

Impact of COVID-19 on hospital admissions for acute coronary syndromes (updated analyses including admissions up to 13 September 2020)

Introduction

Researchers in the Nuffield Department of Population Health and the Radcliffe Department of Medicine, working with NHS Digital and a team of experts from other UK universities, analysed the number of admissions to hospitals in England for acute coronary syndrome (ACS) during the COVID-19 pandemic.

Results based on data collected by NHS Digital from NHS Hospital Trusts in England up to 24 May 2020 were published in *The Lancet* on 14 July 2020.¹ Updated monthly analyses (**Figures 1-7**) are published here.

Updated Methods

The study methods are described in the main publication and supplementary appendix, including the adjustment that was made for incomplete clinical coding.¹ For the analyses reported here, an additional adjustment is made to the estimated number of ACS admissions (for the 4 most recent weeks of data only) to account for delays in the reporting of admissions by NHS hospitals. This was done by estimating the *additional* number of ACS admissions that tend to be identified when a subsequent monthly data extract becomes available, as described below.

For each of the July, August, September and October data extracts, we first calculated the percentage increase in the number of reported ACS admissions seen in that data extract compared with the previous month's extract, for the last 4 weeks reported in the previous month's extract (**Table 1**). For example, for the week commencing 15th June 2020 (which was week '-1' for the July data extract), the number of reported ACS admissions was 2694 in the July data extract but 2891 by the time of the August data extract. Therefore, the 'August vs July' inflation factor for week -1 was 7.3% (since $2891/2694=1.073$). By estimating each of these statistics four times (ie, July vs June, August vs July, September vs August and October vs September), and taking the average of the four values, we were able to calculate *average* inflation factors for each of weeks -1 through -4, which were then used to adjust the reported number of ACS admissions for the four most recent weeks of data.

Table 1: Proportional increase in weekly ACS admissions observed with subsequent data extract

Week number (relative to earlier data extract)	July vs. June	August vs. July	September vs. August	October vs. September	Average % of four estimates
-1	9.2%	7.3%	6.4%	4.2%	6.8%
-2	4.9%	2.7%	3.2%	1.1%	3.0%
-3	2.8%	1.3%	2.3%	1.3%	1.9%
-4	1.7%	1.2%	0.6%	0.2%	0.9%

The current updated analysis includes admissions for ACS from all 147 acute hospital NHS trusts in England from 1 January 2019 to 13 September 2020. To investigate the effect of season on expected ACS admissions, weekly ACS admissions during 2019 are also shown (Figure 2).

Updated figures

Figure 1: Weekly numbers of admissions with an acute coronary syndrome, by type

Figure 2: Weekly numbers of admissions to acute NHS hospital trusts for acute coronary syndrome between January and July in 2019 and 2020

Figure 3: Weekly numbers of admissions with an acute coronary syndrome that received a particular coronary procedure

Figure 4: (a) Weekly numbers and (b) weekly proportions of admissions to acute NHS hospital trusts with an acute coronary syndrome that received percutaneous coronary intervention on day of admission

Figure 5: (a) Weekly numbers and (b) weekly proportions of admissions to acute NHS hospital trusts with an acute coronary syndrome that received any percutaneous coronary intervention

Figure 6: Weekly median and interquartile range of length of stay for admissions to acute NHS hospital trusts with an acute coronary syndrome, by type

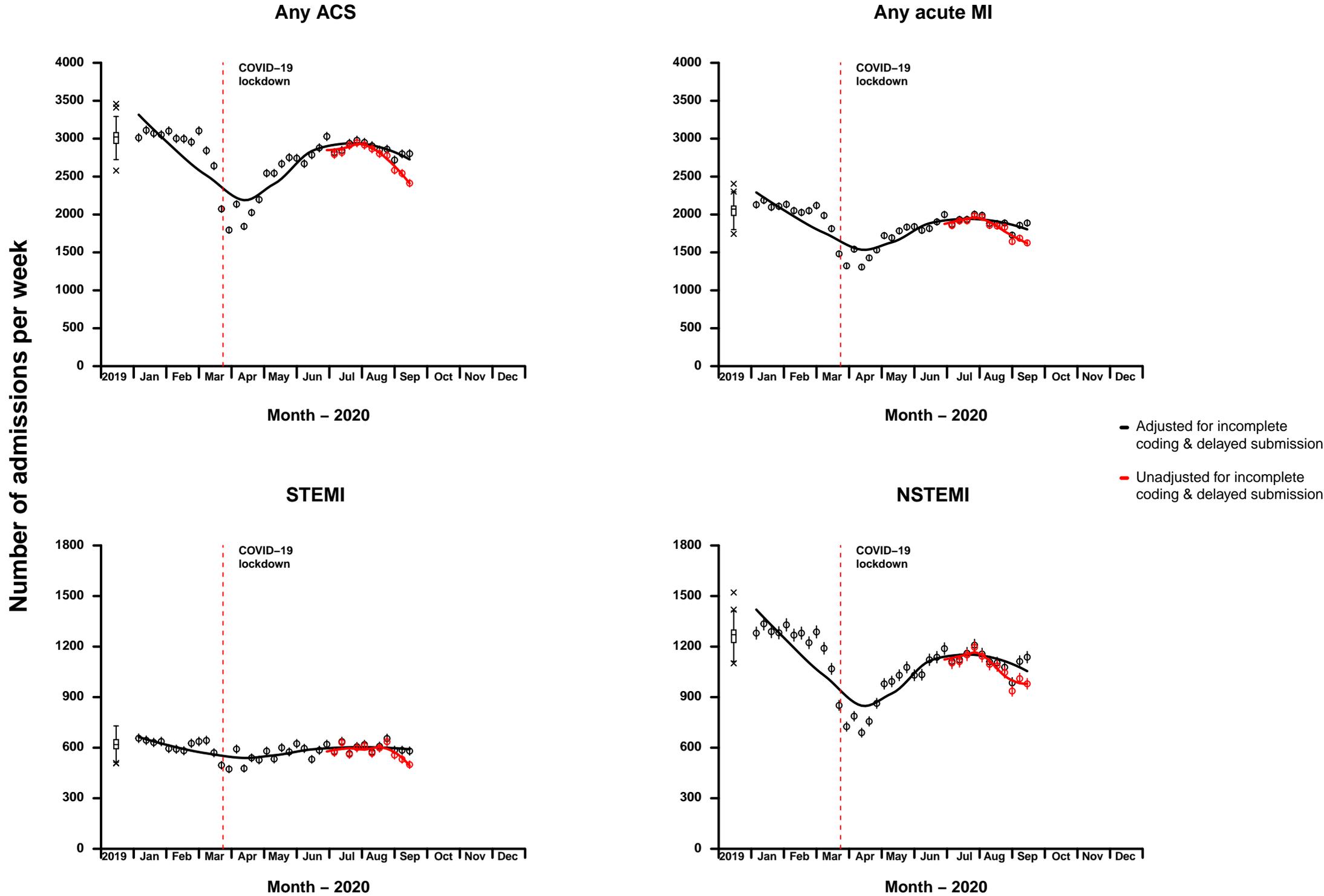
Figure 7: Weekly number of admissions to acute NHS hospital trusts with an acute coronary syndrome, by age, sex, Charlson index, ethnicity and region

Summary

As described in the main publication, weekly admissions for ACS fell between the middle of February and the end of March 2020, with larger reductions in non-ST-elevation myocardial infarction (NSTEMI) than ST-elevation myocardial infarction (STEMI) admissions. After accounting for incomplete coding and delayed reporting by NHS hospitals (see supplementary methods provided online with the main publication and additional adjustment described above) weekly ACS admissions had approximately returned to the 2019 weekly average by August 2020 (Figure 1). Although these updated analyses suggest that weekly ACS admissions in early September 2020 may be slightly lower than those seen in equivalent weeks during 2019 (Figure 2), uncertainties around the completeness of the most recent data make this difficult to interpret. The adjusted weekly number of admissions for 2019 and 2020 are provided in Table 2. Updated analyses will be made available at <https://www.ctsu.ox.ac.uk/research/covid-19-acute-coronary-syndromes>.

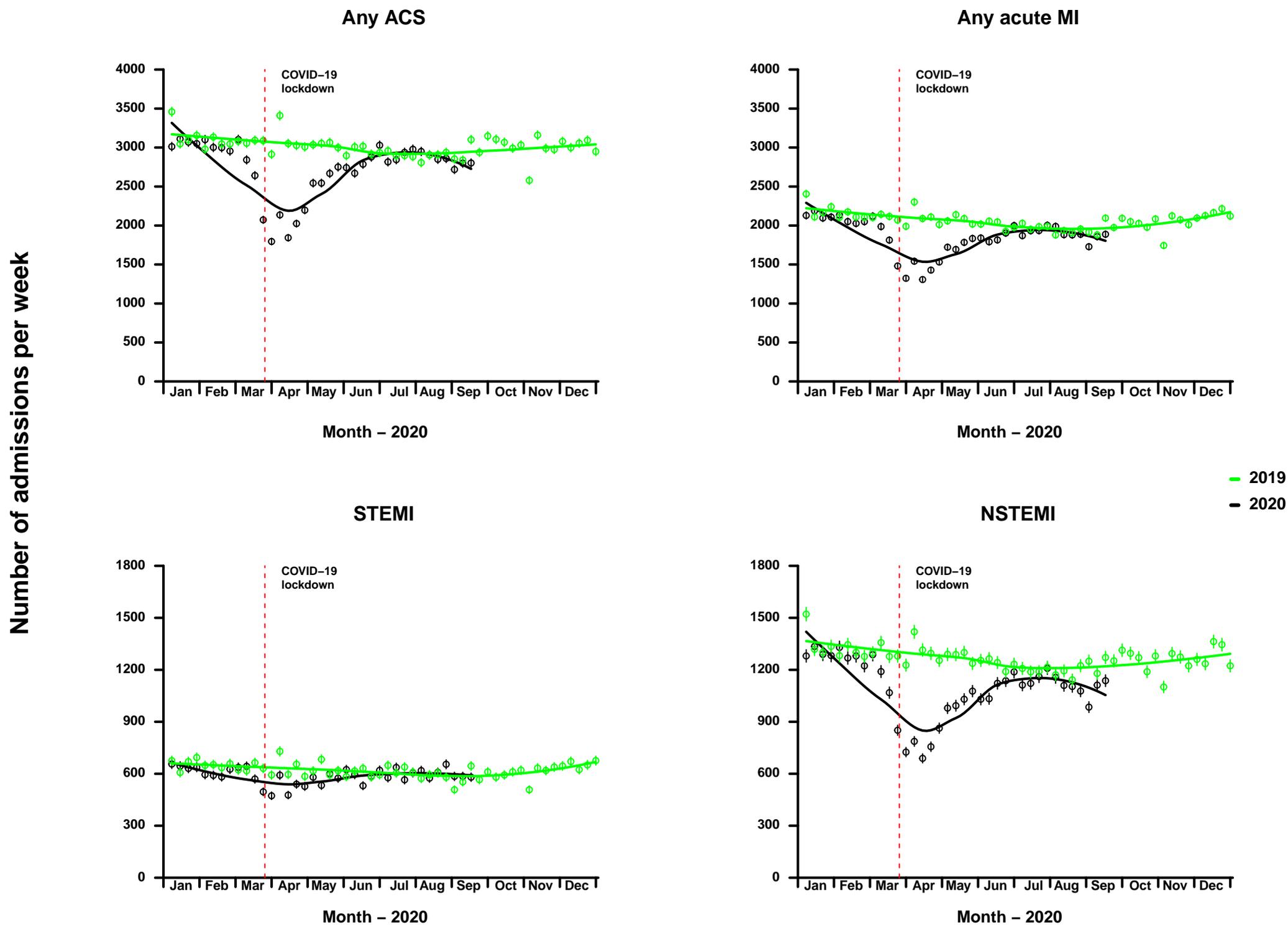
¹ Mafham MM, Spata E, Goldacre R, Gair D, Curnow P, Bray M, Hollings S, Roebuck C, Gale CP, Mamas MA, Deanfield JE, de Belder MA, Luescher TF, Denwood T, Landray MJ, Emberson JR, Collins R, Morris EJA, Casadei B, Baigent C. COVID-19 pandemic and admission rates for and management of acute coronary syndromes in England. *Lancet*. 2020 Aug 8;396(10248):381-389.

Figure 1: Weekly numbers of admissions to acute NHS hospital trusts with an acute coronary syndrome, by type



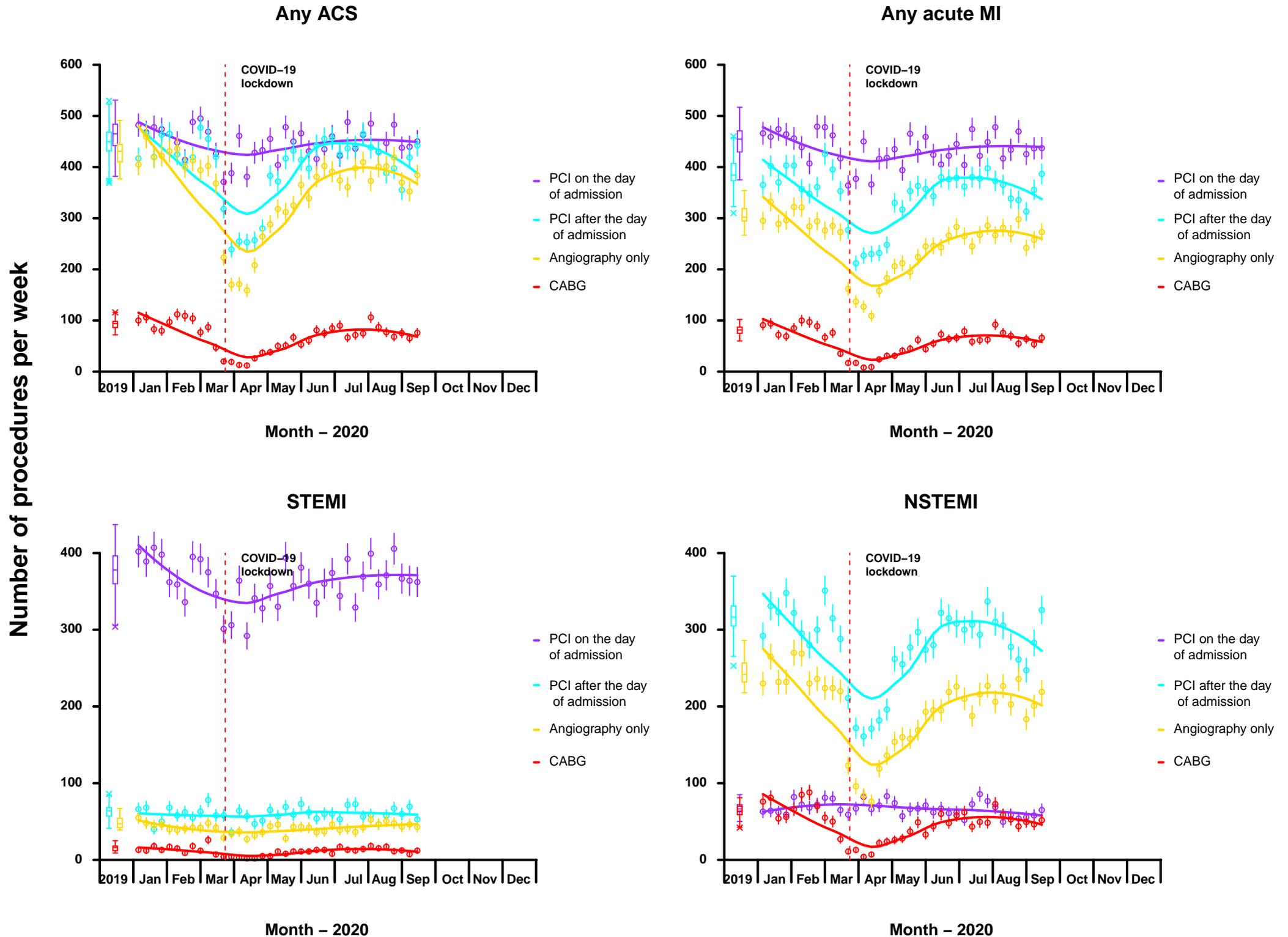
For weekly admissions in 2019, boxplots shows the median and IQR, with whiskers extending (up to) 1.5 times the IQR above the upper quartile and below the lower quartile, with any weekly counts beyond those ranges indicated by x. For 2020, a LOESS smoothing spline is fitted through the weekly reported counts, with datapoints and SEs plotted. The date of the UK COVID-19 lockdown (March 23, 2020) is shown with a vertical dotted line. ACS=acute coronary syndrome. STEMI=ST-elevation myocardial infarction. NSTEMI=non-ST-elevation myocardial infarction. LOESS=locally estimated scatterplot smoothing.

Figure 2: Weekly numbers of admissions to acute NHS hospital trusts with an acute coronary syndrome, by type



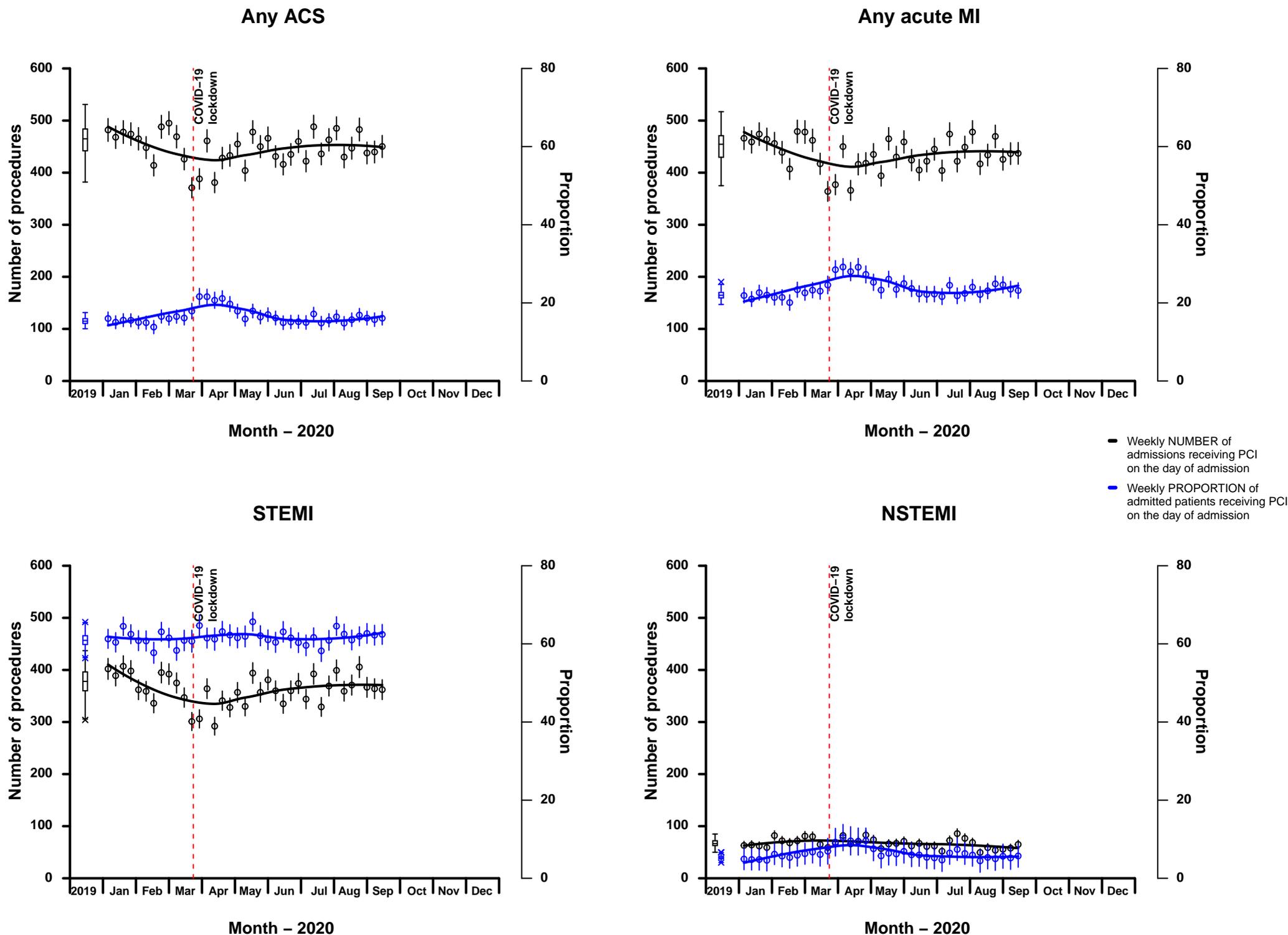
For both 2019 and 2020, a LOESS smoothing spline is fitted through the weekly reported counts, with datapoints and SEs plotted. The date of the UK COVID-19 lockdown (March 23, 2020) is shown with a vertical dotted line. ACS=acute coronary syndrome. STEMI=ST-elevation myocardial infarction. NSTEMI=non-ST-elevation myocardial infarction. LOESS=locally estimated scatterplot smoothing.

Figure 3: Weekly admissions to acute NHS hospital trusts with an acute coronary syndrome that received a particular coronary procedure



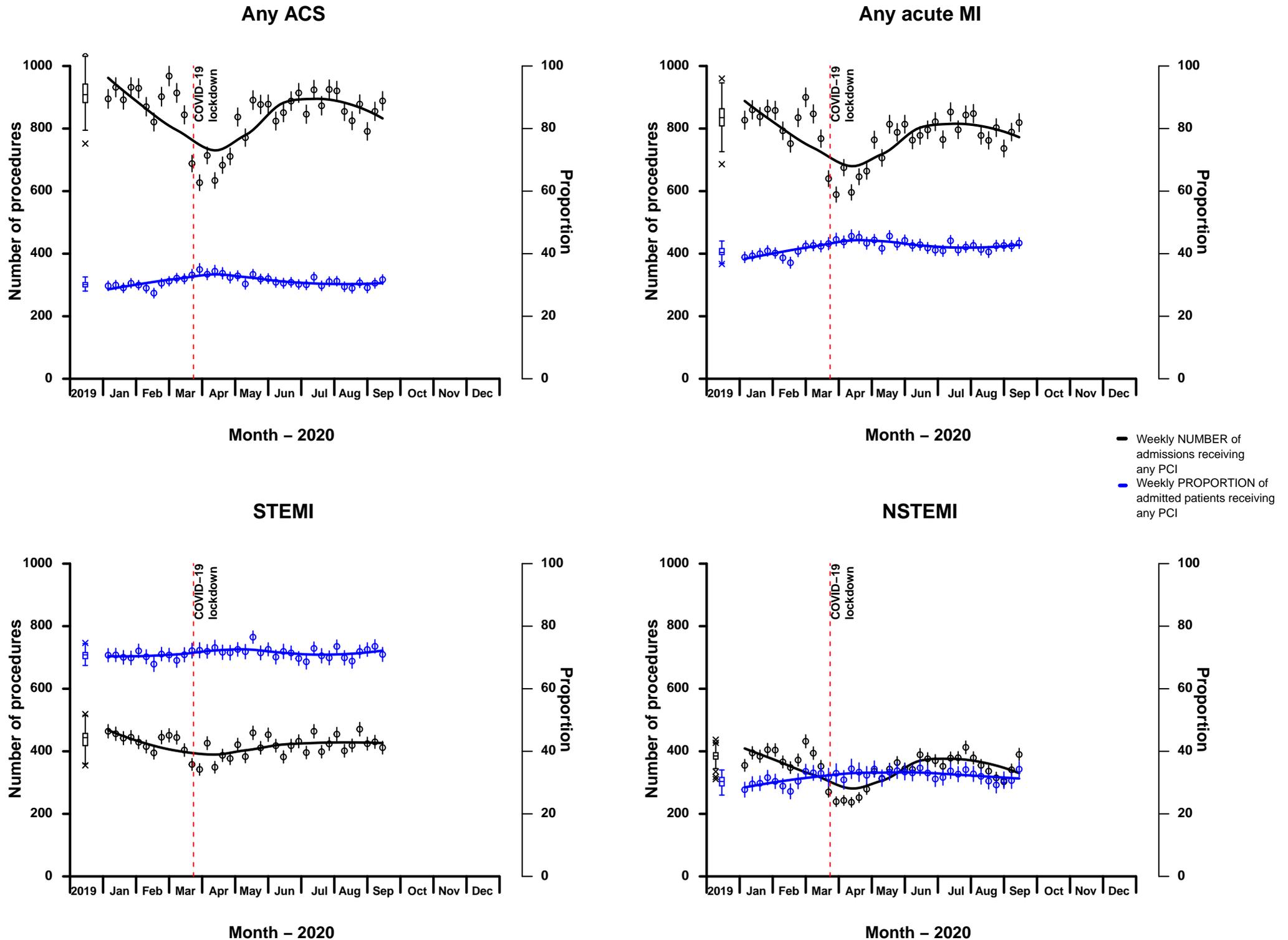
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Figure 4: (a) Weekly numbers and (b) weekly proportions of admissions to acute NHS hospital trusts with an acute coronary syndrome that received percutaneous coronary intervention on day of admission



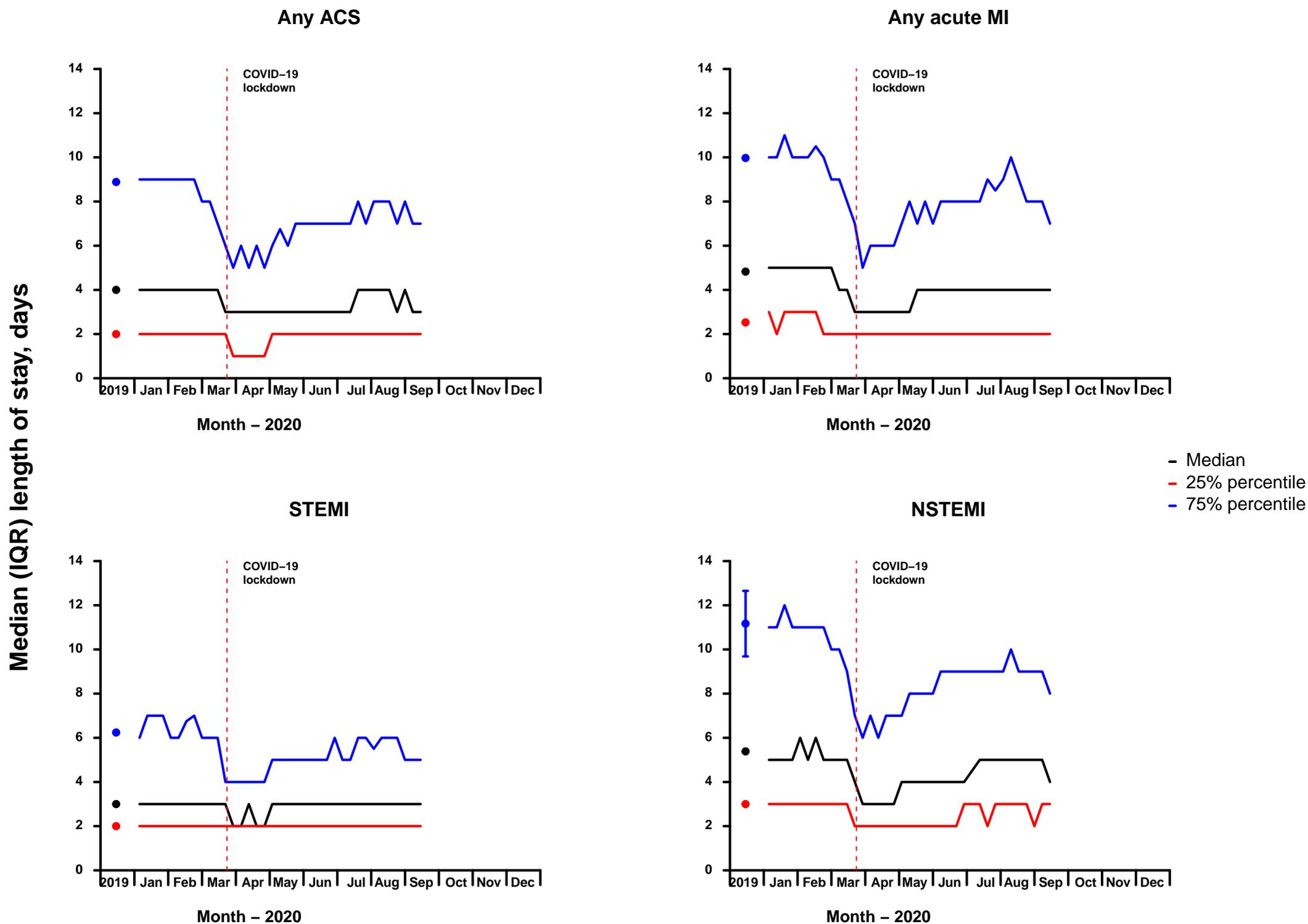
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Figure 5: (a) Weekly numbers and (b) weekly proportions of admissions to acute NHS hospital trusts with an acute coronary syndrome that received any percutaneous coronary intervention



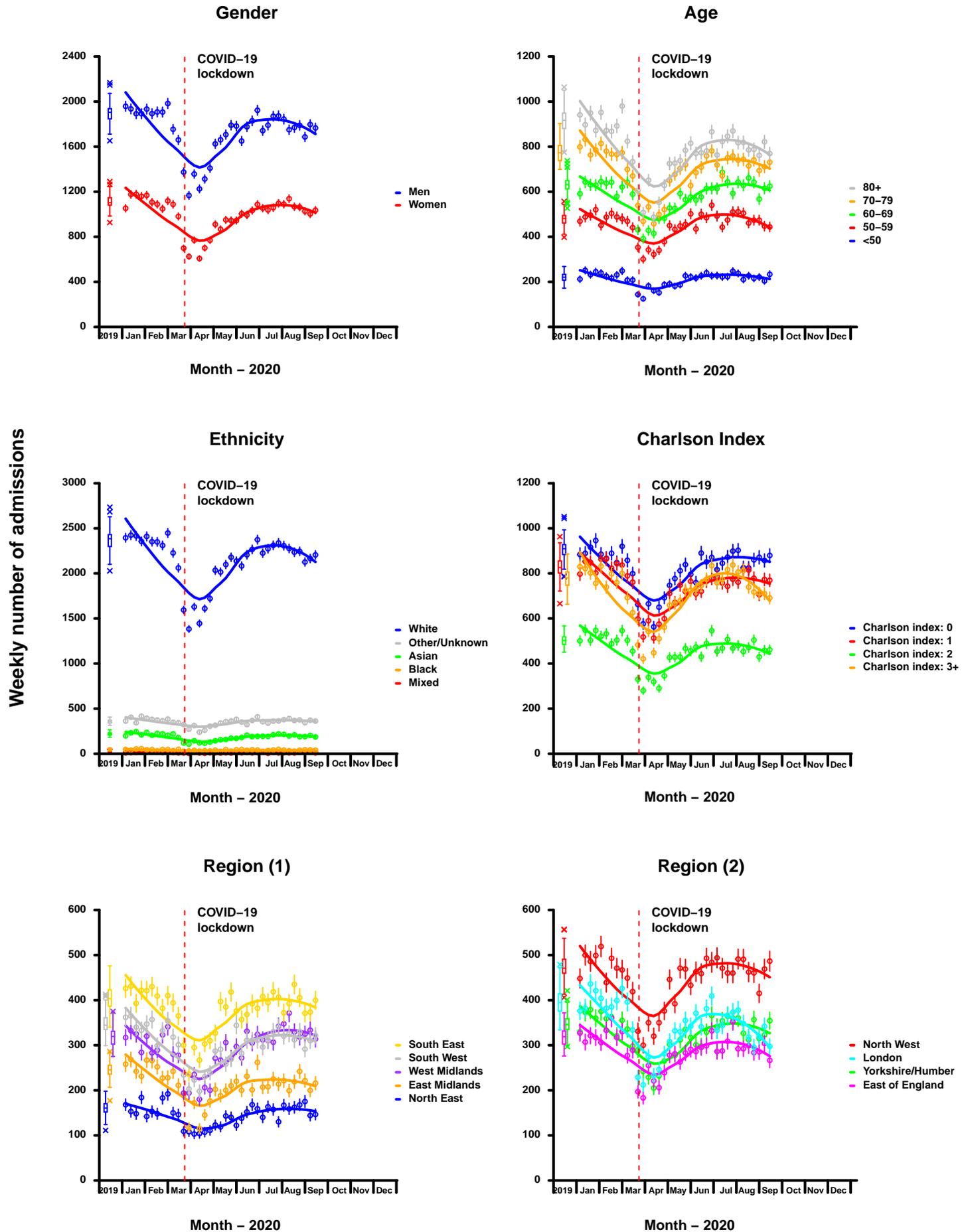
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Figure 6: Weekly median and interquartile range of length of stay for admissions to acute NHS hospital trusts with an acute coronary syndrome, by type



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Figure 7: Weekly number of admissions to acute NHS hospital trusts with an acute coronary syndrome, by age, sex, Charlson index, ethnicity and region



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Table 2: Weekly number of admissions from acute coronary syndrome, any acute myocardial infarction, ST-elevation myocardial infarction and non-ST-elevation myocardial infarction in 2019 and 2020

Weekly admissions in 2020 are adjusted for incomplete coding and delayed reporting (see methods above)

Week	Any ACS		Any acute MI		STEMI		NSTEMI	
	2019	2020	2019	2020	2019	2020	2019	2020
1	3,459	3,012	2,405	2,129	676	656	1,521	1,280
2	3,048	3,111	2,111	2,188	607	644	1,318	1,335
3	3,098	3,070	2,166	2,096	670	631	1,301	1,289
4	3,156	3,051	2,241	2,109	694	637	1,335	1,282
5	2,980	3,101	2,105	2,134	648	595	1,282	1,329
6	3,135	3,002	2,175	2,051	653	591	1,345	1,268
7	3,047	2,998	2,109	2,027	635	582	1,301	1,280
8	3,047	2,955	2,105	2,050	658	626	1,277	1,223
9	3,081	3,103	2,102	2,119	622	637	1,298	1,287
10	3,055	2,842	2,144	1,987	617	643	1,357	1,190
11	3,093	2,641	2,117	1,813	664	570	1,277	1,068
12	3,088	2,073	2,070	1,481	631	496	1,279	851
13	2,913	1,795	1,990	1,323	593	473	1,227	725
14	3,411	2,136	2,302	1,542	729	592	1,419	787
15	3,052	1,843	2,090	1,307	596	477	1,314	689
16	3,027	2,025	2,110	1,428	655	540	1,295	756
17	3,009	2,197	2,012	1,532	585	527	1,254	863
18	3,037	2,544	2,059	1,722	616	580	1,289	979
19	3,054	2,544	2,139	1,693	683	533	1,288	993
20	3,065	2,668	2,090	1,784	594	600	1,300	1,030
21	2,999	2,751	2,019	1,834	618	575	1,237	1,077
22	2,896	2,742	2,018	1,840	584	624	1,254	1,030
23	3,009	2,670	2,056	1,791	616	596	1,264	1,033
24	3,017	2,786	2,047	1,815	631	531	1,242	1,122
25	2,916	2,879	1,926	1,903	582	585	1,190	1,137
26	2,935	3,029	1,976	1,999	594	620	1,232	1,188
27	2,959	2,816	2,029	1,870	648	577	1,208	1,112
28	2,897	2,844	1,952	1,933	605	636	1,188	1,121
29	2,897	2,938	1,985	1,935	639	565	1,190	1,161
30	2,883	2,978	1,989	2,002	609	606	1,215	1,209
31	2,807	2,950	1,879	1,989	573	618	1,171	1,156
32	2,903	2,905	1,936	1,883	594	575	1,194	1,110
33	2,908	2,849	1,907	1,879	605	608	1,142	1,104
34	2,938	2,860	1,956	1,888	580	655	1,224	1,077
35	2,854	2,718	1,915	1,728	508	585	1,250	985
36	2,840	2,799	1,881	1,858	553	585	1,179	1,112
37	3,101	2,802	2,095	1,888	645	580	1,271	1,137
38	2,938		1,974		566		1,252	

Week	Any ACS		Any acute MI		STEMI		NSTEMI	
	2019	2020	2019	2020	2019	2020	2019	2020
39	3,148		2,093		611		1,313	
40	3,105		2,050		580		1,295	
41	3,067		2,027		593		1,270	
42	2,992		1,978		611		1,189	
43	3,033		2,084		621		1,280	
44	2,579		1,744		508		1,101	
45	3,159		2,124		633		1,294	
46	2,989		2,073		619		1,274	
47	2,975		2,011		639		1,223	
48	3,079		2,096		645		1,260	
49	2,999		2,127		671		1,235	
50	3,056		2,165		624		1,363	
51	3,094		2,216		651		1,345	
52	2,949		2,121		676		1,223	