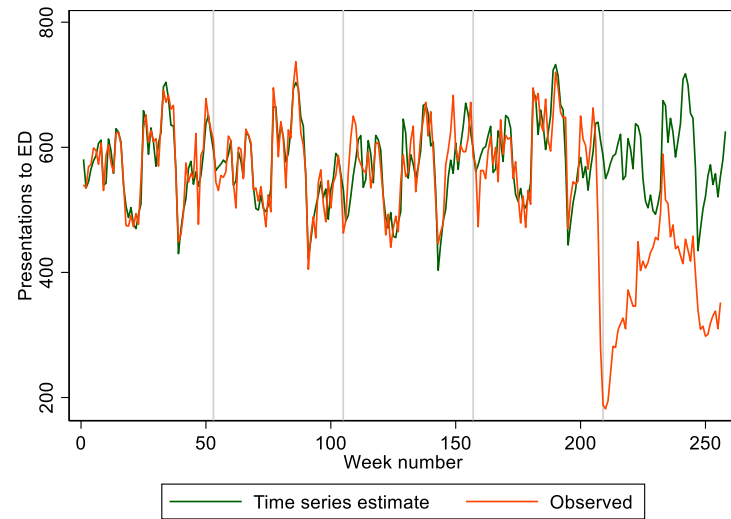
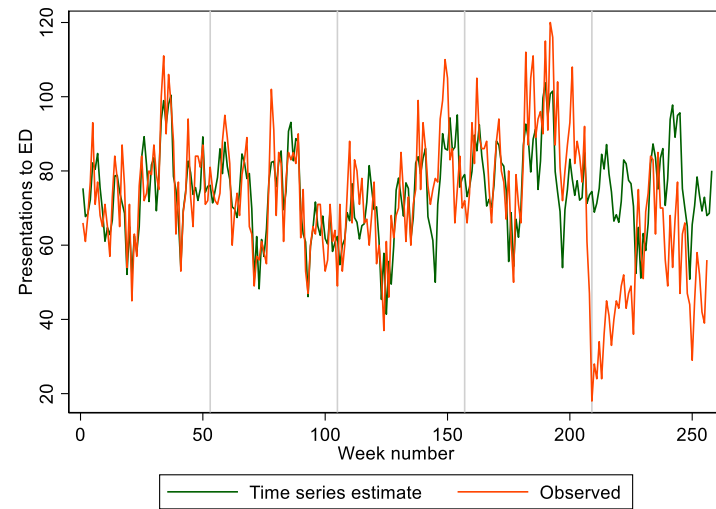
(a) White ethnicity**(b) Non-white ethnicity**

Figure S5. Weekly presentations and admissions by (a) white ethnicity and (b) non-white ethnicity. Figures represent time series and observed presentations by ethnicity. Seasonal Holt Winters time series approach was used with data from weeks 1 to 206 (years 1 to 4) being used to estimate the presentations and admissions in year 5 had the pandemic not occurred. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

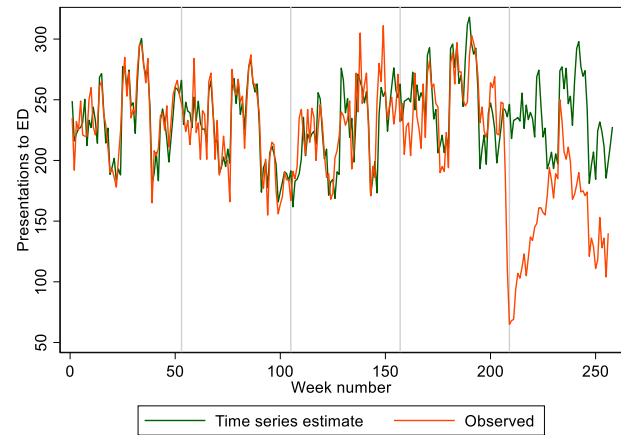
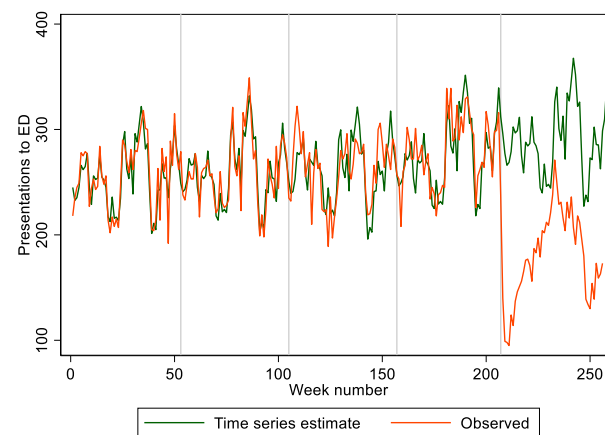
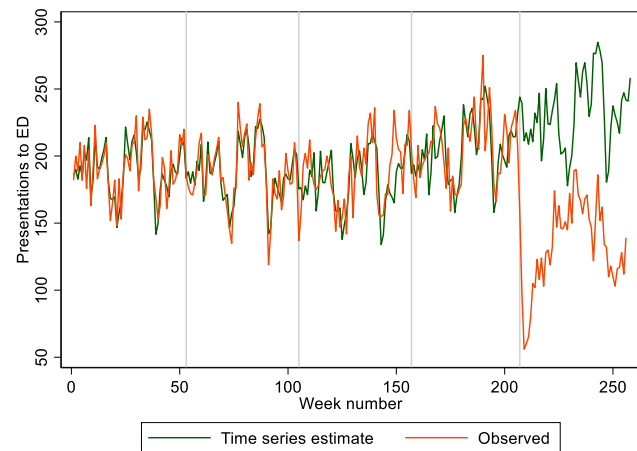
(a) High deprivation**(b) Moderate deprivation****(c) Low deprivation**

Figure S6. Weekly presentations by (a) high deprivation, (b) moderate deprivation and (c) low deprivation. Figures represent time series and observed presentations by deprivation. Seasonal Holt Winters time series approach was used with data from weeks 1 to 206 (years 1 to 4) being used to estimate the presentations in year 5 had the pandemic not occurred. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

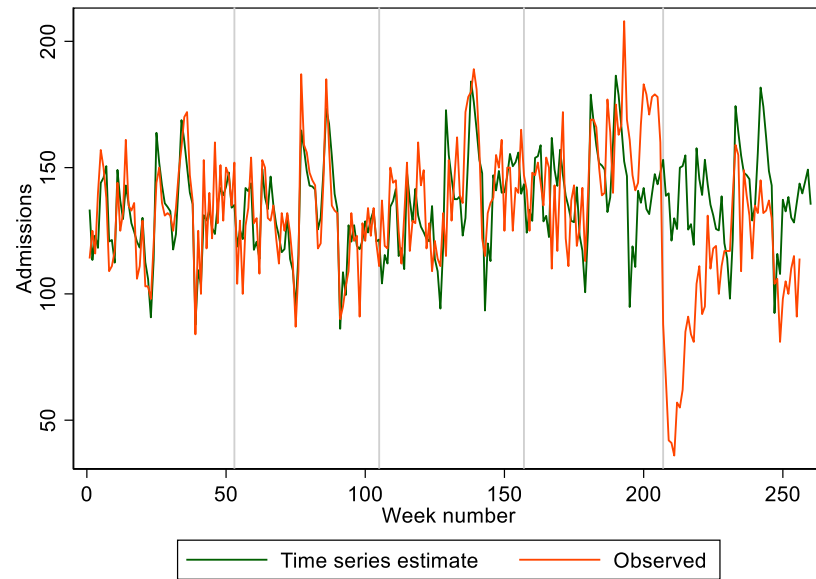
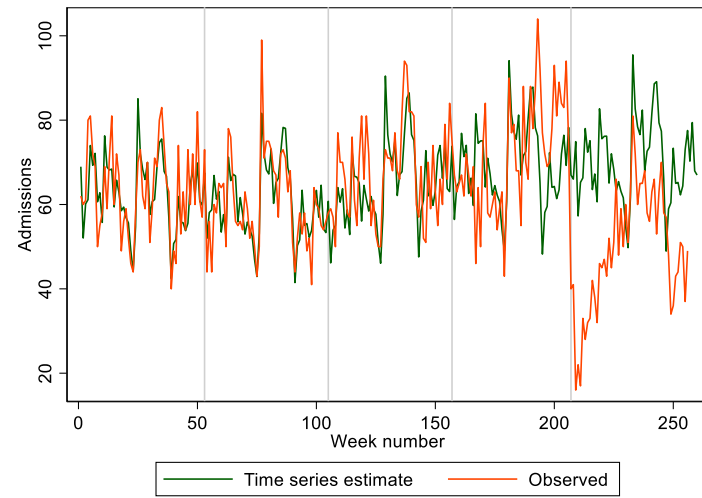


Figure S7. Weekly admissions for all. Figures represent time series and observed admissions. Seasonal Holt Winters time series approach was used with data from weeks 1 to 156 (years 1 to 3) were used to estimate the admissions in year 5 had the pandemic not occurred. Year 4 data was excluded given the untypical large number of admissions in that year. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

(a) Males



(b) Females

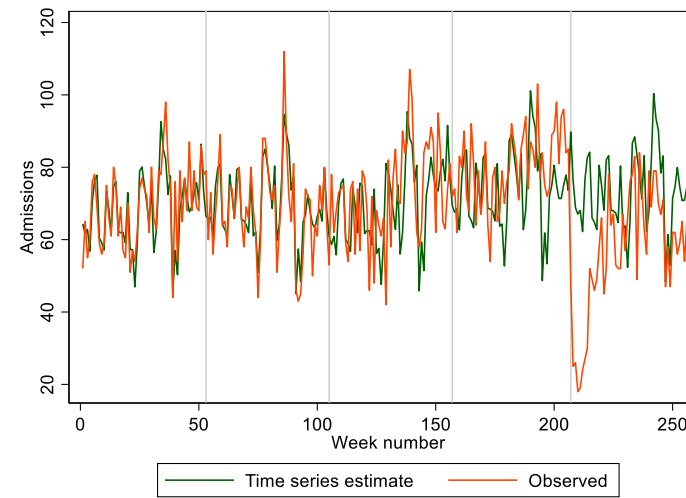


Figure S8. Weekly admissions for (a) males and (b) males. Figures represent time series and observed admissions by sex. Seasonal Holt Winters time series approach was used with data from weeks 1 to 156 (years 1 to 3) were used to estimate the admissions in year 5 had the pandemic not occurred. Year 4 data was excluded given the untypical large number of admissions in that year. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

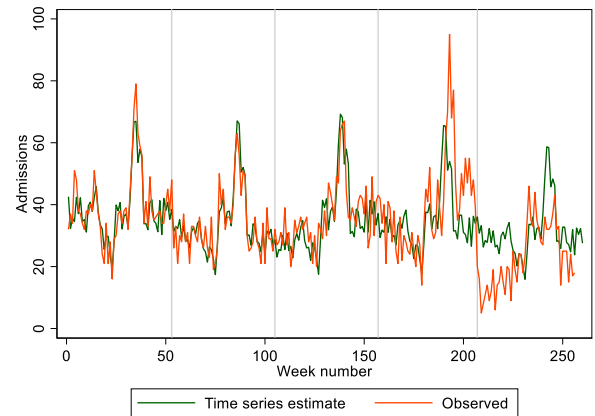
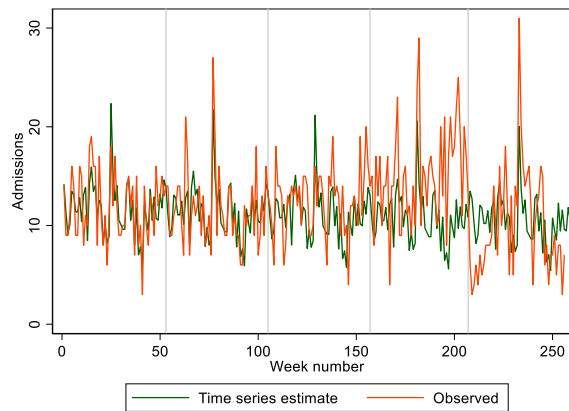
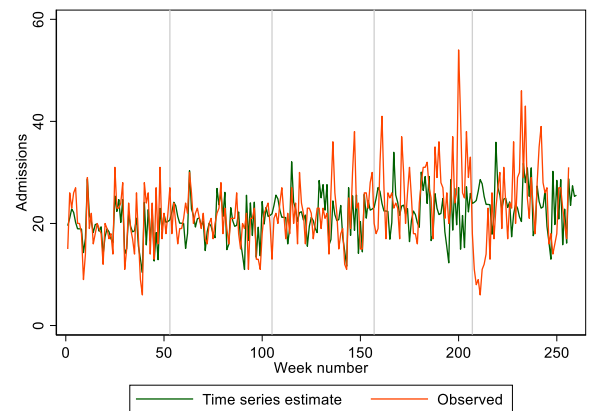
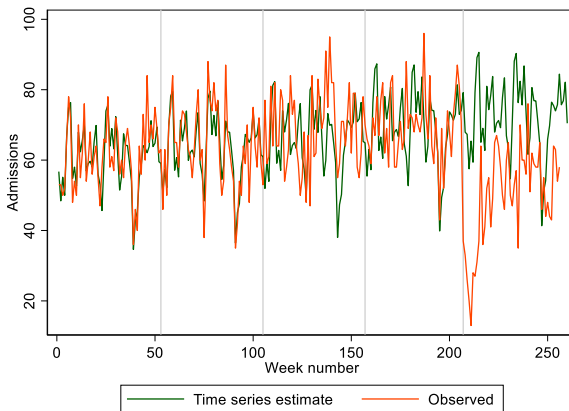
(a) 0-4 years**(b) 5-10 years****(c) 11-17 years****(d) 18-24 years**

Figure S9. Weekly admissions for (a) 0-4 years, (b) 5-10 years, (c) 11-17 years and (d) 18-24 years. Figures represent time series and observed admissions by age group. Seasonal Holt Winters time series approach was used with data from weeks 1 to 156 (years 1 to 3 [years 1 to 2 for 5 to 10 year age group]) to estimate admissions in year 5. Year 4 data was excluded given the untypical large number of admissions in that year. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

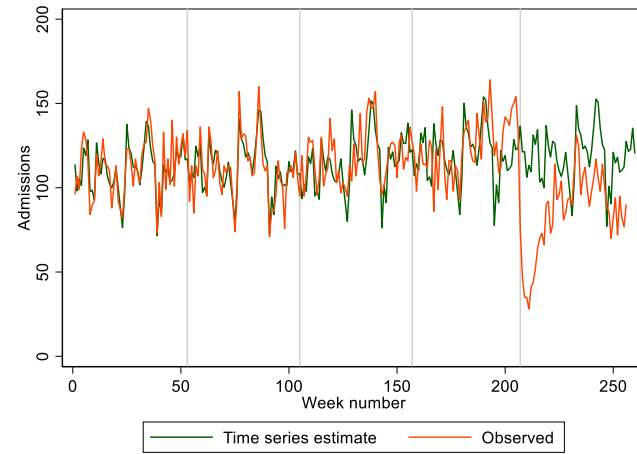
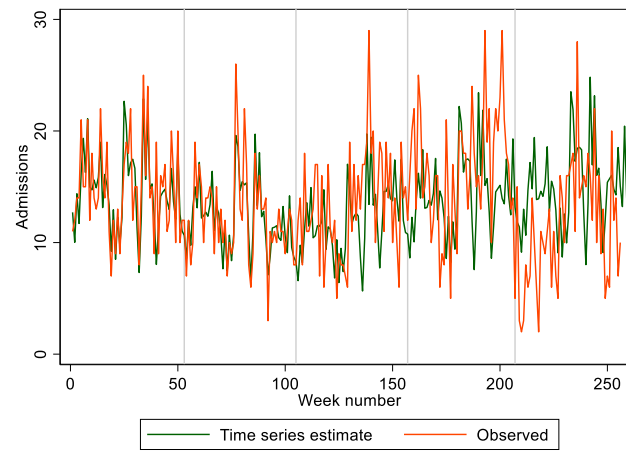
(a) White ethnicity**(b) Non-white ethnicity**

Figure S10. Weekly admissions by (a) white ethnicity and (b) non-white ethnicity. Figures represent time series and observed admissions by ethnicity. Seasonal Holt Winters time series approach was used with data from weeks 1 to 156 (years 1 to 3) to estimate admissions in year 5. Year 4 data was excluded given the untypical large number of admissions in that year. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

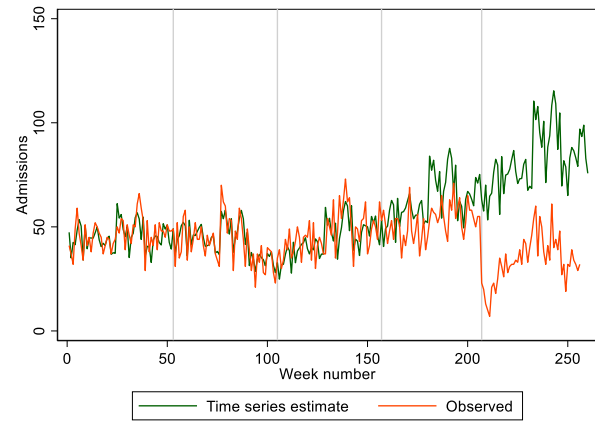
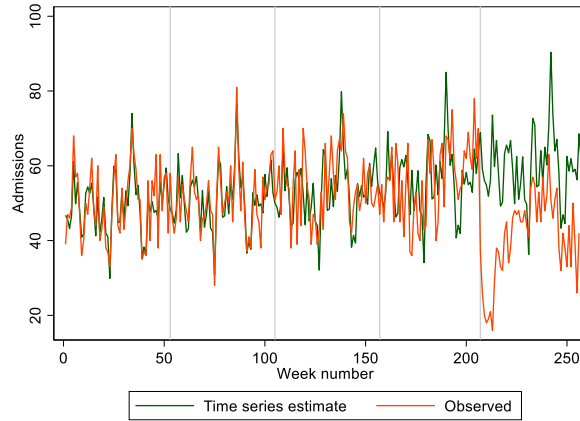
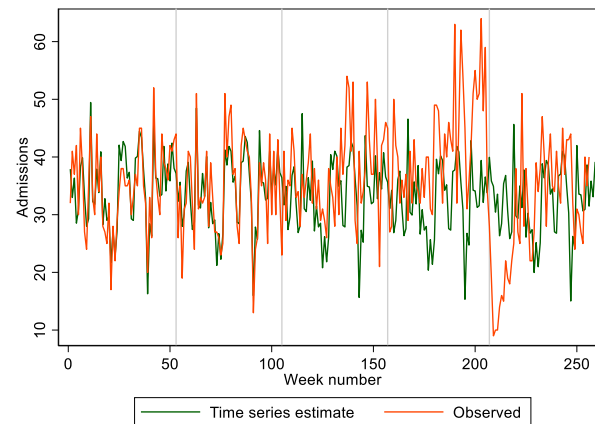
(a) High deprivation**(b) Moderate deprivation****(c) Low deprivation**

Figure S11. Weekly admissions by (a) high deprivation, (b) moderate deprivation and (c) low deprivation. Figures represent time series and observed admissions by deprivation. Seasonal Holt Winters time series approach was used with data from weeks 1 to 156 (years 1 to 3 [years 1 to 2 for low deprivation]) used to estimate admissions in year 5. Year 4 data was excluded given the untypical large number of admissions in that year. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

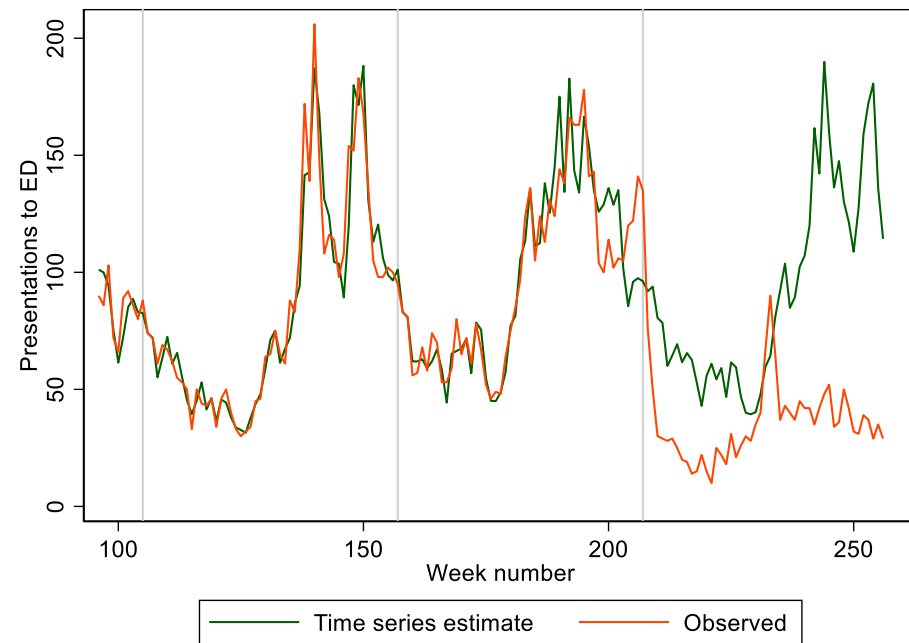


Figure S12. Weekly respiratory infection presentations. Figures represent time series and observed presentations. Seasonal Holt Winters time series approach was used with data from weeks 96 to 206 (years 1 to 4) were used to estimate the presentations in year 5 had the pandemic not occurred. Year 1 and 2 data untypical of other years. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

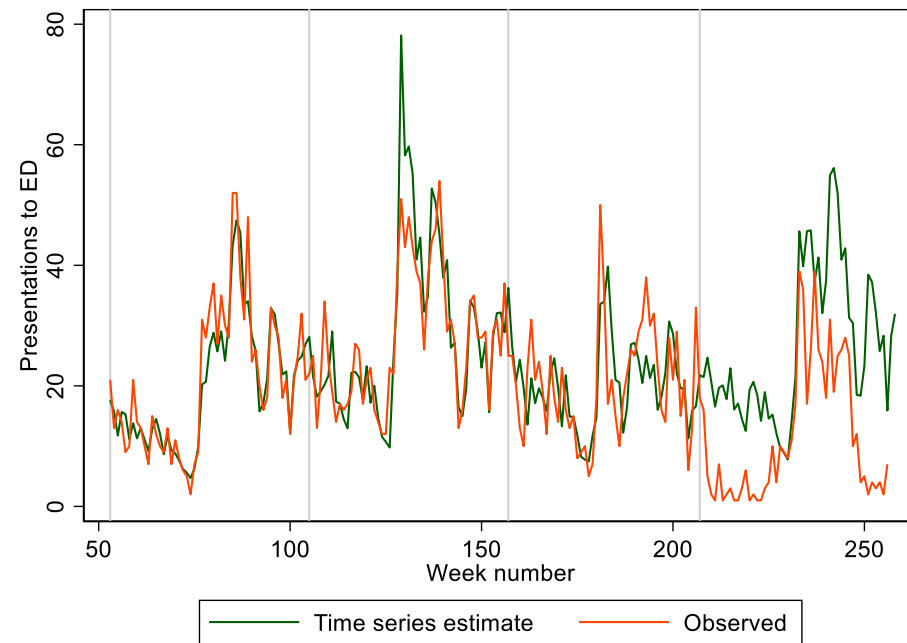


Figure S13. Weekly asthma and wheeze presentations. Figures represent time series and observed presentations. Seasonal Holt Winters time series approach was used with data from weeks 1 to 206 (years 2 to 4) were used to estimate the presentations in year 5 had the pandemic not occurred. Year 1 data was untypically low compare to years 2-4. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

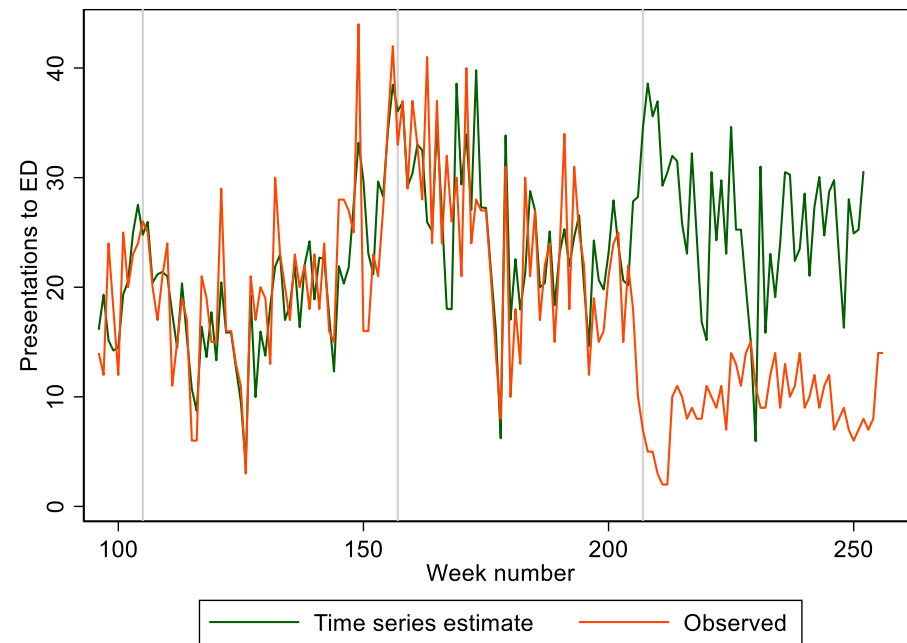


Figure S14. Weekly gastrointestinal infection presentations. Figures represent time series and observed presentations. Seasonal Holt Winters time series approach was used with data from weeks 96 to 206 (years 1 to 4) were used to estimate the presentations in year 5 had the pandemic not occurred. Year 1 and 2 data untypical of other years. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

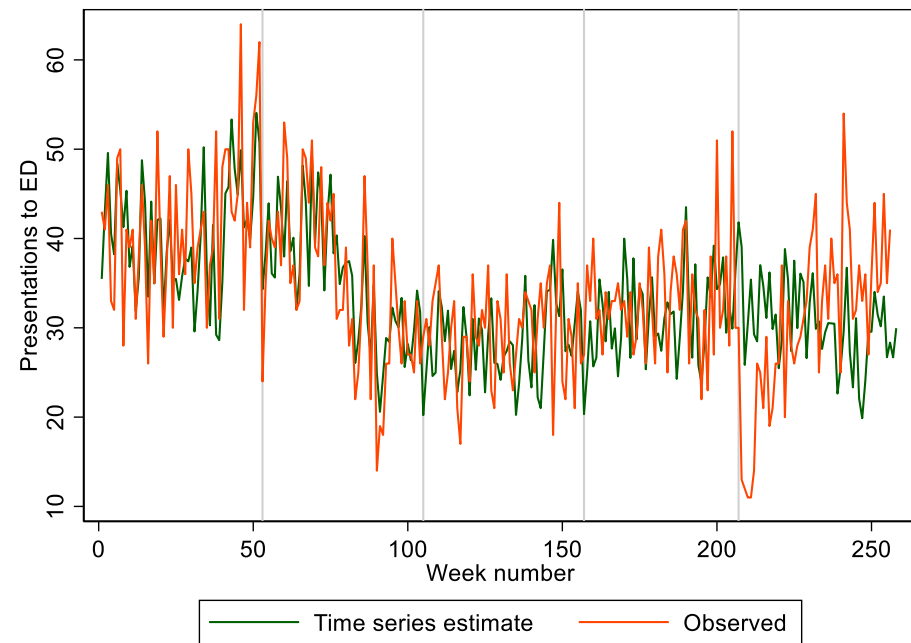


Figure S15. Weekly surgical presentations. Figures represent time series and observed presentations. Seasonal Holt Winters time series approach was used with data from weeks 1 to 206 (years 1 to 4) were used to estimate the presentations in year 5 had the pandemic not occurred. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

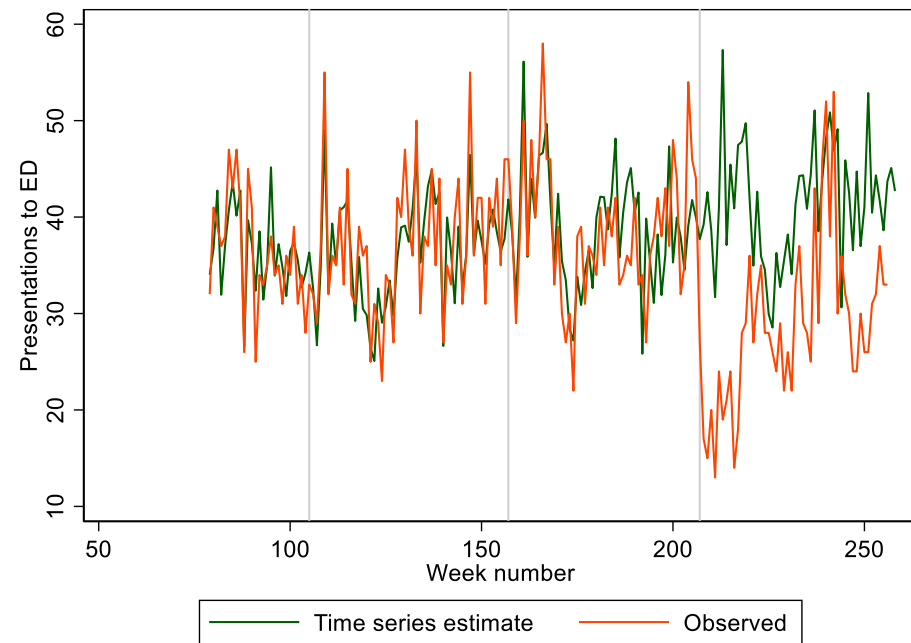


Figure S16. Weekly mental health presentations. Figures represent time series and observed presentations. Seasonal Holt Winters time series approach was used with data from weeks 80 to 206 (years 1 to 4) were used to estimate the presentations in year 5 had the pandemic not occurred. Year 1 data untypical of other years. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

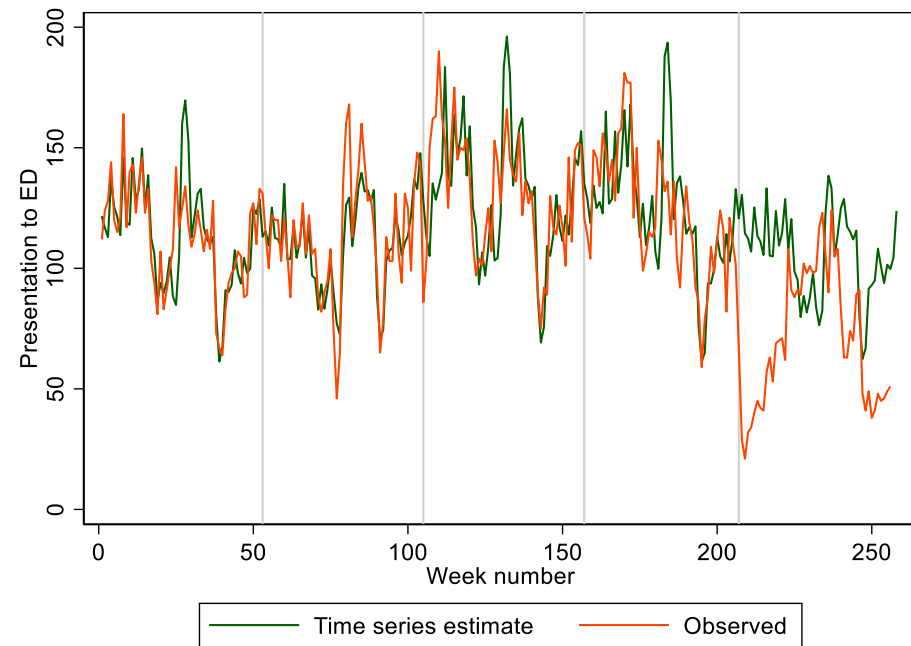


Figure S17. Weekly accidental injury and trauma presentations. Figures represent time series and observed presentations. Seasonal Holt Winters time series approach was used with data from weeks 1 to 206 (years 1 to 4) were used to estimate the presentations in year 5 had the pandemic not occurred. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

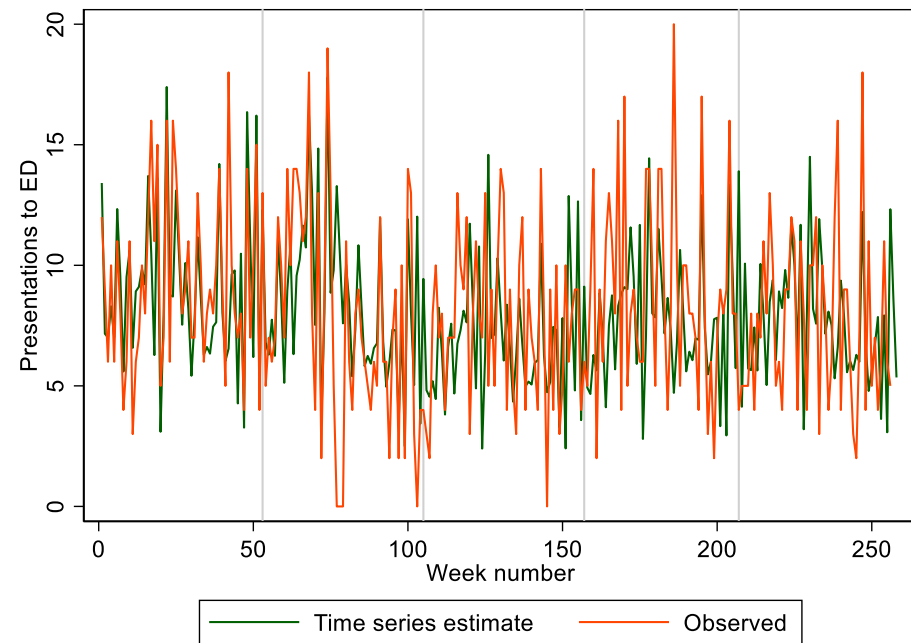


Figure S18. Weekly burn/scald presentations. Figures represent time series and observed presentations. Seasonal Holt Winters time series approach was used with data from weeks 1 to 206 (years 1 to 4) were used to estimate the presentations in year 5 had the pandemic not occurred. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

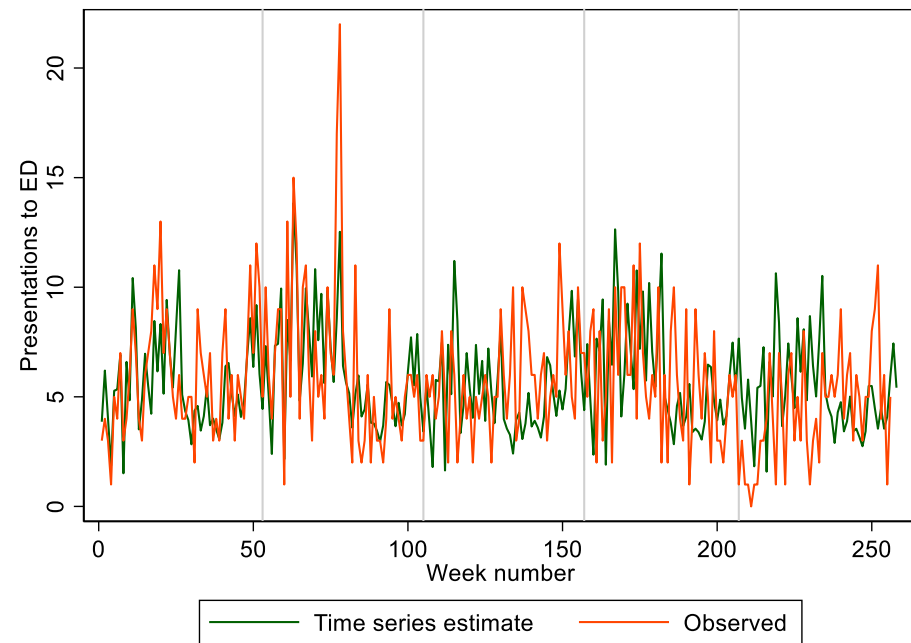


Figure S19. Weekly allergy presentations. Figures represent time series and observed presentations. Seasonal Holt Winters time series approach was used with data from weeks 1 to 206 (years 1 to 4) were used to estimate the presentations in year 5 had the pandemic not occurred. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

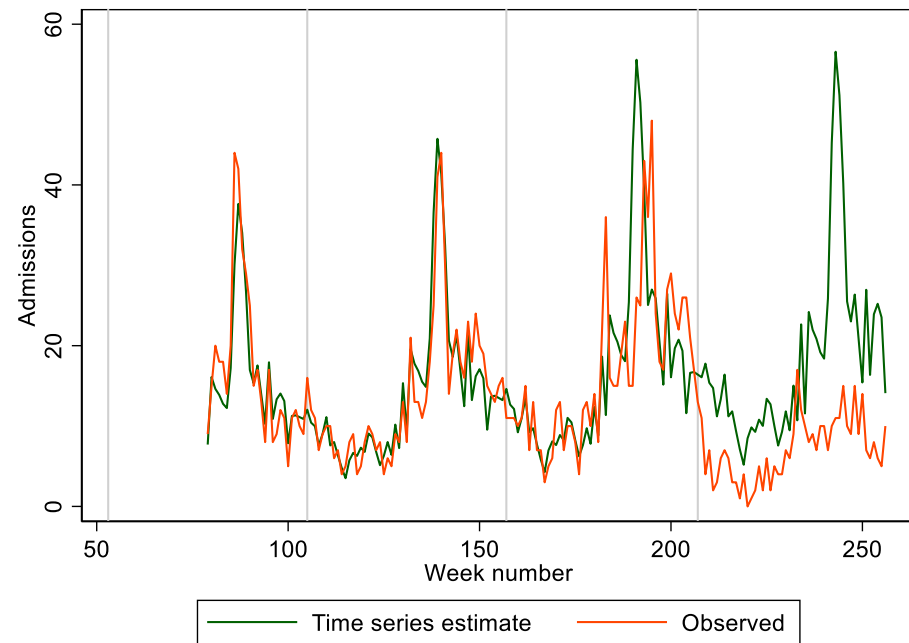


Figure S20. Weekly respiratory infection admissions. Figures represent time series and observed admissions. Seasonal Holt Winters time series approach was used with data from weeks 80 to 206 (years 2 to 4) were used to estimate the admissions in year 5 had the pandemic not occurred. Year 1 data was untypical compared years 2-4. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

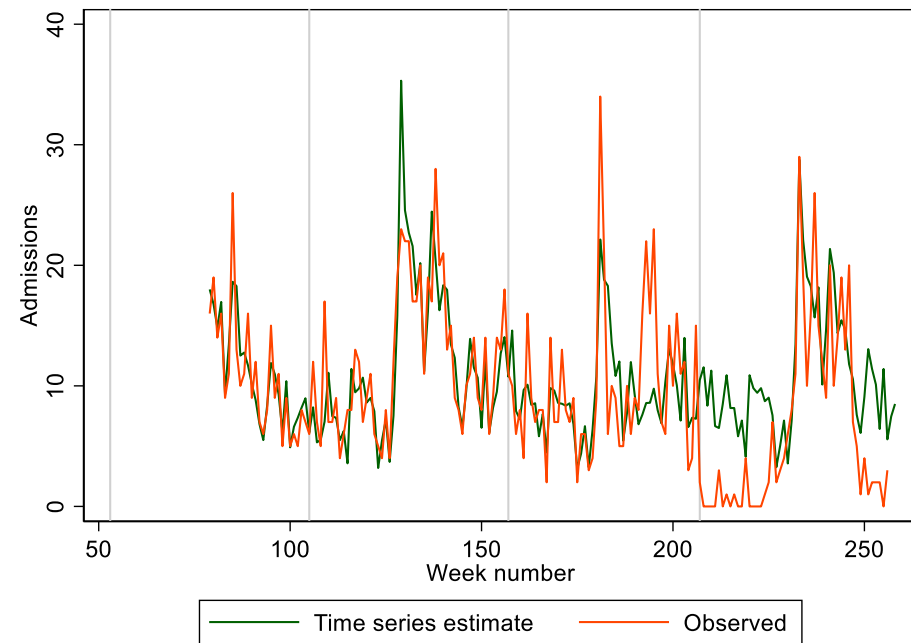


Figure S21. Weekly asthma and wheeze admissions. Figures represent time series and observed admissions. Seasonal Holt Winters time series approach was used with data from weeks 80 to 206 (years 2 to 4) were used to estimate the admissions in year 5 had the pandemic not occurred. Year 1 data was untypical compared years 2-4. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

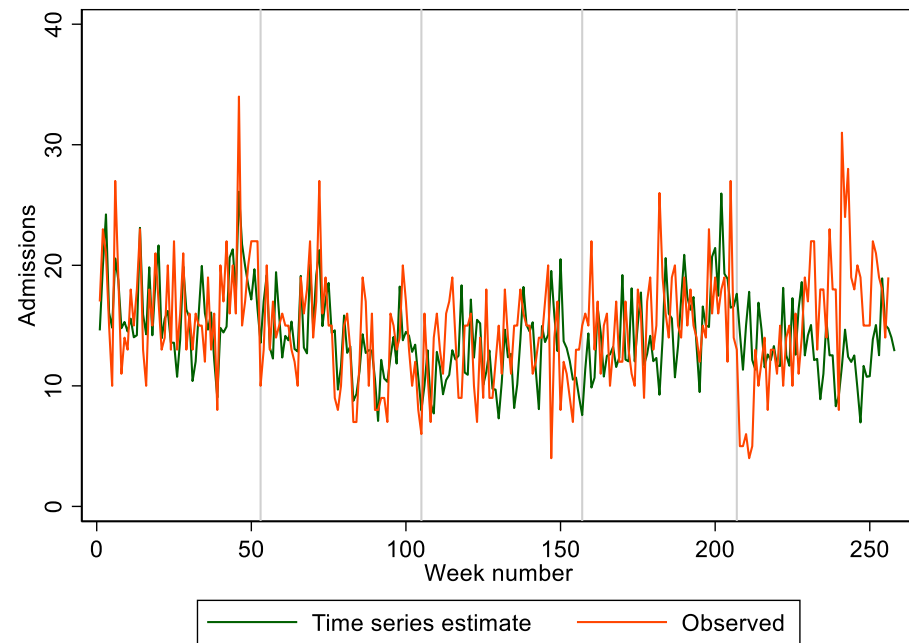


Figure S22. Weekly surgical admissions. Figures represent time series and observed admissions. Seasonal Holt Winters time series approach was used with data from weeks 1 to 206 (years 1 to 4) were used to estimate the admissions in year 5 had the pandemic not occurred. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

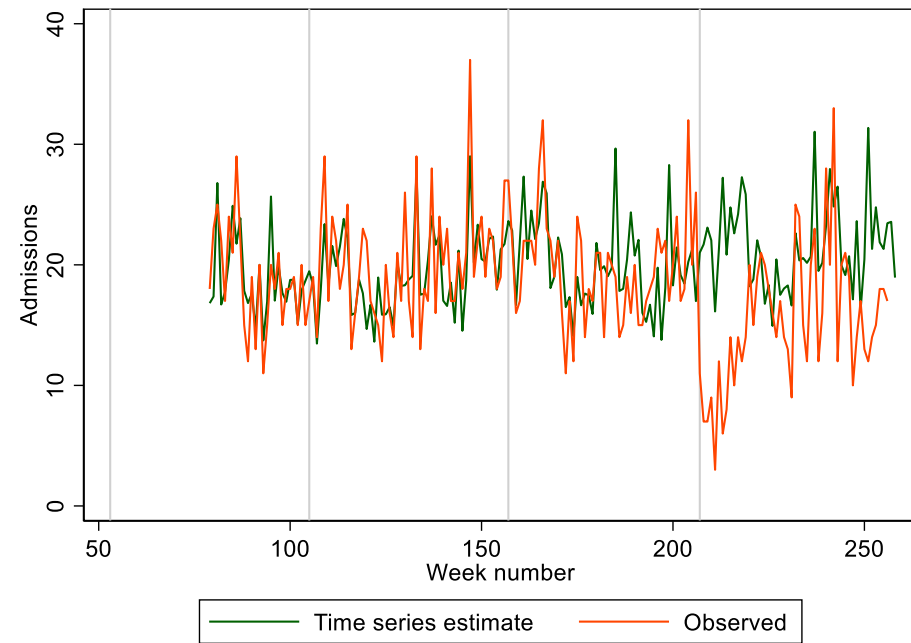


Figure S23. Weekly mental health admissions. Figures represent time series and observed admissions. Seasonal Holt Winters time series approach was used with data from weeks 80 to 206 (years 2 to 4) were used to estimate the admissions in year 5 had the pandemic not occurred. Year 1 data was untypical compared years 2-4. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

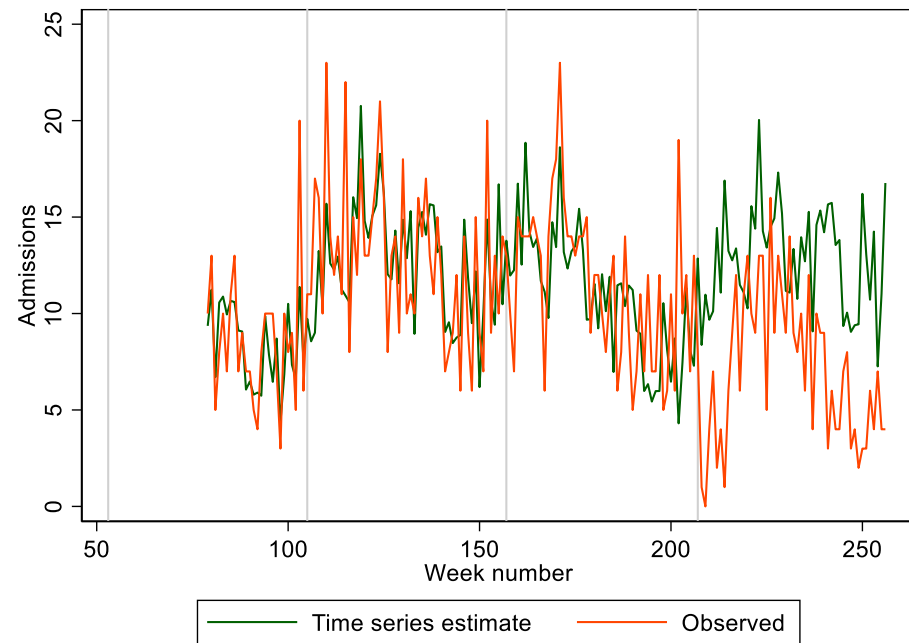


Figure S24. Accidental injury and trauma admissions. Figures represent time series and observed admissions. Seasonal Holt Winters time series approach was used with data from weeks 80 to 206 (years 2 to 4) were used to estimate the admissions in year 5 had the pandemic not occurred. Year 1 data was untypical compared years 2-4. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

1 References

- 2 1) Organisation, W. H. (2017, 03/02/2017). "Determinants of health." Retrieved 01/06/2021,
3 2021, from <https://www.who.int/news-room/q-a-detail/determinants-of-health>, last
4 accessed 16th October 2021
- 5 2) Wohlgemut JM, Morrison JJ, Apodaca AN, Egan G, Sponseller PD, Driver CP, et al.
6 Demographic and geographical characteristics of pediatric trauma in Scotland. *J Pediatr Surg.*
7 2013;48(7):1593-7
- 8 3) Crede SH, Mason S, Such E, Jacques RM. Paediatric emergency department utilisation rates
9 and maternal migration status in the Born in Bradford cohort: A cross-sectional study. *PLoS*
10 *Med.* 2020;17(3):e1003043.
- 11 4) Griffin E, McMahon E, McNicholas F, Corcoran P, Perry IJ, Arensman E. Increasing rates of
12 self-harm among children, adolescents and young adults: a 10-year national registry study
13 2007-2016. *Soc Psychiatry Psychiatr Epidemiol.* 2018;53(7):663-71
- 14 5) Office of National Statistics. English indices of deprivation 2019: GOV.UK; 2019 [updated
15 26/09/2019. Available from: [https://www.gov.uk/government/statistics/english-indices-of-](https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019)
16 [deprivation-2019](https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019), last accessed 16th October 2021
- 17 6) Stata.com. tssmooth shwinters - Holt-Winters seasonal smoothing 2019 [Available from:
18 <https://www.stata.com/manuals13/tstssmoothshwinters.pdf>, last accessed 16th October
19 2021
- 20 7) Ewusie JE, Soobiah C, Blondal E, Beyene J, Thabane L, Hamid JS. Methods, Applications and
21 Challenges in the Analysis of Interrupted Time Series Data: A Scoping Review. *J Multidiscip*
22 *Healthc.* 2020;13:411-23

23

Impact of the COVID-19 pandemic on emergency department attendances and admissions for children, adolescents and young adults

Folasade Solanke¹, Stephanie Easton^{1,2}, Anna Selby^{1,2}, David James², Graham Roberts¹⁻⁴

Affiliations

1. University of Southampton Faculty of Medicine, Southampton;
2. Child Health, University Hospital Southampton NHS Foundation Trust, Southampton;
3. NIHR Southampton Biomedical Research Centre, University Hospital Southampton NHS Foundation Trust, Southampton;
4. David Hide Asthma and Allergy Research Centre, St Mary's Hospital, Newport, Isle of Wight.

Address for correspondence: Graham Roberts, Paediatric Allergy and Respiratory Medicine (Mailpoint 805), Southampton University Hospital NHS Foundation Trust, Tremona Road, Southampton SO16 6YD, United Kingdom. E-mail: g.c.roberts@soton.ac.uk. Tel. 02381206160.

Online supplementary material

Contents

Introduction	3
Methods	3
Table S1: Summary of participants attending emergency department and people living in Southampton local authority.	5
Table S2: Summary of participants admitted to hospital.	6
Table S3: Respiratory infection presentations divided by population subgroups.	7
Table S4: Asthma and wheeze presentations divided by population subgroups.	8
Table S5: Gastrointestinal infection presentations divided by population subgroups.	9
Table S6: Surgical presentations divided by population subgroups.	10
Table S7: Mental health presentations divided by population subgroups.	11
Table S8: Accidental injury and traumatic presentations divided by population subgroups.	12
Table S9: Burns and scalds presentations divided by population subgroups.	13
Table S10: Allergy and anaphylaxis presentations divided by population subgroups.	14
Table S11: Respiratory infection admissions divided by population subgroups.	15
Table S12 Asthma and wheeze admissions divided by population subgroups.	16

Table S13 Gastrointestinal infection admissions divided by population subgroups.	17
Table S14: Surgical admissions divided by population subgroups.	18
Table S15: Mental health admissions divided by population subgroups.	19
Table S16: Accidental injury and trauma admissions divided by population subgroups.	20
Table S17: Burns and scalds admissions divided by population subgroups.	21
Table S18: Allergy and anaphylaxis admissions divided by population subgroups	22
Table S19: Mental health presentations divided by sex and age group.	23
Table S20: Mental health admissions divided by sex and age group.	24
Table S21: Diagnostic labels included in each group presentation	25
Figure S1: Weekly mental health presentations before and during the pandemic in the 11-17 and 18-24 year age groups for (a) males and (b) females.	26
Figure S2. Weekly presentations for all.	27
Figure S3. Weekly presentations for (a) males and (b) females.	28
Figure S4. Weekly presentations for (a) 0-4 years, (b) 5-10 years, (c) 11-17 years and (d) 18-24 years.	29
Figure S5. Weekly presentations and admissions by (a) white ethnicity and (b) non-white ethnicity.	30
Figure S6. Weekly presentations by (a) high deprivation, (b) moderate deprivation and (c) low deprivation.	31
Figure S7. Weekly admissions for all.	32
Figure S8. Weekly admissions for (a) males and (b) males.	33
Figure S9. Weekly admissions for (a) 0-4 years, (b) 5-10 years, (c) 11-17 years and (d) 18-24 years.	34
Figure S10. Weekly admissions by (a) white ethnicity and (b) non-white ethnicity.	35
Figure S11. Weekly admissions by (a) high deprivation, (b) moderate deprivation and (c) low deprivation.	36
Figure S12. Weekly respiratory infection presentations.	37
Figure S13. Weekly asthma and wheeze presentations.	38
Figure S14. Weekly gastrointestinal infection presentations.	39
Figure S15. Weekly surgical presentations.	40
Figure S16. Weekly mental health presentations.	41
Figure S17. Weekly accidental injury and trauma presentations.	42
Figure S18. Weekly burn/scold presentations.	43
Figure S19. Weekly allergy presentations.	44
Figure S20. Weekly respiratory infection admissions	45
Figure S21. Weekly asthma and wheeze admissions	46
Figure S22. Weekly surgical admissions.	47
Figure S23. Weekly mental health admissions.	48
Figure S24. Weekly accidental injury and trauma admissions.	49
References	50

Introduction

The WHO defines the determinates of health as the social, economic and physical environment and the person's individual characteristics and behaviours.¹ Different factors can impact on the types of presentation to the Emergency Department (ED), with patterns of presentation correlating with biopsychosocial factors. These factors could include location, genetics, education level and gender. Emergency attendances for children, adolescents and young adults can occur for various reasons such as accidental injury resulting in trauma or medical illness and fever. Traumatic presentations in children are associated with socioeconomic deprivation and males, showing a bimodal age distribution peaking in pre-schoolers and adolescents.² Paediatric ED usage is higher in infants, with presentation reducing as age increases per year during the first five years of life.³ Mental health presentations such as self-harm to the ED are frequently seen in older adolescents and young adults with the greatest severity of self-harm in those between 18 and 25 years old.⁴

Methods

Study design and participants

Date of birth was substituted with age in complete years. Postcode data was substituted with the decile of index of multiple deprivation via the Office of National Statistics (ONS) small area codes.⁵ Presentation dates were merged into week of presentation. Prior to September 2019, some children and adolescents were referred to a paediatric assessment unit by their general practitioner rather than to ED. Data from the paediatric assessment unit was merged with the ED data for this analysis. From September 2019, all those aged under 18 accessed the hospital via the Children's ED. Data for a five year period was included in the study to check that these pathway changes had not altered any long-term trajectories. Data management and anonymisation was undertaken using Microsoft excel version 2008 within the hospital information technology system.

Population subgroups

Different subgroups were considered *a priori* to assess whether the impact of the pandemic was similar across the entire population. Participants were divided into the following age groups: 0-4, 5-10, 11-17 and 18-24 complete years of age. This was based on the developmental trajectory of children and adolescents and their expected emergency department usage: 0-4 years – pre-schoolers who are frequently presented to the emergency department; 5-10 years – primary school children who are less likely to be unwell; 11-17 years – adolescents who are developing their independence, are relatively well but have more adolescent presentations; 18-24 years – young adults who are usually independent but frequently use the emergency department of their healthcare. Additional subgroups were male/female sex, ethnicity (white versus non-white given the predominant white population) and deprivation (divided into high [decile of index of multiple deprivation 1-3], moderate [4-7] and low [8-10]).⁵

For tables and figures, ED presentations were divided into five time periods: Year 1: 01/04/2016 to 30/03/2017 (52 weeks); Year 2: 31/03/2017 to 29/03/2018 (52 weeks); Year 3: 30/03/2018 to 28/03/2019 (52 weeks); Year 4: 29/03/2019 to 12/03/2020 (50 weeks); Year 5: 13/03/2020 to 25/02/2021 (50 weeks). Year 5 included the first year of the pandemic in the United Kingdom with the Prime Minister saying that all non-essential contact and travel should stop on 16th March 2020.

Statistical analysis

A seasonal Holt Winters time series approach was used,⁶ this models the weekly data according to trend (long term change in presentations which invalidate a simple average of the preceding years), cycle (aperiodic oscillations around the trend), seasonal (increased presentations in autumn and winter) and random noise. The seasonal Holt Winters time series was used data from years 1 to 4 to estimate the number of presentations and admissions that would have occurred during year 5 had the pandemic not occurred. The primary analysis focused on presentations. Given the numbers, we were able to analyse the data as one week blocks to capture the granularity of the week to week changes in attendance while controlling for the regular pattern of differing numbers of patients presenting to ED on different days of the week.

The validity of the time series forecast was assessed in two ways. Firstly, the residual (difference) between the time series forecast and the observed data for each week pre-pandemic was reviewed to ensure it was minimal. Secondly the time series analysis was repeated using the observed data for years 1-3 to forecast year 4 data; the year 4 forecast and observed data were then compared. Where necessary the time series approach was altered to optimise the fit.

It has been suggested that 24 or more time points have more than 80% power to detect an effect size of 1 or greater, with a minimum of 8 time points per period needed for sufficient power in estimating regression coefficients.⁷ Five years of presentation data provides 260 time points, 50 of which were after the pandemic began. With approximately 500 attendance and 100 admissions per week block for primary analysis, this was expected to provide at least 80% power for primary analysis.

As a secondary analysis, we estimated the expected number of presentations and admissions using the average of the preceding two years on the basis that this minimised the impact of any long-term trends. We used this to assess whether the impact of the pandemic was similar for each subgroup for each presentation. This was assessed with a chi squared analysis to highlight overall differences.

	ED total sample		Southampton local authority (only 0-24 years)		Southampton local authority (all population)	
All usual residents	166,459	100%	86,135	100%	236,882	100%
Total child and young people ages	166,459	100%	86,135	100%	86,135	100%
Males	86,164	52%	44,154	51%	119,453	50%
Females	80,262	48%	41,981	49%	117,429	50%
0 to 4 years	57,166	34%	15,407	18%	15,407	18%
5 to 10 years	25,804	16%	14,057	16%	14,057	16%
11 to 17 years	31,042	19%	16,685	19%	16,685	19%
18 to 24 years	52,447	32%	39,986	46%	39,986	46%
Low deprivation (8-10)	46,452	28%			29*	20%
Moderate deprivation (4-7)	63,385	38%			68*	46%
High Deprivation (1-3)	55,522	33%			51*	34%
White ethnicity	137,411 ^x	83%	70,408	82%	203,528	86%
Non-white ethnicity	18,359 ^x	11%	15,727	18%	33,354	14%
Mixed/multiple ethnic groups	3,781 ^x	2%	3,597	4%	5,678	2%
Asian/Asian British	8,531 ^x	5%	8,920	10%	19,892	8%
Black/African/Caribbean/Black British	2,436 ^x	1%	2,053	2%	5,067	2%
Other ethnic group	3,611 ^x	2%	1,157	1%	2,717	1%

Table S1: Summary of participants attending emergency department and people living in Southampton local authority.

Emergency Department (ED) sample relates to the data set included in this study. These are compared with 0-24 year olds in Southampton local authority and all the population in that area. Local authority data from Office of National Statistics (https://www.nomisweb.co.uk/census/2011/data_finder, <https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/datasets/mappingincomeanddeprivationatlocalauthoritylevel>, accessed 14th June 2021). Deprivation data is not available for each age group. *Represents number of areas in Southampton in each deprivation group. ^xInformation about ethnicity not available for all patients. Non-white ethnicity represents: mixed/multiple ethnic groups; Asian/Asian British; Black/African/Caribbean/Black British; and Other ethnic group.

	Pre-pandemic								Pandemic	
	Year 1		Year 2		Year 3		Year 4		Year 5	
All	6,870	100.0%	6,706	100.0%	7,246	100.0%	7,568	100.0%	5,293	100.0%
Males	3,284	47.8%	3,129	46.7%	3,493	48.2%	3,582	47.3%	2,447	46.3%
Females	3,586	52.2%	3,576	53.3%	3,751	51.8%	3,983	52.7%	2,842	53.7%
0 to 4 years	2,041	29.7%	1,730	25.8%	1,884	26.0%	1,975	26.1%	1,146	21.7%
5 to 10 years	622	9.1%	606	9.0%	648	8.9%	755	10.0%	501	9.5%
11 to 17 years	1,028	15.0%	1,056	15.7%	1,142	15.8%	1,352	17.9%	1,145	21.6%
18 to 24 years	3,179	46.3%	3,314	49.4%	3,572	49.3%	3,486	46.1%	2,501	47.3%
High Deprivation	2,404	35.4%	2,195	33.0%	2,424	33.8%	2,612	34.8%	1,694	32.2%
Moderate deprivation	2,582	38.0%	2,660	40.0%	2,820	39.3%	2,803	37.4%	2,045	38.9%
Low deprivation	1,809	26.6%	1,790	26.9%	1,924	26.8%	2,083	27.8%	1,518	28.9%
White ethnicity	5,801	88.3%	5,764	90.0%	6,137	89.9%	6,223	88.2%	4,260	88.3%
Non-white ethnicity	770	11.7%	639	10.0%	692	10.1%	833	11.8%	567	11.7%
Own transport	3,417	51.7%	3,555	54.5%	3,915	55.8%	4,525	60.5%	3,140	59.3%
Ambulance	2,851	43.1%	2,695	41.3%	2,921	41.6%	2,797	37.4%	2,094	39.6%
Public transport	294	4.4%	220	3.4%	155	2.2%	131	1.8%	37	0.7%
Other arrival mode	53	0.8%	51	0.8%	28	0.4%	27	0.4%	22	0.4%
Self or carer referral	4,588	66.9%	4,918	73.3%	5,829	80.4%	6,026	79.6%	3,990	75.8%
Ambulance and hospital referral	1,105	16.1%	677	10.1%	217	3.0%	161	2.1%	92	1.7%
NHS 111 service	561	8.2%	561	8.4%	671	9.3%	552	7.3%	644	12.2%
General Practitioner referral	384	5.6%	375	5.6%	389	5.4%	647	8.5%	429	8.2%
Other referral pathway	223	3.3%	175	2.6%	140	1.9%	182	2.4%	107	2.0%

Table S2: Summary of participants admitted to hospital. Admission is defined as being in hospital for more than four hours. Data are number (column percentage). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). Information about sex and ethnicity not available for all patients. Other arrival mode includes custodial services, police and unknown. NHS 111 also includes NHS Direct and other NHS advice. Other referral pathway includes custodial services, police service, planned review and unknown. Trauma just covers head injuries, fractures and soft tissue injuries

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic					Pandemic							Year 5	Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number presentations	1212	100%	3152	100%	4373	100%	4853	100%	1872	100%	4613	100%		-2741	-59.4%
Males	678	56%	1,734	55%	2,452	56%	2,653	55%	985	53%	2553	55%	<0.05	-1568	-61.4%
Females	534	44%	1,418	45%	1,921	44%	2,200	45%	887	47%	2061	45%		-1174	-57.0%
0 to 4 years	1,016	84%	2,420	77%	3,278	75%	3,463	71%	1,242	66%	3371	73%	<0.001	-2129	-63.2%
5 to 10 years	120	10%	349	11%	501	11%	651	13%	189	10%	576	12%		-387	-67.2%
11 to 17 years	76	6%	154	5%	212	5%	293	6%	138	7%	253	5%		-115	-45.3%
18 to 24 years	0	0%	229	7%	382	9%	446	9%	303	16%	414	9%		-111	-26.8%
Low deprivation	361	30%	913	29%	1,144	26%	1,315	27%	517	28%	1230	27%	0.102	-713	-58.0%
Moderate deprivation	475	39%	1,204	38%	1,591	36%	1,842	38%	736	39%	1717	37%		-981	-57.1%
High Deprivation	374	31%	1,029	33%	1,602	37%	1,663	34%	614	33%	1633	35%		-1019	-62.4%
White ethnicity	1,007	83%	2,579	82%	3,538	81%	3,790	78%	1,468	78%	3664	79%	0.877	-2196	-59.9%
Non-white ethnicity	163	13%	407	13%	593	14%	720	15%	260	14%	657	14%		-397	-60.4%

Table S3: Respiratory infection presentations divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of presentations between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated presentations assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic					Pandemic							Year 5	Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number presentations	813	100%	1,077	100%	1,434	100%	1,023	100%	579	100%	1229	100%		-650	-52.9%
Males	409	50%	640	59%	888	62%	626	61%	365	63%	757	62%	0.555	-392	-51.8%
Females	404	50%	437	41%	546	38%	397	39%	214	37%	472	38%		-258	-54.6%
0 to 4 years	350	43%	614	57%	948	66%	604	59%	348	60%	776	63%	0.272	-428	-55.2%
5 to 10 years	185	23%	201	19%	264	18%	225	22%	124	21%	245	20%		-121	-49.3%
11 to 17 years	132	16%	128	12%	131	9%	93	9%	48	8%	112	9%		-64	-57.1%
18 to 24 years	146	18%	134	12%	91	6%	101	10%	59	10%	96	8%		-37	-38.5%
Low deprivation	240	30%	293	27%	419	29%	292	29%	158	27%	356	29%	0.674	-198	-55.6%
Moderate deprivation	293	36%	407	38%	536	37%	341	33%	218	38%	439	36%		-221	-50.3%
High Deprivation	274	34%	375	35%	472	33%	380	37%	202	35%	426	35%		-224	-52.6%
White ethnicity	668	82%	887	82%	1,142	80%	808	79%	436	75%	975	79%	0.115	-539	-55.3%
Non-white ethnicity	113	14%	150	14%	220	15%	163	16%	106	18%	192	16%		-86	-44.6%

Table S4: Asthma and wheeze presentations divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of presentations between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated presentations assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic		P value (Chi squared)	Pandemic (year 5) estimated verses observed difference	
	Pre-pandemic					Pandemic					Year 5	Year 5		Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number presentations	286	100%	618	100%	1,056	100%	1,199	100%	473	100%	1128	100%		-655	-58.0%
Males	146	51%	313	51%	545	52%	587	49%	246	52%	566	50%	0.479	-320	-56.5%
Females	140	49%	305	49%	511	48%	612	51%	226	48%	562	50%		-336	-59.8%
0 to 4 years	176	62%	344	56%	582	55%	615	51%	229	48%	599	53%	<0.01	-370	-61.7%
5 to 10 years	71	25%	103	17%	229	22%	271	23%	91	19%	250	22%		-159	-63.6%
11 to 17 years	39	14%	85	14%	103	10%	125	10%	53	11%	114	10%		-61	-53.5%
18 to 24 years	0	0%	86	14%	142	13%	188	16%	100	21%	165	15%		-65	-39.4%
Low deprivation	103	36%	173	28%	286	27%	318	27%	119	25%	302	27%	0.535	-183	-60.6%
Moderate deprivation	107	37%	259	42%	429	41%	441	37%	174	37%	435	39%		-261	-60.0%
High Deprivation	73	26%	186	30%	332	31%	433	36%	173	37%	383	34%		-210	-54.8%
White ethnicity	239	84%	502	81%	793	75%	886	74%	362	77%	840	74%	0.397	-478	-56.9%
Non-white ethnicity	39	14%	82	13%	191	18%	229	19%	80	17%	210	19%		-130	-61.9%

Table S5: Gastrointestinal infection presentations divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of presentations between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated presentations assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic					Pandemic							Year 5	Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number presentations	2,163	100%	1,806	100%	1,524	100%	1,658	100%	1,541	100%	1591	100%		-50	-3.1%
Males	909	42%	882	49%	903	59%	1,011	61%	924	60%	957	60%	0.931	-33	-3.4%
Females	1,254	58%	924	51%	621	41%	647	39%	616	40%	634	40%		-18	-2.8%
0 to 4 years	280	13%	327	18%	433	28%	381	23%	374	24%	407	26%	0.117	-33	-8.1%
5 to 10 years	285	13%	271	15%	244	16%	321	19%	266	17%	283	18%		-17	-5.8%
11 to 17 years	383	18%	356	20%	318	21%	338	20%	373	24%	328	21%		45	13.7%
18 to 24 years	1,215	56%	852	47%	529	35%	618	37%	528	34%	574	36%		-46	-7.9%
Low deprivation	589	27%	534	30%	440	29%	478	29%	505	33%	459	29%	<0.05	46	10.0%
Moderate deprivation	813	38%	710	39%	621	41%	652	39%	608	39%	637	40%		-29	-4.5%
High Deprivation	743	34%	553	31%	456	30%	516	31%	423	27%	486	31%		-63	-13.0%
White ethnicity	1,824	84%	1,521	84%	1,251	82%	1,328	80%	1,224	79%	1290	81%	0.953	-66	-5.1%
Non-white ethnicity	221	10%	165	9%	158	10%	199	12%	171	11%	179	11%		-8	-4.2%

Table S6: Surgical presentations divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of presentations between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated presentations assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic					Pandemic							Year 5	Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total	756	100%	1,392	100%	1,926	100%	1,926	100%	1,441	100%	1,659	100%	-218	-13.1%	
Males	313	41%	586	42%	733	38%	640	33%	452	31%	660	40%	<0.001	-208	-31.5%
Females	443	59%	805	58%	1,192	62%	1,285	67%	986	68%	999	60%		-13	-1.3%
0 to 4 years	18	2%	47	3%	49	3%	39	2%	36	2%	48	3%	<0.001	-12	-25.0%
5 to 10 years	30	4%	35	3%	32	2%	39	2%	31	2%	34	2%		-3	-7.5%
11 to 17 years	210	28%	400	29%	546	28%	633	33%	599	42%	473	29%		126	26.6%
18 to 24 years	498	66%	910	65%	1,299	67%	1,215	63%	775	54%	1,105	67%		-330	-29.8%
Low deprivation	138	18%	355	26%	429	22%	457	24%	400	28%	392	24%	<0.05	8	2.0%
Moderate deprivation	310	41%	562	40%	807	42%	775	40%	560	39%	685	41%		-125	-18.2%
High Deprivation	292	39%	445	32%	660	34%	670	35%	474	33%	553	33%		-79	-14.2%
White ethnicity	662	88%	1,199	86%	1,675	87%	1,642	85%	1,197	83%	1,437	87%	0.898	-240	-16.7%
Non-white ethnicity	60	8%	95	7%	116	6%	117	6%	90	6%	106	6%		-16	-14.7%

Table S7: Mental health presentations divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of presentations between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated presentations assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic					Pandemic							Year 5	Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number presentations	5,874	100%	5,874	100%	6,820	100%	6,144	100%	3,523	100%	6482	100%		-2959	-45.6%
Males	3,298	56%	3,388	58%	3,985	58%	3,595	59%	2,058	58%	3790	58%	0.971	-1732	-45.7%
Females	2,572	44%	2,486	42%	2,835	42%	2,549	41%	1,464	42%	2692	42%		-1228	-45.6%
0 to 4 years	1,563	27%	1,461	25%	1,456	21%	1,253	20%	958	27%	1355	21%	<0.001	-397	-29.3%
5 to 10 years	1,126	19%	1,127	19%	1,418	21%	1,251	20%	739	21%	1335	21%		-596	-44.6%
11 to 17 years	1,433	24%	1,542	26%	1,885	28%	1,863	30%	985	28%	1874	29%		-889	-47.4%
18 to 24 years	1,752	30%	1,744	30%	2,061	30%	1,777	29%	841	24%	1919	30%		-1078	-56.2%
Low deprivation	1,710	29%	1,734	30%	2,076	30%	1,811	29%	1,125	32%	1944	30%	0.224	-819	-42.1%
Moderate deprivation	2,123	36%	2,204	38%	2,520	37%	2,306	38%	1,313	37%	2413	37%		-1100	-45.6%
High Deprivation	2,012	34%	1,892	32%	2,177	32%	1,981	32%	1,071	30%	2079	32%		-1008	-48.5%
White ethnicity	5,056	86%	5,036	86%	5,884	86%	5,127	83%	2,916	83%	5506	85%	0.616	-2590	-47.0%
Non-white ethnicity	483	8%	529	9%	606	9%	543	9%	316	9%	575	9%		-259	-45.0%

Table S8: Accidental injury and traumatic presentations divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of presentations between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated presentations assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic					Pandemic							Year 5	Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number presentations	485	100%	407	100%	389	100%	446	100%	379	100%	418	100%		-39	-9.2%
Males	248	51%	191	47%	203	52%	242	54%	191	50%	223	53%	0.405	-32	-14.2%
Females	237	49%	216	53%	186	48%	204	46%	188	50%	195	47%		-7	-3.6%
0 to 4 years	236	49%	197	48%	186	48%	214	48%	220	58%	200	48%	<0.05	20	10.0%
5 to 10 years	55	11%	49	12%	53	14%	46	10%	33	9%	50	12%		-17	-33.3%
11 to 17 years	43	9%	45	11%	48	12%	80	18%	47	12%	64	15%		-17	-26.6%
18 to 24 years	151	31%	116	29%	102	26%	106	24%	79	21%	104	25%		-25	-24.0%
Low deprivation	145	30%	113	28%	84	22%	122	27%	91	24%	103	25%	0.654	-12	-11.7%
Moderate deprivation	166	34%	148	36%	167	43%	210	47%	163	43%	189	45%		-26	-13.5%
High Deprivation	174	36%	144	35%	137	35%	113	25%	125	33%	125	30%		0	0.0%
White ethnicity	400	82%	339	83%	295	76%	358	80%	323	85%	327	78%	0.312	-4	-1.1%
Non-white ethnicity	61	13%	45	11%	55	14%	48	11%	41	11%	52	12%		-11	-20.4%

Table S9: Burns/scalds presentations divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of presentations between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated presentations assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic					Pandemic							Year 5	Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number presentations	310	100%	335	100%	296	100%	295	100%	219	100%	296	100%		-77	-25.9%
Males	152	49%	155	46%	154	52%	137	46%	98	45%	146	49%	0.304	-48	-32.6%
Females	158	51%	180	54%	142	48%	158	54%	121	55%	150	51%		-29	-19.3%
0 to 4 years	100	32%	122	36%	103	35%	114	39%	89	41%	109	37%	<0.01	-20	-18.0%
5 to 10 years	52	17%	58	17%	55	19%	52	18%	28	13%	54	18%		-26	-47.7%
11 to 17 years	64	21%	61	18%	34	11%	44	15%	49	22%	39	13%		10	25.6%
18 to 24 years	94	30%	94	28%	104	35%	85	29%	53	24%	95	32%		-42	-43.9%
Low deprivation	111	36%	105	31%	80	27%	82	28%	66	30%	81	27%	0.437	-15	-18.5%
Moderate deprivation	108	35%	138	41%	140	47%	126	43%	87	40%	133	45%		-46	-34.6%
High Deprivation	90	29%	88	26%	74	25%	83	28%	66	30%	79	27%		-13	-15.9%
White ethnicity	252	81%	261	78%	230	78%	229	78%	160	73%	230	78%	0.397	-70	-30.3%
Non-white ethnicity	48	15%	58	17%	48	16%	45	15%	40	18%	47	16%		-7	-14.0%

Table S10: Allergy and anaphylaxis presentations divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of presentations between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated presentations assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic					Pandemic							Year 5	Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number admissions	81	100%	455	100%	713	100%	843	100%	359	100%	778	100%		-419	-53.9%
Males	45	56%	239	53%	400	56%	188	22%	188	52%	294	38%	<0.05	-106	-36.1%
Females	36	44%	216	47%	313	44%	398	47%	171	48%	356	46%		-185	-51.9%
0 to 4 years	65	80%	325	71%	466	65%	519	62%	178	50%	493	63%	<0.001	-315	-63.9%
5 to 10 years	9	11%	25	5%	50	7%	78	9%	21	6%	64	8%		-43	-67.2%
11 to 17 years	7	9%	19	4%	39	5%	38	5%	38	11%	39	5%		-1	-1.3%
18 to 24 years	0	0%	86	19%	158	22%	168	20%	122	34%	163	21%		-41	-25.2%
Low deprivation	20	25%	134	29%	179	25%	227	27%	117	33%	203	26%	<0.05	-86	-42.4%
Moderate deprivation	32	40%	174	38%	261	37%	320	38%	134	37%	291	37%		-157	-53.9%
High Deprivation	29	36%	147	32%	268	38%	293	35%	107	30%	281	36%		-174	-61.9%
White ethnicity	75	93%	396	87%	605	85%	671	80%	281	78%	638	82%	0.510	-357	-56.0%
Non-white ethnicity	4	5%	42	9%	75	11%	113	13%	47	13%	94	12%		-47	-50.0%

Table S11: Respiratory infection admissions divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of admissions between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated admissions assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic		P value (Chi squared)	Pandemic (year 5) estimated verses observed difference	
	Pre-pandemic					Pandemic					Year 5	Year 5		Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number admissions	196	100%	378	100%	620	100%	494	100%	314	100%	557	100%		-243	-43.6%
Males	94	48%	222	59%	379	61%	313	63%	214	68%	346	62%	0.074	-132	-38.2%
Females	102	52%	156	41%	241	39%	181	37%	100	32%	211	38%		-111	-52.6%
0 to 4 years	44	22%	218	58%	442	71%	319	65%	217	69%	381	68%	0.310	-164	-43.0%
5 to 10 years	52	27%	64	17%	96	15%	87	18%	58	18%	92	16%		-34	-36.6%
11 to 17 years	31	16%	35	9%	36	6%	36	7%	22	7%	36	6%		-14	-38.9%
18 to 24 years	69	35%	61	16%	46	7%	52	11%	17	5%	49	9%		-32	-65.3%
Low deprivation	50	26%	82	22%	173	28%	149	30%	85	27%	161	29%	0.703	-76	-47.2%
Moderate deprivation	73	37%	169	45%	243	39%	153	31%	111	35%	198	36%		-87	-43.9%
High Deprivation	72	37%	126	33%	200	32%	186	38%	118	38%	193	35%		-75	-38.9%
White ethnicity	171	87%	323	85%	498	80%	389	79%	240	76%	444	80%	0.612	-204	-45.9%
Non-white ethnicity	21	11%	46	12%	100	16%	78	16%	53	17%	89	16%		-36	-40.4%

Table S12: Asthma and wheeze admissions divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of admissions between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated admissions assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic								Pandemic				Year 5	Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 5	Year 5								
Total number admissions	21	100%	53	100%	106	100%	162	100%	69	100%	134	100%		-65	-48.5%
Males	12	57%	26	49%	49	46%	73	45%	42	61%	61	46%	<0.05	-19	-31.1%
Females	9	43%	27	51%	57	54%	89	55%	26	38%	73	54%		-47	-64.4%
0 to 4 years	14	67%	26	49%	61	58%	78	48%	25	36%	70	52%	<0.05	-45	-64.0%
5 to 10 years	4	19%	10	19%	20	19%	38	23%	10	14%	29	22%		-19	-65.5%
11 to 17 years	3	14%	4	8%	6	6%	13	8%	8	12%	10	7%		-2	-15.8%
18 to 24 years	0	0%	13	25%	19	18%	33	20%	26	38%	26	19%		0	0.0%
Low deprivation	7	33%	14	26%	30	28%	41	25%	14	20%	36	26%	0.472	-22	-60.6%
Moderate deprivation	6	29%	21	40%	42	40%	58	36%	31	45%	50	37%		-19	-38.0%
High Deprivation	8	38%	18	34%	32	30%	62	38%	23	33%	47	35%		-24	-51.1%
White ethnicity	20	95%	46	87%	81	76%	122	75%	56	81%	102	76%	0.438	-46	-44.8%
Non-white ethnicity	1	5%	4	8%	18	17%	31	19%	10	14%	25	18%		-15	-59.2%

Table S13: Gastrointestinal infection admissions divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of admissions between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated admissions assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic		P value (Chi squared)	Pandemic (year 5) estimated verses observed difference	
	Pre-pandemic					Pandemic					Year 5	Year 5		Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number admissions	889	100%	719	100%	671	100%	791	100%	764	100%	731	100%		33	4.5%
Males	350	39%	292	41%	353	53%	444	56%	430	56%	399	55%	0.472	32	7.9%
Females	539	61%	427	59%	318	47%	347	44%	333	44%	333	45%		1	0.2%
0 to 4 years	63	7%	54	8%	79	12%	74	9%	105	14%	77	10%	<0.05	29	37.3%
5 to 10 years	80	9%	78	11%	95	14%	128	16%	114	15%	112	15%		3	2.2%
11 to 17 years	165	19%	159	22%	158	24%	194	25%	211	28%	176	24%		35	19.9%
18 to 24 years	581	65%	428	60%	339	51%	395	50%	334	44%	367	50%		-33	-9.0%
Low deprivation	229	26%	202	28%	190	28%	222	28%	269	35%	206	28%	<0.05	63	30.6%
Moderate deprivation	345	39%	393	55%	274	41%	308	39%	283	37%	291	40%		-8	-2.7%
High Deprivation	303	34%	221	31%	200	30%	255	32%	208	27%	228	31%		-20	-8.6%
White ethnicity	775	87%	621	86%	551	82%	641	81%	617	81%	596	82%	0.837	21	3.5%
Non-white ethnicity	82	9%	60	8%	68	10%	92	12%	80	10%	80	11%		0	0.0%

Table S14: Surgical admissions divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of admissions between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated admissions assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic		P value (Chi squared)	Pandemic (year 5) estimated verses observed difference	
	Pre-pandemic					Pandemic					Year 5	Year 5		Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number admissions	318	100%	669	100%	1,038	100%	989	100%	771	100%	1014	100%		-243	-23.9%
Males	127	40%	245	37%	349	34%	296	30%	209	27%	323	32%	<0.05	-114	-35.2%
Females	191	60%	423	63%	689	66%	692	70%	560	73%	691	68%		-131	-18.9%
0 to 4 years	5	2%	11	2%	10	1%	7	1%	8	1%	9	1%	<0.01	-1	-5.9%
5 to 10 years	3	1%	7	1%	7	1%	12	1%	8	1%	10	1%		-2	-15.8%
11 to 17 years	110	35%	214	32%	327	32%	358	36%	321	42%	343	34%		-22	-6.3%
18 to 24 years	200	63%	437	65%	694	67%	612	62%	434	56%	653	64%		-219	-33.5%
Low deprivation	56	18%	176	26%	236	23%	225	23%	199	26%	231	23%	0.355	-32	-13.7%
Moderate deprivation	128	40%	269	40%	432	42%	377	38%	294	38%	405	40%		-111	-27.3%
High Deprivation	125	39%	204	30%	359	35%	375	38%	274	36%	367	36%		-93	-25.3%
White ethnicity	278	87%	589	88%	909	88%	860	87%	637	83%	885	87%	0.087	-248	-28.0%
Non-white ethnicity	20	6%	40	6%	55	5%	61	6%	58	8%	58	6%		0	0.0%

Table S15: Mental health admissions divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of admissions between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated admissions assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic					Pandemic							Year 5	Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number admissions	284	100%	342	100%	668	100%	576	100%	355	100%	622	100%		-267	-42.9%
Males	174	61%	226	66%	447	67%	375	65%	232	65%	411	66%	0.818	-179	-43.6%
Females	110	39%	116	34%	221	33%	201	35%	123	35%	211	34%		-88	-41.7%
0 to 4 years	54	19%	48	14%	90	13%	92	16%	49	14%	91	15%	0.566	-42	-46.2%
5 to 10 years	21	7%	47	14%	121	18%	107	19%	63	18%	114	18%		-51	-44.7%
11 to 17 years	45	16%	65	19%	138	21%	121	21%	88	25%	130	21%		-42	-32.0%
18 to 24 years	164	58%	182	53%	319	48%	256	44%	155	44%	288	46%		-133	-46.1%
Low deprivation	79	28%	117	34%	206	31%	176	31%	114	32%	191	31%	0.871	-77	-40.3%
Moderate deprivation	104	37%	142	42%	258	39%	217	38%	131	37%	238	38%		-107	-44.8%
High Deprivation	97	34%	81	24%	191	29%	178	31%	108	30%	185	30%		-77	-41.5%
White ethnicity	239	84%	285	83%	566	85%	498	86%	274	77%	532	86%	0.166	-258	-48.5%
Non-white ethnicity	30	11%	31	9%	51	8%	41	7%	33	9%	46	7%		-13	-28.3%

Table S16: Accidental injury and trauma admissions divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of admissions between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated admissions assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic					Pandemic							Year 5	Absolute	Relative
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
Total number admissions	8	100%	7	100%	9	100%	11	100%	8	100%	10	100%		-2	-20.0%
Males	6	75%	5	71%	4	44%	7	64%	5	63%	6	55%	0.729	-1	-9.1%
Females	2	25%	2	29%	5	56%	4	36%	3	38%	5	45%		-2	-33.3%
0 to 4 years	3	38%	0	0%	1	11%	4	36%	2	25%	3	25%		-1	-20.0%
5 to 10 years	2	25%	2	29%	1	11%	1	9%	0	0%	1	10%	0.409	-1	-100.0%
11 to 17 years	0	0%	2	29%	0	0%	3	27%	0	0%	2	15%		-2	-100.0%
18 to 24 years	3	38%	3	43%	7	78%	3	27%	6	75%	5	50%		1	20.0%
Low deprivation		0%	2	29%	1	11%	6	55%	2	25%	4	35%	0.598	-2	-42.9%
Moderate deprivation	4	50%	2	29%	4	44%	2	18%	4	50%	3	30%		1	33.3%
High Deprivation	4	50%	3	43%	4	44%	3	27%	2	25%	4	35%		-2	-42.9%
White ethnicity	4	50%	6	86%	6	67%	9	82%	5	63%	8	75%	0.375	-3	-33.3%
Non-white ethnicity	3	38%	1	14%	2	22%	0	0%	2	25%	1	10%		1	100.0%

Table S17: Burns and scalds admissions divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of admissions between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated admissions assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

	Observed										Estimated had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
	Pre-pandemic								Pandemic				Absolute	Relative	
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 5	Year 5								
Total number admissions	75	100%	78	100%	69	100%	56	100%	59	100%	63	100%		-4	-5.6%
Males	38	51%	39	50%	26	38%	26	46%	19	32%	26	42%	0.300	-7	-26.9%
Females	37	49%	39	50%	43	62%	30	54%	40	68%	37	58%		4	9.6%
0 to 4 years	23	31%	20	26%	19	28%	11	20%	11	19%	15	24%	<0.05	-4	-26.7%
5 to 10 years	14	19%	14	18%	6	9%	9	16%	4	7%	8	12%		-4	-46.7%
11 to 17 years	7	9%	16	21%	7	10%	5	9%	20	34%	6	10%		14	233.3%
18 to 24 years	31	41%	28	36%	37	54%	31	55%	24	41%	34	54%		-10	-29.4%
Low deprivation	28	37%	28	36%	17	25%	15	27%	28	47%	16	26%	<0.05	12	75.0%
Moderate deprivation	25	33%	29	37%	33	48%	23	41%	24	41%	28	45%		-4	-14.3%
High Deprivation	22	29%	20	26%	18	26%	17	30%	7	12%	18	28%		-11	-60.0%
White ethnicity	65	87%	59	76%	53	77%	38	68%	46	78%	46	73%	0.443	1	1.1%
Non-white ethnicity	8	11%	18	23%	14	20%	12	21%	9	15%	13	21%		-4	-30.8%

Table S18: Allergy and anaphylaxis admissions divided by population subgroups. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of admissions between the subgroups comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated admissions assuming no pandemic with the observed ones in year 5. Information about sex and ethnicity not available for all patients.

		Observed										Estimate had there not been a pandemic		P value (Chi squared)	Pandemic (year 5) estimated verses observed difference	
		Pre-pandemic					Pandemic								Absolute	Relative
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 5	Year 5	Year 5	Year 5	Year 5					
Male	0-4 years	10	3%	28	5%	29	4%	16	2%	18	4%	23	3%	0.813	-5	-20%
	5-10 years	18	6%	22	4%	21	3%	23	4%	15	3%	22	3%		-7	-32%
	11-17 years	69	22%	139	24%	165	22%	169	26%	119	26%	167	24%		-48	-29%
	18-24 years	216	69%	398	68%	519	71%	433	68%	303	67%	476	69%		-173	-36%
Female	0-4 years	8	2%	19	2%	20	2%	23	2%	18	2%	22	2%	<0.001	-4	-16%
	5-10 years	12	3%	13	2%	11	1%	16	1%	16	2%	14	1%		3	19%
	11-17 years	141	32%	262	33%	381	32%	465	36%	482	49%	423	34%		59	14%
	18-24 years	282	64%	512	64%	781	65%	782	61%	473	48%	782	63%		-309	-39%

Table S19: Mental health presentations divided by sex and age group. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of presentations between the age subgroups separately for male and female comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated presentations assuming no pandemic with the observed ones in year 5. Information about sex not available for all patients.

		Observed										Estimate had there not been a pandemic	P value (Chi squared)	Pandemic (year 5) estimated verses observed difference		
		Pre-pandemic					Pandemic							Year 5	Absolute	Relative
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 1	Year 2	Year 3	Year 4	Year 5					
													0.57			
Male	0-4 years	2	1%	7	1%	5	1%	4	1%	6	1%	5	1%	2	33%	
	5-10 years	1	0%	4	1%	5	1%	7	1%	2	0%	6	1%	-4	-67%	
	11-17 years	37	12%	61	10%	83	11%	83	13%	58	13%	83	12%	-25	-30%	
	18-24 years	87	28%	174	30%	256	35%	203	32%	145	32%	230	33%	-85	-37%	
Female	0-4 years	3	1%	4	0%	5	0%	3	0%	2	0%	4	0%	-2	-50%	
	5-10 years	2	0%	3	0%	2	0%	5	0%	6	1%	4	0%	3	71%	
	11-17 years	73	16%	154	19%	244	20%	276	21%	264	27%	260	21%	4	2%	
	18-24 years	113	26%	263	33%	438	37%	409	32%	290	29%	424	34%	-134	-32%	

Table S20: Mental health admissions divided by sex and age group. The estimated year 5 values are calculated from an average of years 3 and 4 to reduce influence of long-term trends. Data are numbers (sub-column percentages). Year 1: 01/04/2016 to 31/03/2017 (365 days); Year 2: 01/04/2017 to 31/03/2018 (365 days); Year 3: 01/04/2018 to 31/03/2019 (365 days); Year 4: 01/04/2019 to 12/03/2020 (347 days); Year 5: 13/03/2020 to 26/02/2021(351). P value represents a Chi squared test assessing the difference in distribution of admissions between the age subgroups separately for male and female comparing the estimated and observed year 5 data. Absolute and relative differences compare the estimated admissions assuming no pandemic with the observed ones in year 5. Information about sex not available for all patients.

Diagnostic label	Presentations included
Respiratory infection	Acute epiglottitis, Bronchiolitis, Bronchopneumonia, COVID-19, Croup, Cystic fibrosis, Empyema, Influenza, Lobar pneumonia, Lower respiratory tract infection, Pertussis / whooping cough, Quinsy / peritonsillar abscess, Tonsillitis, Tuberculosis, Upper respiratory tract infection
Asthma / wheeze	Asthma, Respiratory conditions - bronchial asthma, Viral wheeze
GI infections	Dysentery, Food poisoning, Infectious gastroenteritis, Infectious gastroenteritis with bloody diarrhoea
Surgical presentations	Abscess: perianal or anal, Anal fissure, Anorectal bleeding, Appendicitis, Boil / abscess, Bowel obstruction, Complication of gastrostomy (PEG tube), Concretions, Diaphragmatic hernia, Epididymitis / orchitis / epidymo-orchitis, Foreign body: alimentary tract, Foreign body: penis, Foreign body: rectum, Foreskin problem anatomical: phimosis / paraphimosis, Foreskin problem infection: balanitis / balanoposthitis, Fractured penis, Gallstones with cholecystitis, Gastrointestinal conditions - acute abdominal pain, Gastrointestinal conditions – haemorrhage, Haemorrhoids, Hydrocele, Hydronephrosis, Incisional hernia, Indwelling urinary catheter: problem related to, Inguinal hernia, Intestinal malrotation, Intussusception, Ischaemic bowel, Lower gastrointestinal haemorrhage, Malignant tumour, Oesophageal perforation, Oesophageal stricture, Perforated / ruptured bowel, Pyloric stenosis, Rectal prolapse, Renal / ureteric colic due to stone, Sphincter of Oddi dysfunction, Stoma problem, Surgical procedure complication, Testicular torsion, Torsion of hydatid of Morgagni, Umbilical hernia, Undescended testis, Upper gastrointestinal hemorrhage, Urinary retention, Urological conditions (including cystitis), Volvulus
Mental health presentations	Adjustment disorder, Alcohol (ethanol) intoxication, Alcohol dependence syndrome, Alcohol withdrawal seizure, Alcohol withdrawal syndrome, Antidepressant overdose, Anxiety disorder, Benzodiazepine overdose, Bipolar affective disorder, Delirium (acute confusion), Dementia, Dependence on opioids, Dependence on sedatives or hypnotics, Depressive disorder, Dissociative (conversion) disorder, Eating disorder, Factitious disorder, NSAID overdose, Opiate overdose, Paracetamol overdose, Personality disorder, Pseudoseizure, Psychiatric conditions, Psychotic disorder, Recreational drug use, Schizophrenia, Somatisation disorder, Somatoform pain disorder
Accidental injuries/trauma	Closed fracture: ankle, Closed fracture: carpal bones, Closed fracture: cervical spine, Closed fracture: clavicle, Closed fracture: coccyx, Closed fracture: elbow joint, Closed fracture: facial bones / mandible, Closed fracture: femur (not NoF), Closed fracture: fibula (not ankle), Closed fracture: finger, Closed fracture: foot, Closed fracture: Galeazzi (frac rad: disloc ulna), Closed fracture: hand, Closed fracture: heel, Closed fracture: hip (NoF), Closed fracture: humerus, Closed fracture: knee, Closed fracture: lumbar spine, Closed fracture: Monteggia (frac ulna: disloc rad), Closed fracture: nose, Closed fracture: patella, Closed fracture: pelvis, Closed fracture: pubic rami, Closed fracture: radius, Closed fracture: radius AND ulna, Closed fracture: rib, Closed fracture: sacrum, Closed fracture: scaphoid, Closed fracture: scapula, Closed fracture: skull, Closed fracture: sternum, Closed fracture: thoracic spine, Closed fracture: thumb metacarpal, Closed fracture: thumb phalanx, Closed fracture: tibia (not ankle), Closed fracture: tibia AND fibula (not ankle), Closed fracture: toe, Closed fracture: ulna, Head injury – concussion, Head injury - other head injury, Minor traumatic brain injury (GCS more than 12): LOC less than 30s, Minor traumatic brain injury (GCS more than 12): LOC more than 30s, Minor traumatic brain injury (GCS more than 12): no LOC, Moderate traumatic brain injury (GCS less than 13), Severe traumatic brain injury (GCS less than 9), Sprain / ligament injury: ankle joint, Sprain / ligament injury: cervical spine, Sprain / ligament injury: elbow joint, Sprain / ligament injury: finger, Sprain / ligament injury: foot, Sprain / ligament injury: hand, Sprain / ligament injury: hip joint, Sprain / ligament injury: knee joint, Sprain / ligament injury: lumbar spine, Sprain / ligament injury: shoulder joint, Sprain / ligament injury: thoracic spine, Sprain / ligament injury: thumb, Sprain / ligament injury: toe, Sprain / ligament injury: wrist joint, Sprain/ligament injury
Burns/Scalds	Burn: buttock, Burn: elbow, Burn: eye, Burn: face, Burn: finger, Burn: foot, Burn: forearm, Burn: hand, Burn: head, Burn: knee, Burn: lower leg, Burn: neck, Burn: perineum, Burn: shoulder, Burn: thigh, Burn: thumb, Burn: toe, Burn: trunk, Burn: upper arm, Burns and scalds – chemical, Burns and scalds – electric, Burns and scalds – radiation, Burns and scalds – thermal
Allergies and anaphylaxis	Allergy (including anaphylaxis), Anaphylaxis, Other allergic reaction (see free text)

Table S21: Diagnostic labels included in each group presentation



Figure S1: Four weekly mental health presentations before and during the pandemic in the 11-17 and 18-24 year age groups for (a) males and (b) females. Presentations to emergency department by four week period for one year before and after the start of the pandemic (marked with grey line). A four week period chosen due to the small number in each of these subgroups. Minimal change in presentations with the pandemic in the 11-17 year female group compared to the other females and male groups.

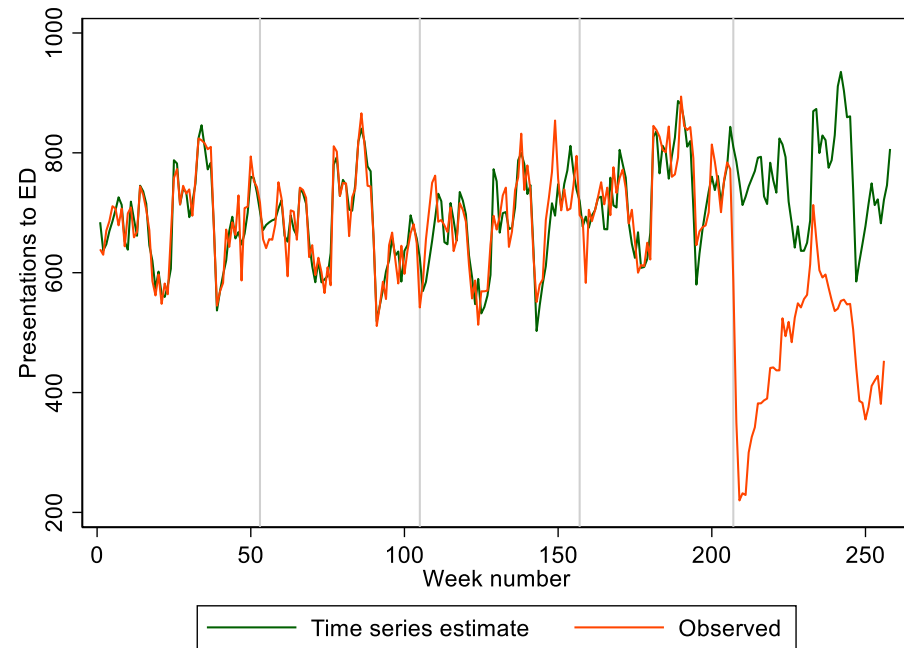
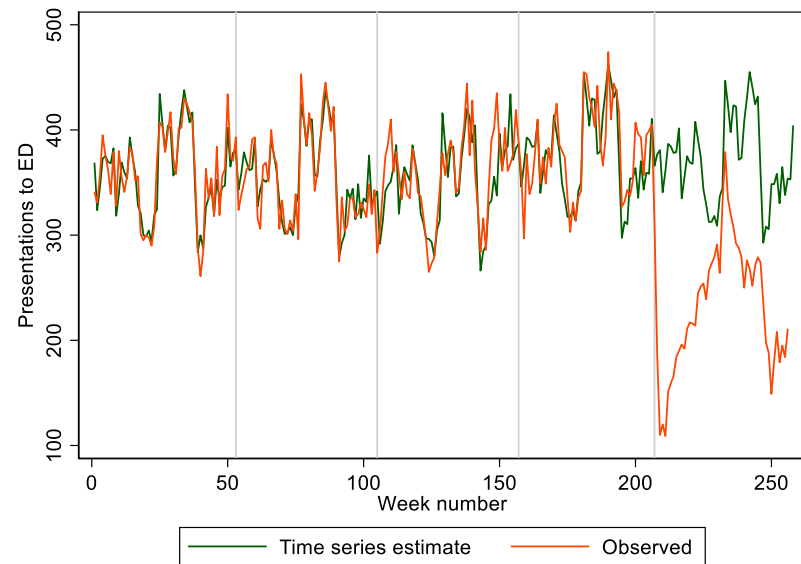


Figure S2. Weekly presentations for all. Figures represent time series and observed presentations. Seasonal Holt Winters time series approach was used with data from weeks 1 to 206 (years 1 to 4) were used to estimate the presentations in year 5 had the pandemic not occurred. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

(a) Males



(b) Females

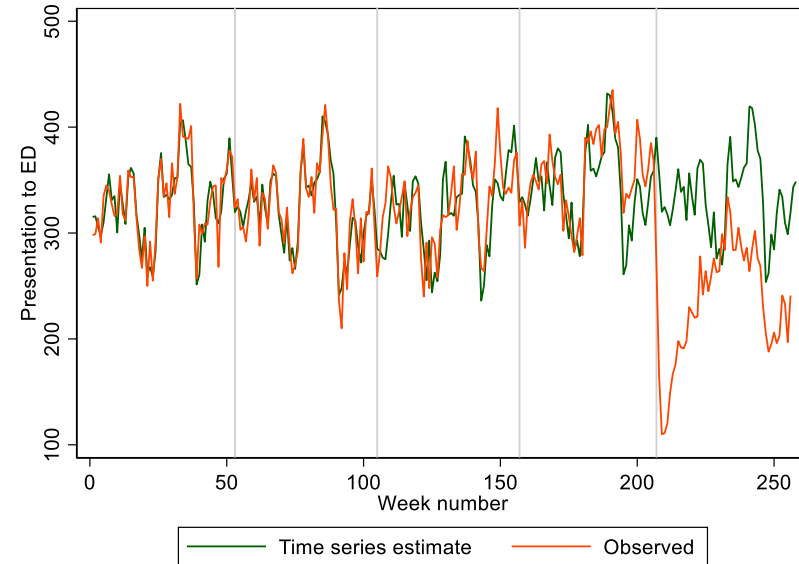


Figure S3. Weekly presentations for (a) males and (b) females. Figures represent time series and observed presentations by sex. Seasonal Holt Winters time series approach was used with data from weeks 1 to 206 (years 1 to 4) were used to estimate the presentations in year 5 had the pandemic not occurred. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 4: weeks 157 to 206; year 5: weeks 207 to 256.

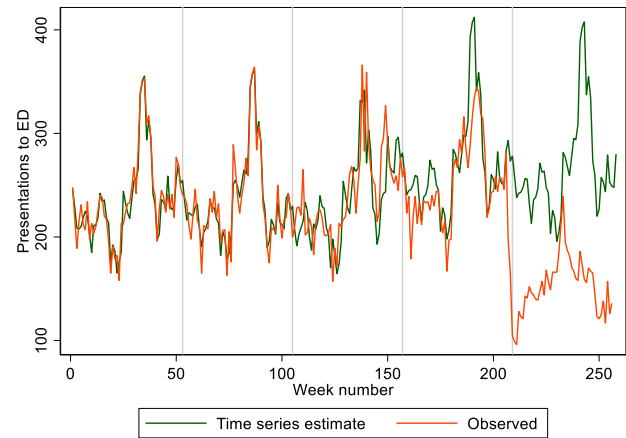
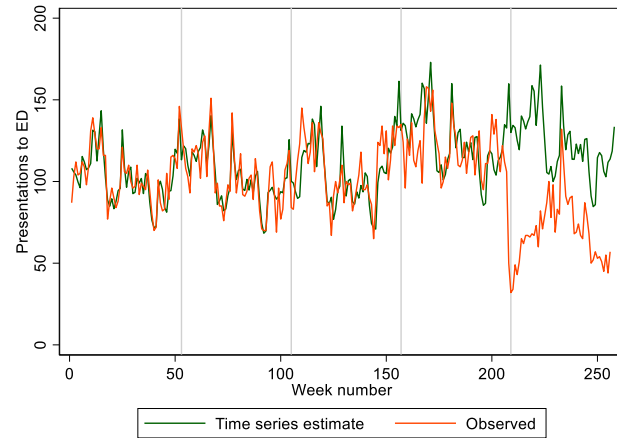
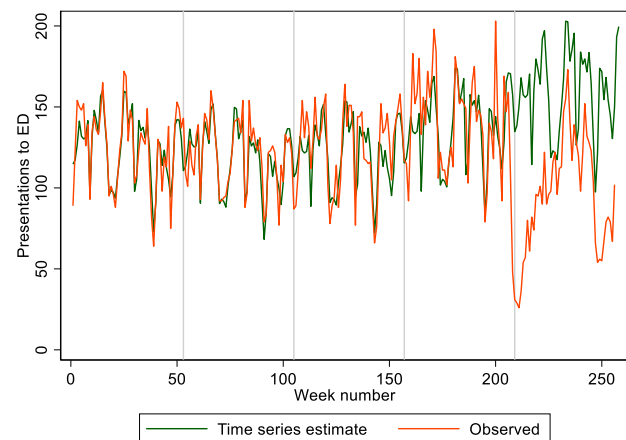
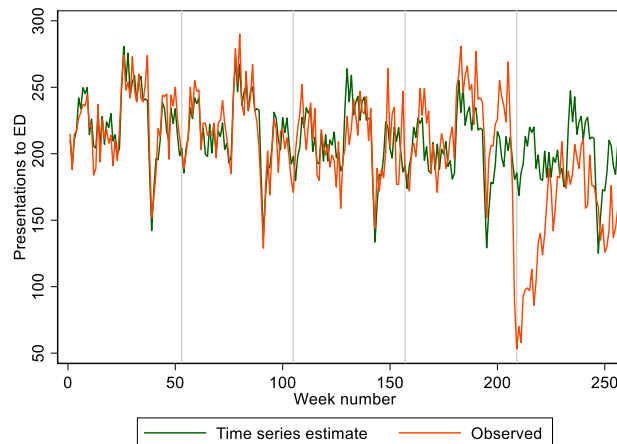
(a) 0-4 years**(b) 5-10 years****(c) 11-17 years****(d) 18-24 years**

Figure S4. Weekly presentations for (a) 0-4 years, (b) 5-10 years, (c) 11-17 years and (d) 18-24 years. Figures represent time series and observed presentations by sex. Seasonal Holt Winters time series approach was used with data from weeks 1 to 206 (years 1 to 4) were used to estimate the presentations in year 5 had the pandemic not occurred. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 4: weeks 157 to 206; year 5: weeks 207 to 256.

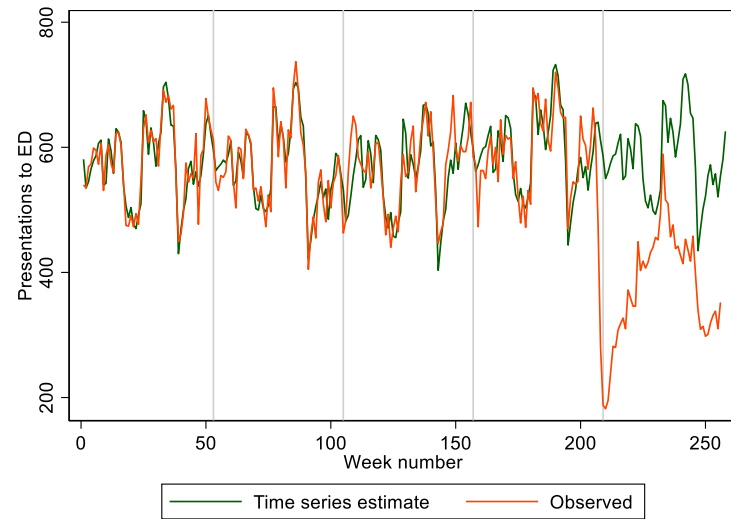
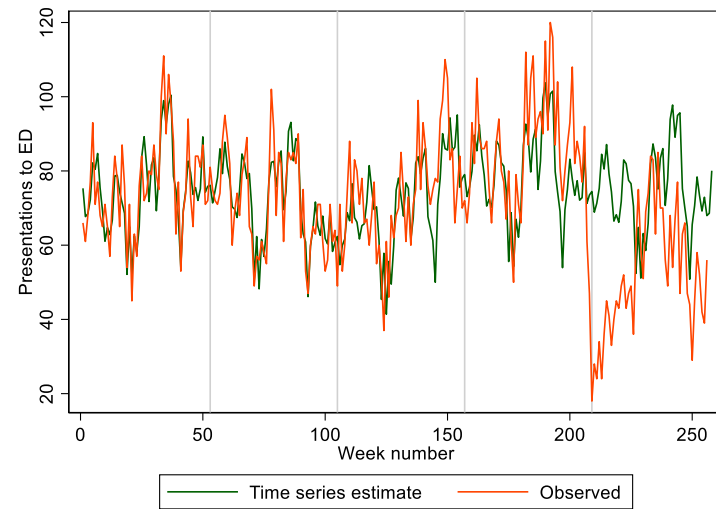
(a) White ethnicity**(b) Non-white ethnicity**

Figure S5. Weekly presentations and admissions by (a) white ethnicity and (b) non-white ethnicity. Figures represent time series and observed presentations by ethnicity. Seasonal Holt Winters time series approach was used with data from weeks 1 to 206 (years 1 to 4) being used to estimate the presentations and admissions in year 5 had the pandemic not occurred. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

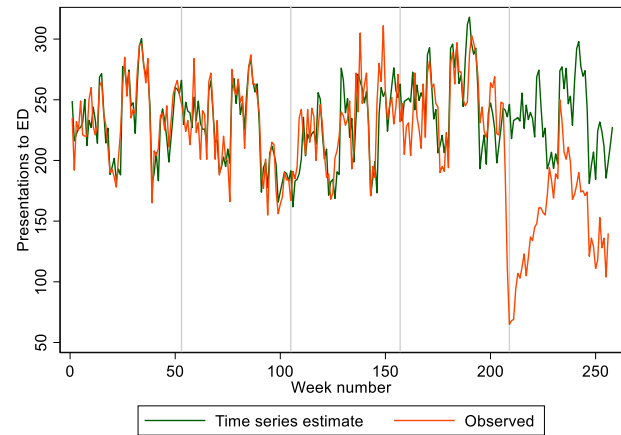
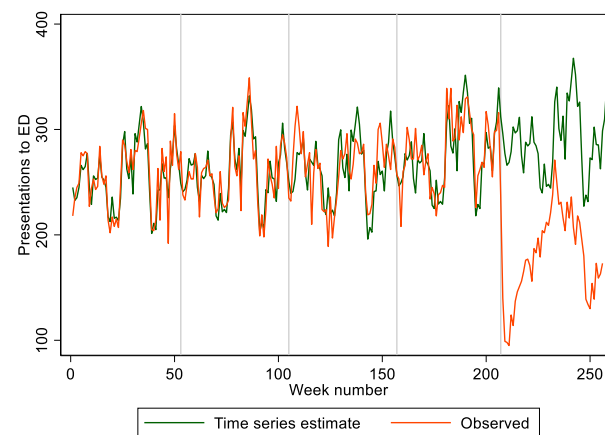
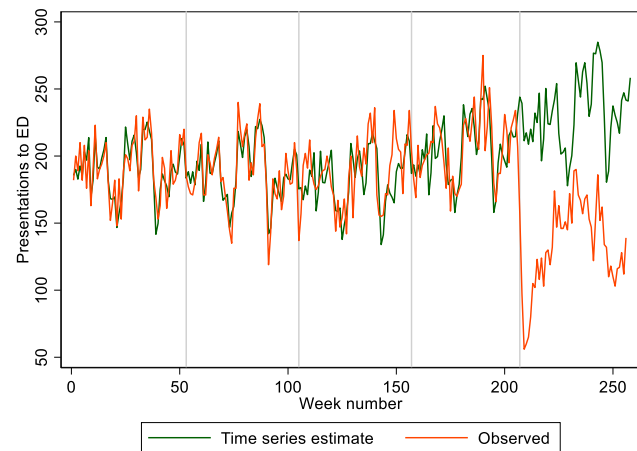
(a) High deprivation**(b) Moderate deprivation****(c) Low deprivation**

Figure S6. Weekly presentations by (a) high deprivation, (b) moderate deprivation and (c) low deprivation. Figures represent time series and observed presentations by deprivation. Seasonal Holt Winters time series approach was used with data from weeks 1 to 206 (years 1 to 4) being used to estimate the presentations in year 5 had the pandemic not occurred. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

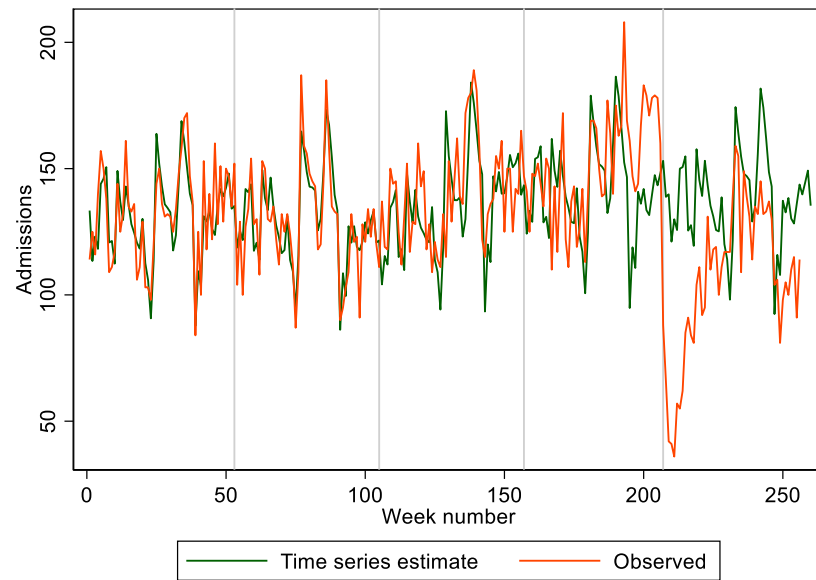
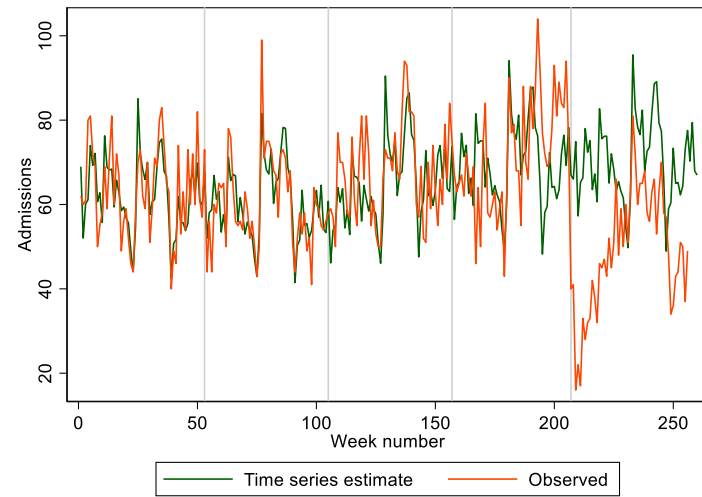


Figure S7. Weekly admissions for all. Figures represent time series and observed admissions. Seasonal Holt Winters time series approach was used with data from weeks 1 to 156 (years 1 to 3) were used to estimate the admissions in year 5 had the pandemic not occurred. Year 4 data was excluded given the untypical large number of admissions in that year. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

(a) Males



(b) Females

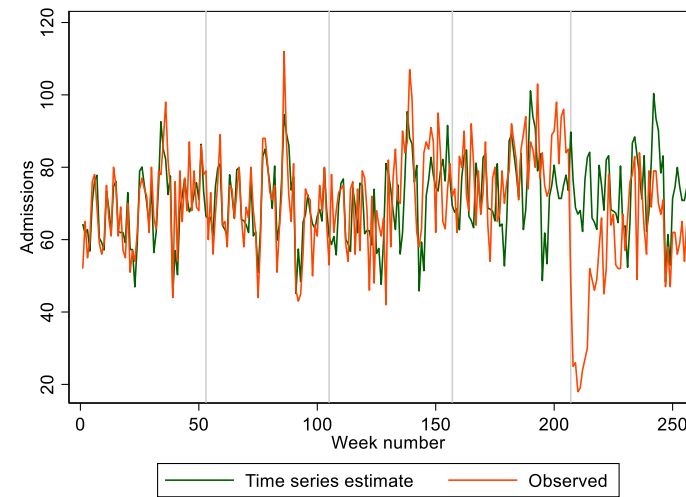


Figure S8. Weekly admissions for (a) males and (b) males. Figures represent time series and observed admissions by sex. Seasonal Holt Winters time series approach was used with data from weeks 1 to 156 (years 1 to 3) were used to estimate the admissions in year 5 had the pandemic not occurred. Year 4 data was excluded given the untypical large number of admissions in that year. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

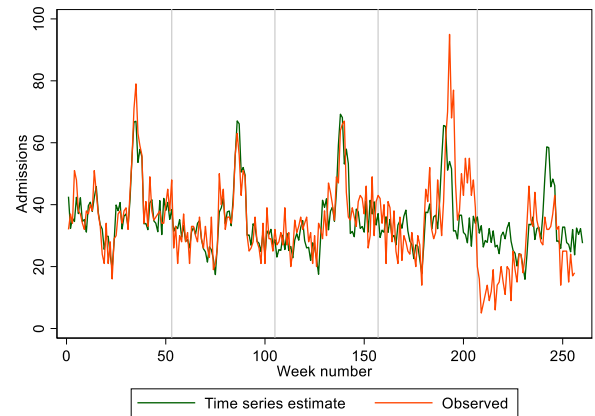
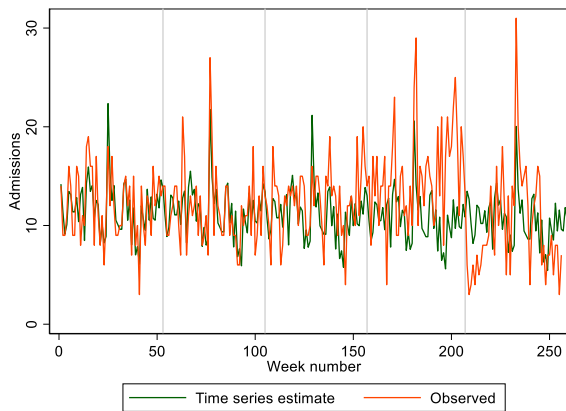
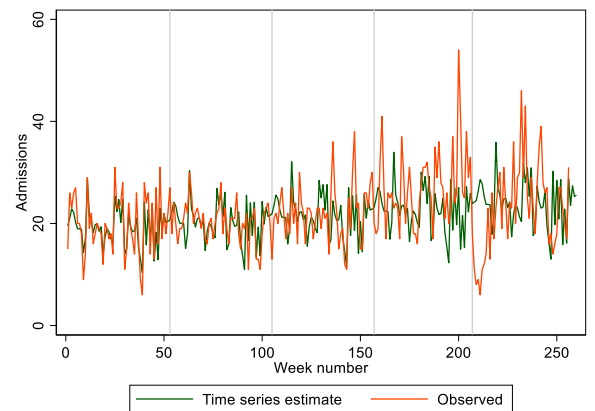
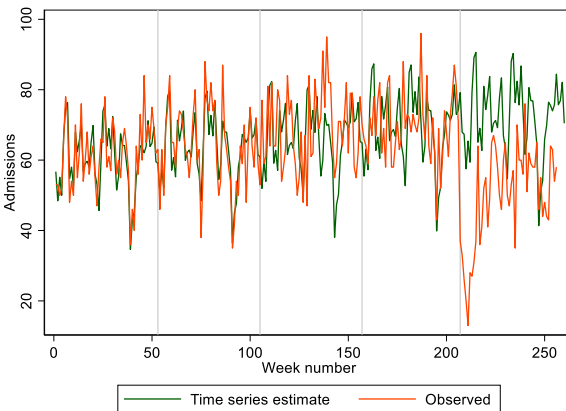
(a) 0-4 years**(b) 5-10 years****(c) 11-17 years****(d) 18-24 years**

Figure S9. Weekly admissions for (a) 0-4 years, (b) 5-10 years, (c) 11-17 years and (d) 18-24 years. Figures represent time series and observed admissions by age group. Seasonal Holt Winters time series approach was used with data from weeks 1 to 156 (years 1 to 3 [years 1 to 2 for 5 to 10 year age group]) to estimate admissions in year 5. Year 4 data was excluded given the untypical large number of admissions in that year. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 4: weeks 157 to 206; year 5: weeks 207 to 256.

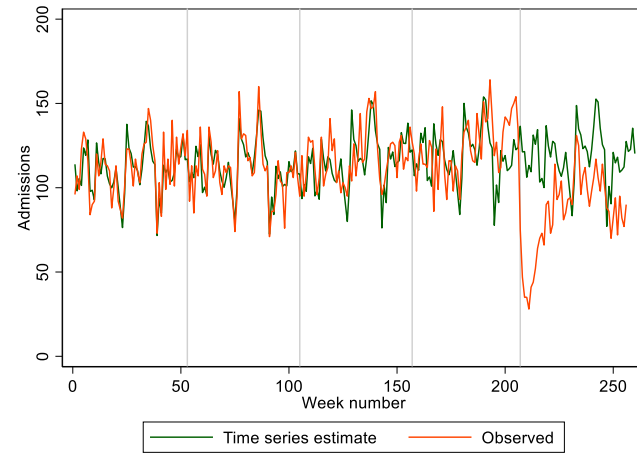
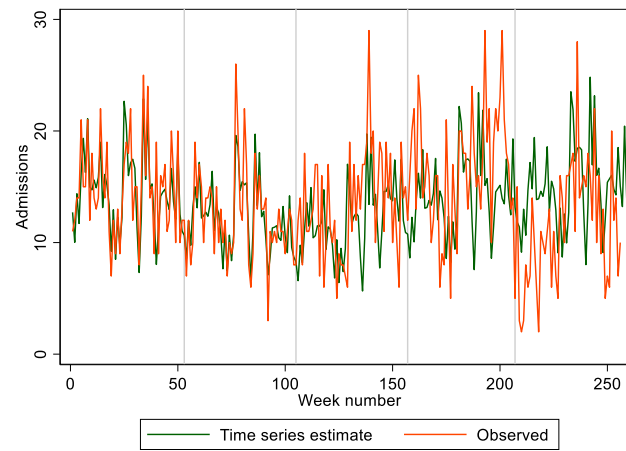
(a) White ethnicity**(b) Non-white ethnicity**

Figure S10. Weekly admissions by (a) white ethnicity and (b) non-white ethnicity. Figures represent time series and observed admissions by ethnicity. Seasonal Holt Winters time series approach was used with data from weeks 1 to 156 (years 1 to 3) to estimate admissions in year 5. Year 4 data was excluded given the untypical large number of admissions in that year. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

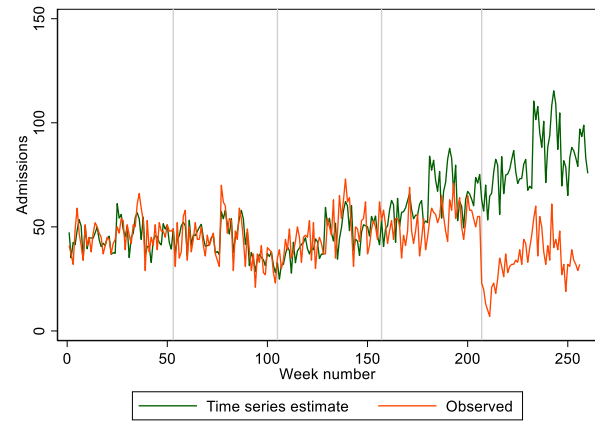
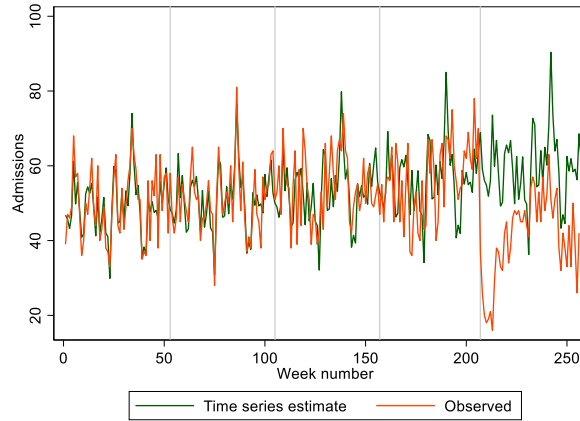
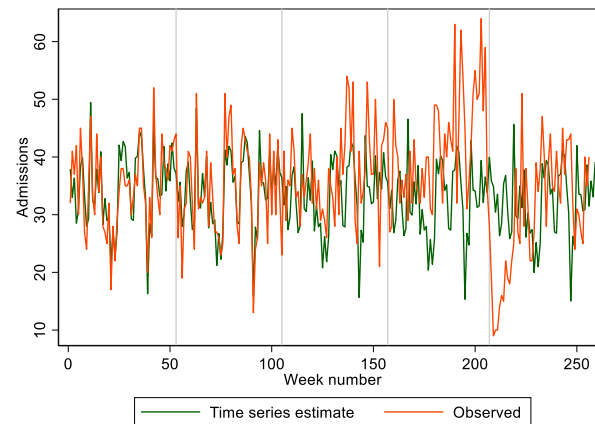
(a) High deprivation**(b) Moderate deprivation****(c) Low deprivation**

Figure S11. Weekly admissions by (a) high deprivation, (b) moderate deprivation and (c) low deprivation. Figures represent time series and observed admissions by deprivation. Seasonal Holt Winters time series approach was used with data from weeks 1 to 156 (years 1 to 3 [years 1 to 2 for low deprivation]) used to estimate admissions in year 5. Year 4 data was excluded given the untypical large number of admissions in that year. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

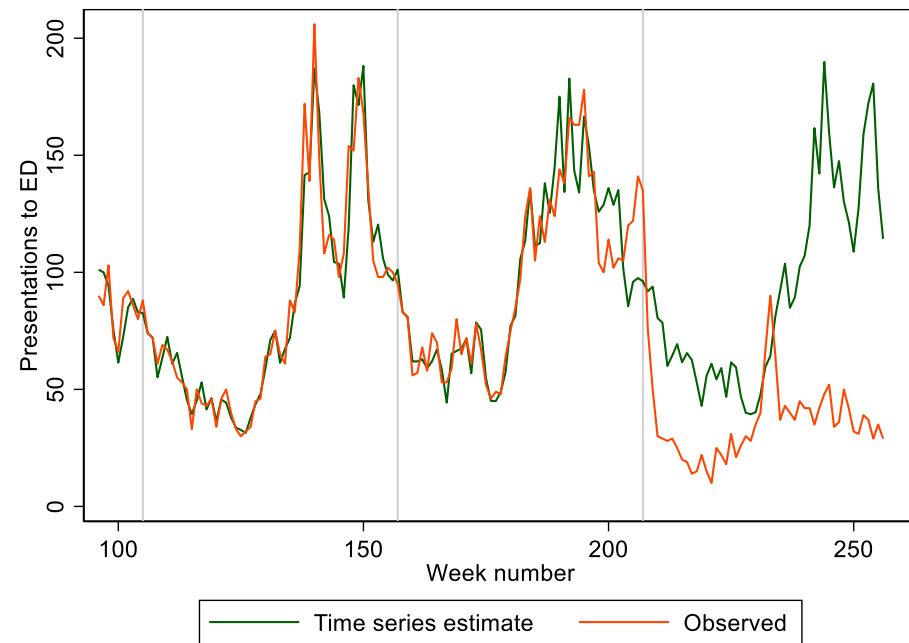


Figure S12. Weekly respiratory infection presentations. Figures represent time series and observed presentations. Seasonal Holt Winters time series approach was used with data from weeks 96 to 206 (years 1 to 4) were used to estimate the presentations in year 5 had the pandemic not occurred. Year 1 and 2 data untypical of other years. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

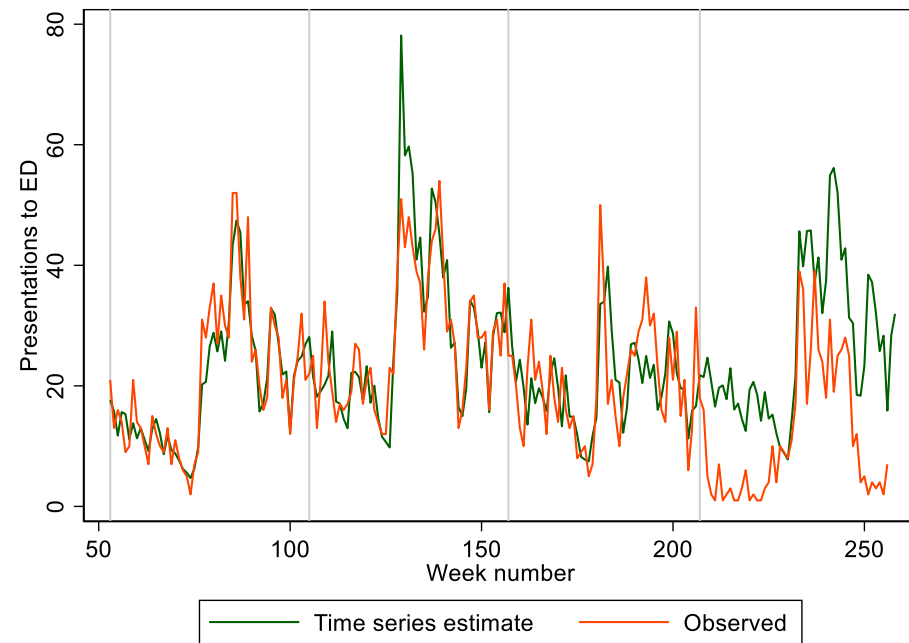


Figure S13. Weekly asthma and wheeze presentations. Figures represent time series and observed presentations. Seasonal Holt Winters time series approach was used with data from weeks 1 to 206 (years 2 to 4) were used to estimate the presentations in year 5 had the pandemic not occurred. Year 1 data was untypically low compare to years 2-4. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

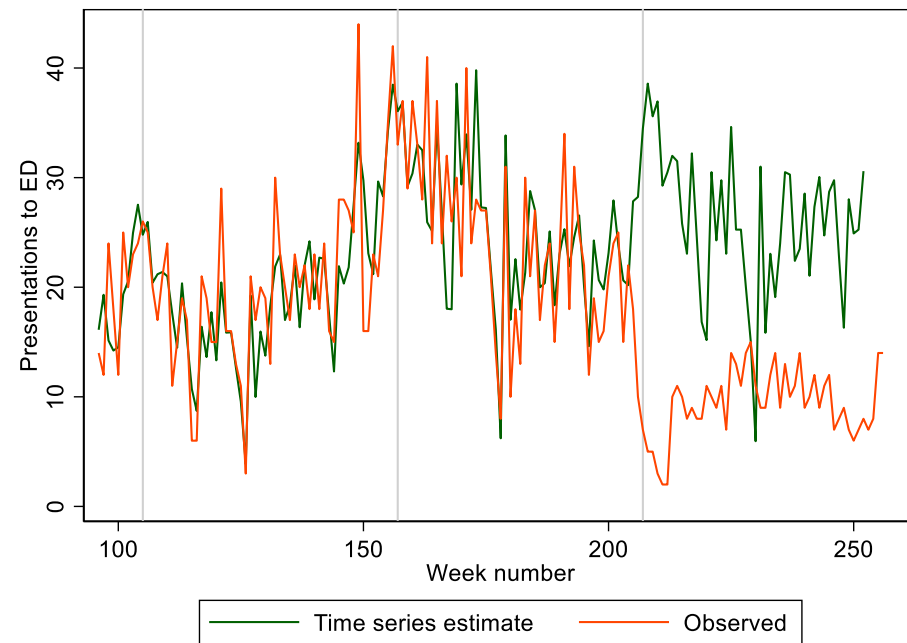


Figure S14. Weekly gastrointestinal infection presentations. Figures represent time series and observed presentations. Seasonal Holt Winters time series approach was used with data from weeks 96 to 206 (years 1 to 4) were used to estimate the presentations in year 5 had the pandemic not occurred. Year 1 and 2 data untypical of other years. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

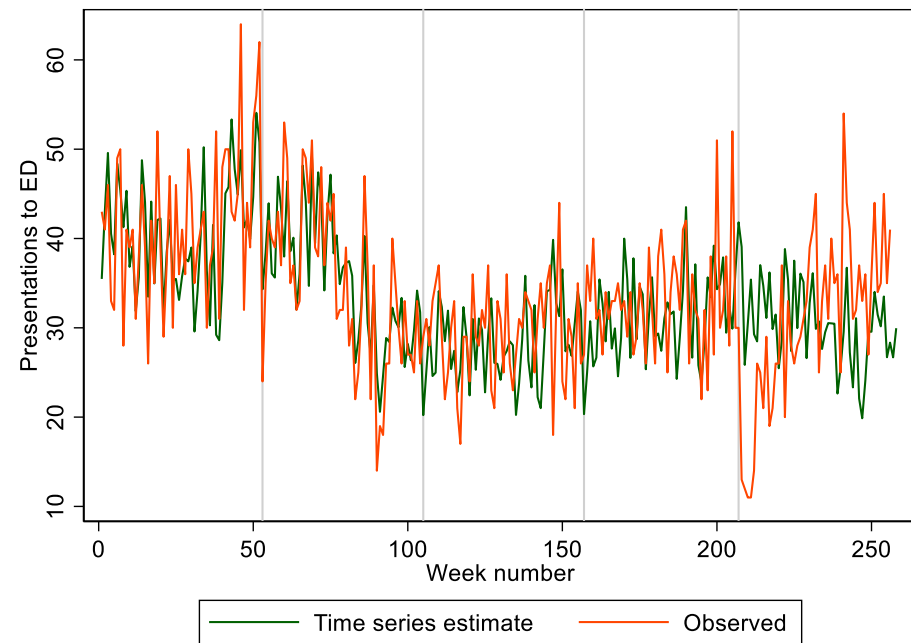


Figure S15. Weekly surgical presentations. Figures represent time series and observed presentations. Seasonal Holt Winters time series approach was used with data from weeks 1 to 206 (years 1 to 4) were used to estimate the presentations in year 5 had the pandemic not occurred. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

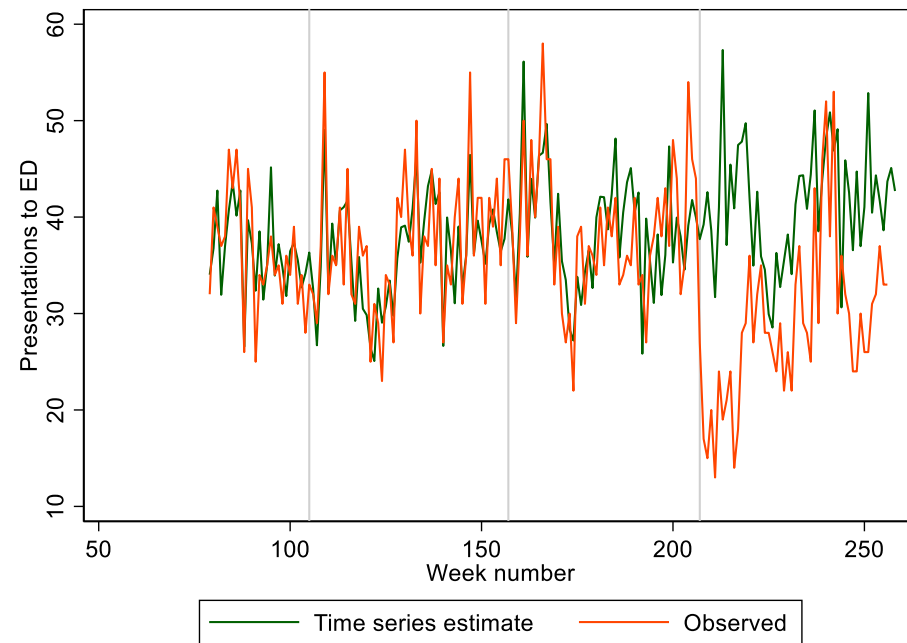


Figure S16. Weekly mental health presentations. Figures represent time series and observed presentations. Seasonal Holt Winters time series approach was used with data from weeks 80 to 206 (years 1 to 4) were used to estimate the presentations in year 5 had the pandemic not occurred. Year 1 data untypical of other years. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

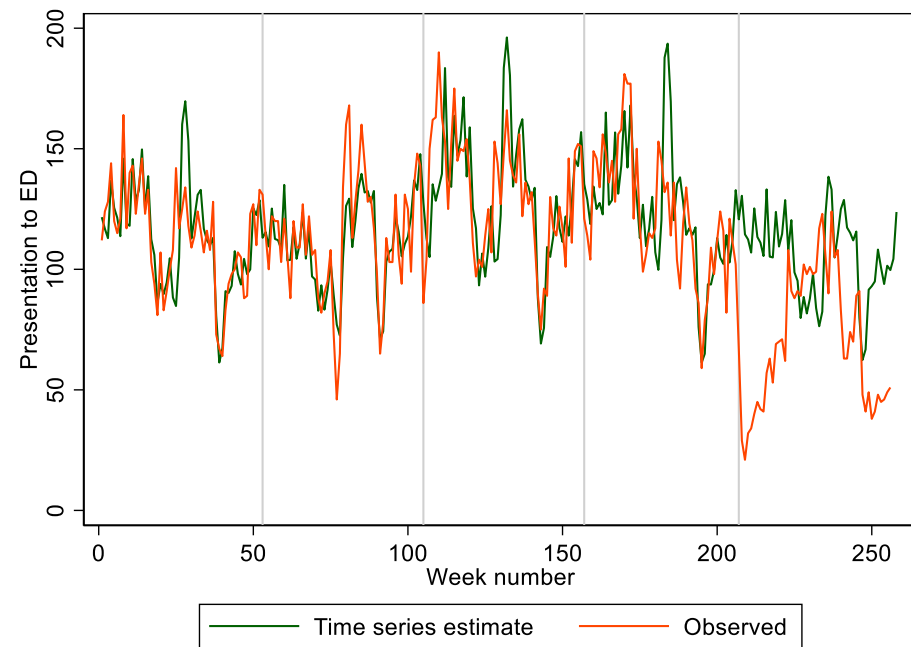


Figure S17. Weekly accidental injury and trauma presentations. Figures represent time series and observed presentations. Seasonal Holt Winters time series approach was used with data from weeks 1 to 206 (years 1 to 4) were used to estimate the presentations in year 5 had the pandemic not occurred. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

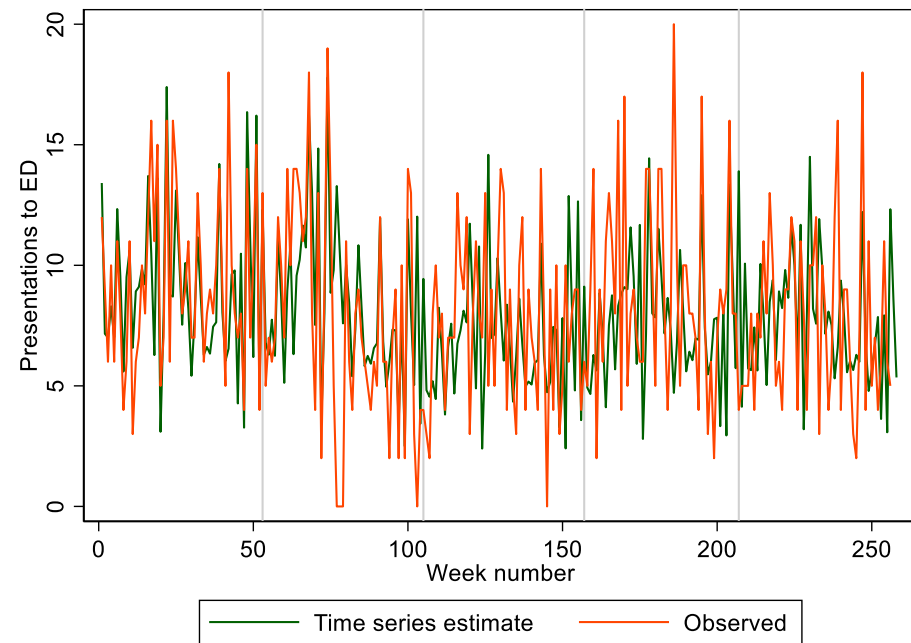


Figure S18. Weekly burn/scald presentations. Figures represent time series and observed presentations. Seasonal Holt Winters time series approach was used with data from weeks 1 to 206 (years 1 to 4) were used to estimate the presentations in year 5 had the pandemic not occurred. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

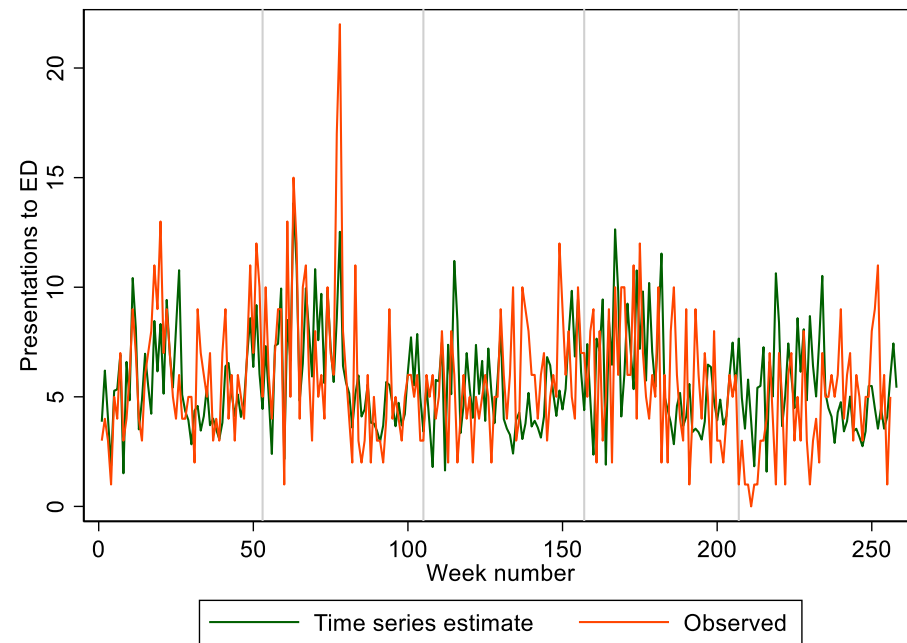


Figure S19. Weekly allergy presentations. Figures represent time series and observed presentations. Seasonal Holt Winters time series approach was used with data from weeks 1 to 206 (years 1 to 4) were used to estimate the presentations in year 5 had the pandemic not occurred. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

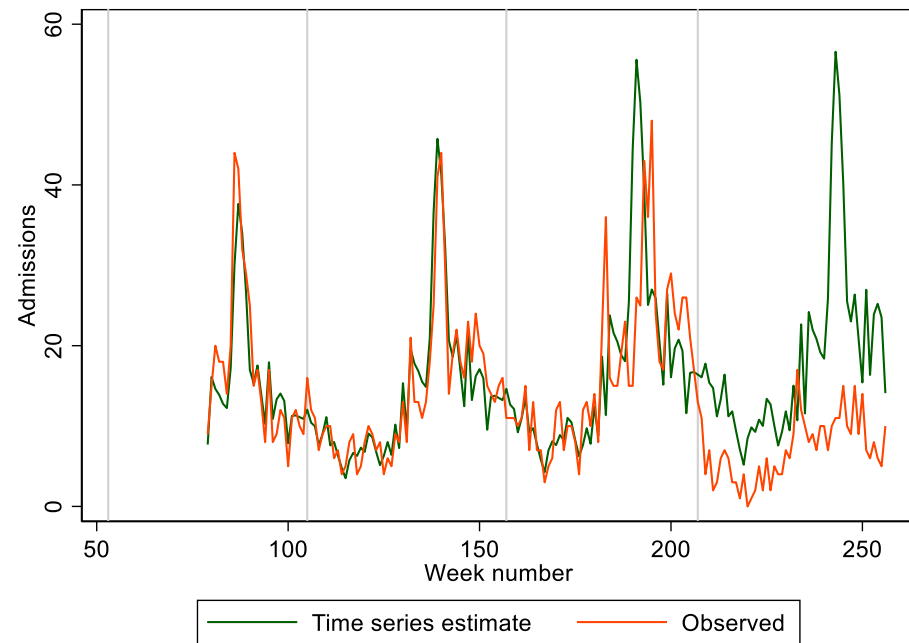


Figure S20. Weekly respiratory infection admissions. Figures represent time series and observed admissions. Seasonal Holt Winters time series approach was used with data from weeks 80 to 206 (years 2 to 4) were used to estimate the admissions in year 5 had the pandemic not occurred. Year 1 data was untypical compared years 2-4. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

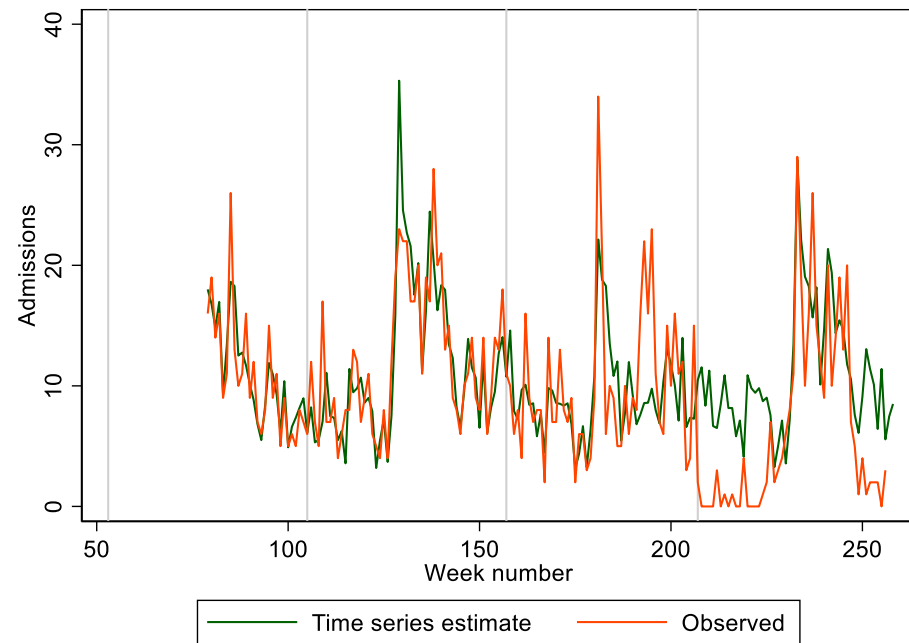


Figure S21. Weekly asthma and wheeze admissions. Figures represent time series and observed admissions. Seasonal Holt Winters time series approach was used with data from weeks 80 to 206 (years 2 to 4) were used to estimate the admissions in year 5 had the pandemic not occurred. Year 1 data was untypical compared years 2-4. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

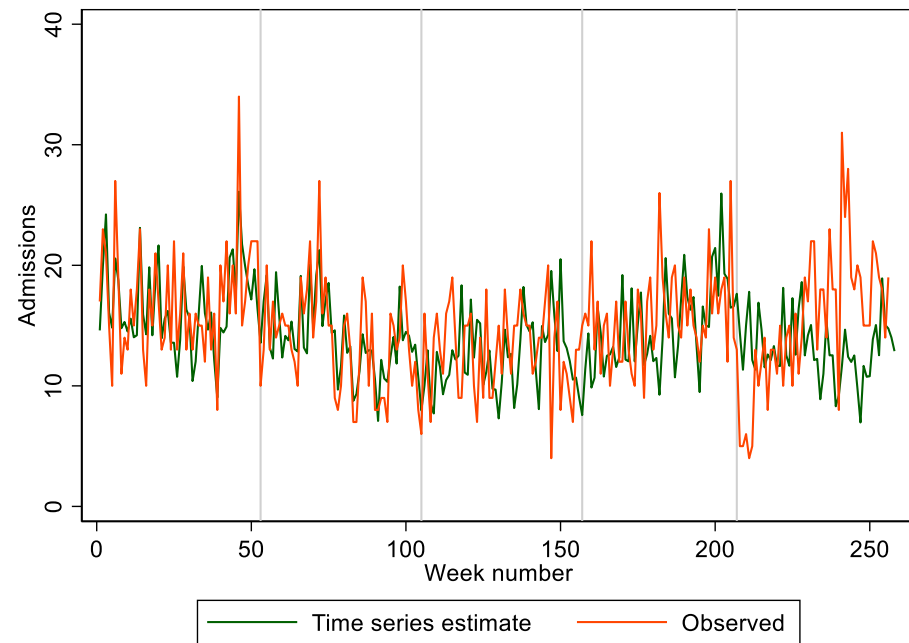


Figure S22. Weekly surgical admissions. Figures represent time series and observed admissions. Seasonal Holt Winters time series approach was used with data from weeks 1 to 206 (years 1 to 4) were used to estimate the admissions in year 5 had the pandemic not occurred. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

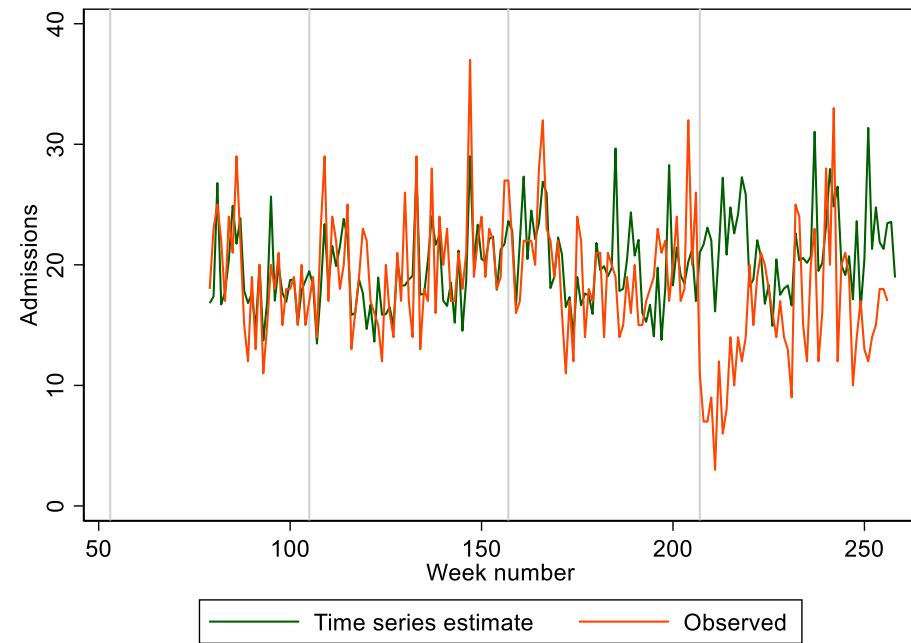


Figure S23. Weekly mental health admissions. Figures represent time series and observed admissions. Seasonal Holt Winters time series approach was used with data from weeks 80 to 206 (years 2 to 4) were used to estimate the admissions in year 5 had the pandemic not occurred. Year 1 data was untypical compared years 2-4. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

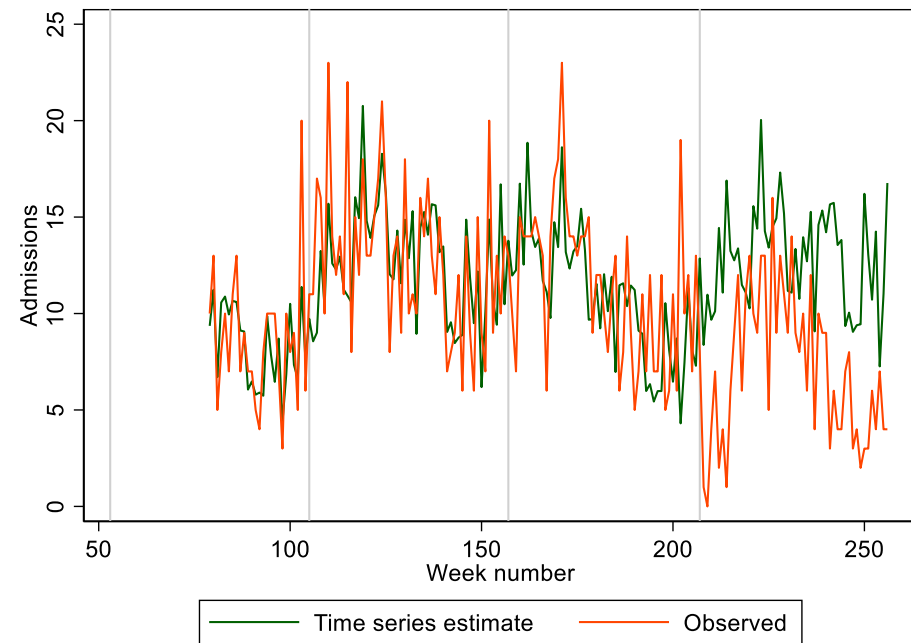


Figure S24. Accidental injury and trauma admissions. Figures represent time series and observed admissions. Seasonal Holt Winters time series approach was used with data from weeks 80 to 206 (years 2 to 4) were used to estimate the admissions in year 5 had the pandemic not occurred. Year 1 data was untypical compared years 2-4. Year 1: weeks 1 to 52; year 2: weeks 53 to 104; year 3: weeks 105 to 156; year 3: weeks 157 to 206; year 4: weeks 207 to 256.

1 References

- 2 1) Organisation, W. H. (2017, 03/02/2017). "Determinants of health." Retrieved 01/06/2021,
3 2021, from <https://www.who.int/news-room/q-a-detail/determinants-of-health>, last
4 accessed 16th October 2021
- 5 2) Wohlgemut JM, Morrison JJ, Apodaca AN, Egan G, Sponseller PD, Driver CP, et al.
6 Demographic and geographical characteristics of pediatric trauma in Scotland. *J Pediatr Surg.*
7 2013;48(7):1593-7
- 8 3) Crede SH, Mason S, Such E, Jacques RM. Paediatric emergency department utilisation rates
9 and maternal migration status in the Born in Bradford cohort: A cross-sectional study. *PLoS*
10 *Med.* 2020;17(3):e1003043.
- 11 4) Griffin E, McMahon E, McNicholas F, Corcoran P, Perry IJ, Arensman E. Increasing rates of
12 self-harm among children, adolescents and young adults: a 10-year national registry study
13 2007-2016. *Soc Psychiatry Psychiatr Epidemiol.* 2018;53(7):663-71
- 14 5) Office of National Statistics. English indices of deprivation 2019: GOV.UK; 2019 [updated
15 26/09/2019. Available from: [https://www.gov.uk/government/statistics/english-indices-of-](https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019)
16 [deprivation-2019](https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019), last accessed 16th October 2021
- 17 6) Stata.com. tssmooth shwinters - Holt-Winters seasonal smoothing 2019 [Available from:
18 <https://www.stata.com/manuals13/tstssmoothshwinters.pdf>, last accessed 16th October
19 2021
- 20 7) Ewusie JE, Soobiah C, Blondal E, Beyene J, Thabane L, Hamid JS. Methods, Applications and
21 Challenges in the Analysis of Interrupted Time Series Data: A Scoping Review. *J Multidiscip*
22 *Healthc.* 2020;13:411-23

23