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COVID-19 and emergency department attendances in Irish public hospitals

A. Brick, B. Walsh, C. Keegan and S. Lyons

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COVID-19 AND EMERGENCY DEPARTMENT ATTENDANCES IN IRISH PUBLIC HOSPITALS

Aoife Brick, Brendan Walsh, Conor Keegan and Seán Lyons[1,2]

ABSTRACT

On 29 February 2020 the first confirmed case of COVID-19 was announced in the Republic of Ireland. In subsequent weeks, progressively more restrictive control measures were introduced in an attempt to 'flatten the curve' and specifically to relieve pressure on emergency and critical care services. Using the most up to date data available on emergency department (ED) attendances in acute public hospitals, this analysis examines the impact on the numbers and types of attendances since the onset of COVID-19. Our analysis shows that there were on average 45.4 per cent fewer ED attendances per day in the week ending 29 March compared to the week ending 1 March. In addition, the reduction in ED attendances appears to be more prevalent in younger age groups. We also show that the proportion of ED attendances across triage categories, used to assess urgency of treatment, remained stable with no substantive changes in the overall proportion of very urgent/immediate attendances. Public information campaigns must encourage people to contact GPs and attend EDs if they require emergency care, and healthcare facilities must ensure that it is safe to do so.

1. INTRODUCTION

On 29 February 2020 the first confirmed case of COVID-19 was announced in the Republic of Ireland. Since then, progressively restrictive control measures have been introduced in an effort to prevent further spread of the disease (or 'flatten the curve') and ease pressure on hospital resources. On 13 March all schools, colleges and childcare facilities closed, and on 28 March guidance was issued from the Government for the public to stay at home in all but a specified set of circumstances, and all but essential services were closed (NPHET, 2020). On 1 May the Government published a roadmap for reopening society and business (Government of Ireland, 2020). There will be a gradual lifting of COVID-19

[1] Aoife Brick, Brendan Walsh, and Conor Keegan are Research Officers at the Economic and Social Research Institute and Adjunct Assistant Professors at Trinity College Dublin. Seán Lyons is an Associate Research Professor at the Economic and Social Research Institute and Adjunct Associate Professor at Trinity College Dublin.

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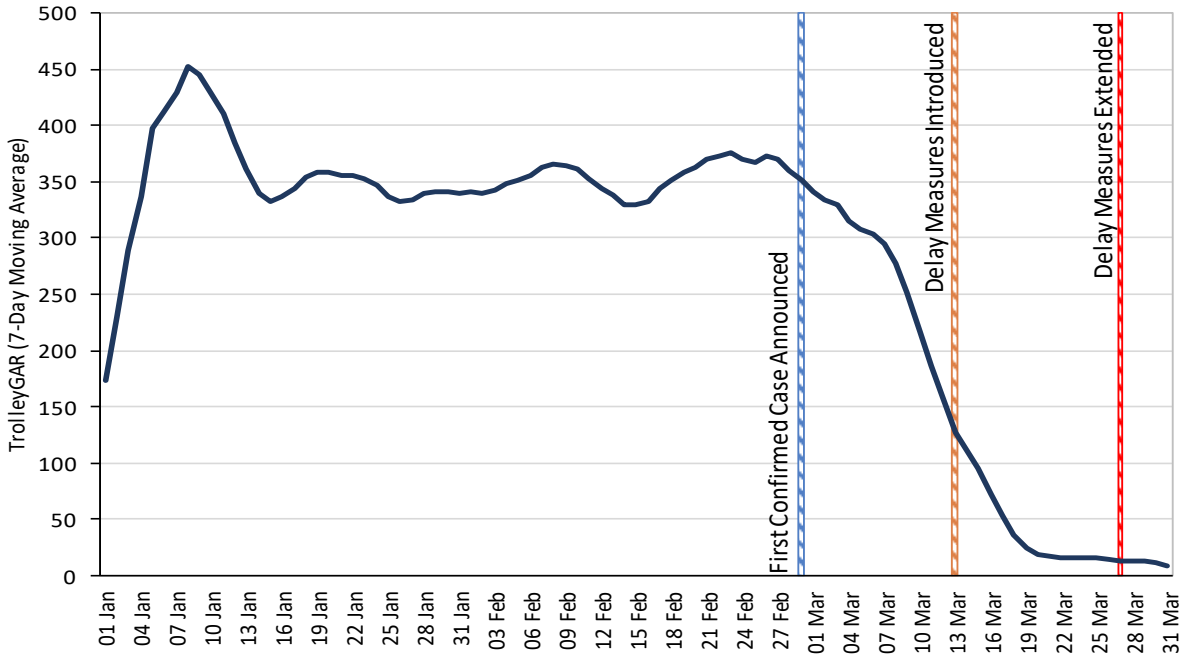
restrictions across five phases beginning on 18 May and on a three-week review process.

Attempts to 'flatten the curve' are partly intended to ameliorate COVID-19 demand pressure on the acute hospital sector, specifically emergency and critical care services. Similar to other countries, Ireland has rapidly implemented substantial changes to its health system to prepare for the prospect of significantly increased demand. In addition, demand for emergency care not related to COVID-19 also appears to have declined rapidly. The net effect of these changes has been a dramatic reduction in emergency department (ED) capacity utilisation.[3] For example, for many years Irish EDs have had large numbers of patients on trolleys in EDs, waiting for long periods for a bed in a ward. Within two weeks of the announcement of the first case of COVID-19 in the Republic of Ireland, this form of queuing had essentially stopped (see Figure 1). The additional capacity created by the cancellation of non-urgent elective activity undoubtedly contributed to the reduction.

FIGURE 1 TROLLEYS OCCUPIED IN EMERGENCY DEPARTMENTS, JANUARY – MARCH 2020



Source: HSE TrolleyGAR, https://www.hse.ie/eng/services/campaigns/trolleygar.html
Note: Number of patients awaiting admissions to an inpatient hospital bed at 8am. Presented as a seven-day moving average.

The need to manage the flow of hospital admissions is further necessitated due to acute care bed capacity being amongst the lowest in the OECD. At the outset of COVID-19 in Ireland, critical care beds in the public hospital system numbered just

[3] Anyone with suspected COVID-19 symptoms was requested to self-isolate and phone their GP. They were told not to go to a GP surgery, pharmacy, or hospital (https://www.gov.ie/en/publication/472f64-covid-19-coronavirus-guidance-and-advice/#symptoms – last accessed 5 May 2020).

248 (HSE, 2019) for its 4.9 million population. However, capacity was increased, and as of 13 April the total stock of critical care beds stood at 500 (excluding additional surge capacity) (HSE, 2020).[4] This includes capacity made available by the private hospital system; on 24 March private hospitals and the Government agreed that during this crisis such facilities would operate essentially as public hospitals (Department of the Taoiseach, 2020). This agreement, signed on 30 March, provided over 2,000 acute beds and 47 critical care beds in addition to ventilators and laboratories for testing (Thomas et al., 2020). In addition to increasing capacity, a substantial proportion of elective hospital care was cancelled or postponed to free-up further workforce and bed capacity for patients presenting with COVID-19.

COVID-19 is having significant impacts on peoples' willingness and ability to access timely healthcare. Serious concerns have been raised by clinicians that patients are foregoing necessary healthcare. In response to reports of non-COVID related attendances to hospital EDs reducing considerably, Chief Medical Officer at the Department of Health, Dr Tony Holohan, stated on 2 April:

> *While protecting yourself from COVID-19 is a priority, no one should ignore signs that they may need medical attention for other ailments such as lumps, chest pain or other concerns. Please do not ignore any symptom outside of COVID-19. The hospitals are there for all ailments, not just COVID-19* (NPHET, 2020).

For countries such as China, Iran and Italy that saw the earliest severe consequences of COVID-19, there is little evidence available to date of the full extent of impacts on ED services. A recent paper examining data from five hospitals in Italy has shown a considerable reduction (up to 88 per cent) in visits to paediatric EDs in March 2020 compared with the same month in 2019 (Lazzerini et al., 2020). More substantial data are emerging from other countries, including England and Scotland, which show large decreases in ED attendances since the onset of the pandemic. Data from NHS England for March 2020 showed a drop in ED attendances of 29.4 per cent on the same month in 2019 (NHS England, 2020). While in Scotland there has been a corresponding drop of approximately one-third in ED attendances (Public Health Scotland, 2020).

This paper examines the most up-to-date data available on ED attendances in Irish public hospitals, to observe if the number of attendances has changed since the onset of the COVID-19 pandemic, and/or the introduction of the associated delay measures by the Government. The paper also investigates whether changes in ED attendances have occurred at similar rates across age-groups. Finally, based on the

[4] Of these 500 beds, 415 were open and staffed (HSE, 2020).

triage status of ED patients, we examine the extent of differences in the urgency of attendance since the onset of the COVID-19 pandemic.

2. PATIENT EXPERIENCE TIME DATA

The data employed for the analysis are from the Patient Experience Time (PET) database managed by the Business Information Unit at the Health Service Executive. This administrative patient level dataset contains records for all ED attendances across the 30 EDs in Irish public hospitals (see Appendix Table A.1). The data cover all attendances from 1 January 2019 to 31 March 2020. The data do not include attendances at minor injury clinics, Acute Medical/Surgical Assessment Units (AMAU/ASAU), presentations to specialist public hospital EDs (e.g. maternity hospitals) or EDs in private hospitals.

As a consequence of missing information for some attendances, 1.4 per cent of attendances have been excluded from the analysis (Appendix Table A.2). The main reason for exclusion was the apparent misclassification of AMAU/ASAU attendances.[5] Approximately 40 per cent of the excluded cases were from a single hospital.

PET gathers information on hospital of attendance, age, sex, date of attendance, ED referral status, and discharge destination. PET has also begun to gather information on attendances' triage status. PET uses the Manchester Triage System to assign clinical priority to patients based on presenting signs and symptoms (HSE Emergency Medicine Programme, 2018). A score between one and five is given to each attendance with one being the most severe indicating immediate care required and five indicating not urgent. The Manchester Triage System score is a new variable in the PET dataset and as such some hospitals are not yet reporting it. Additionally, some hospitals have a high number of attendances where triage was 'not classified'.[6] After exclusions, approximately 63 per cent of ED attendances in both February and March 2020 remain for analysis of triage. We observe broad agreement in the overall proportions of patients in each triage category compared to a recent European study (Zachariasse et al., 2017).

While PET data may include patients attending with COVID-19 it does not yet report information on a specific reason, or diagnosis, for each attendance.

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5 Any attendance with a discharge destination of 'Referred to AMAU' or 'Referred to ASAU' has been excluded. We have crossed checked with HIPE data for 2019 which record all discharges from AMAU/ASAU, and hospitals with some of the largest AMAUs have no record in the PET data of referrals to AMAU/ASAU. In addition, all attendances in one hospital with a PET of ≤5 minutes and a discharge destination of 'admitted to ward' have been excluded as they appear to be misclassification of activity other than ED attendances.

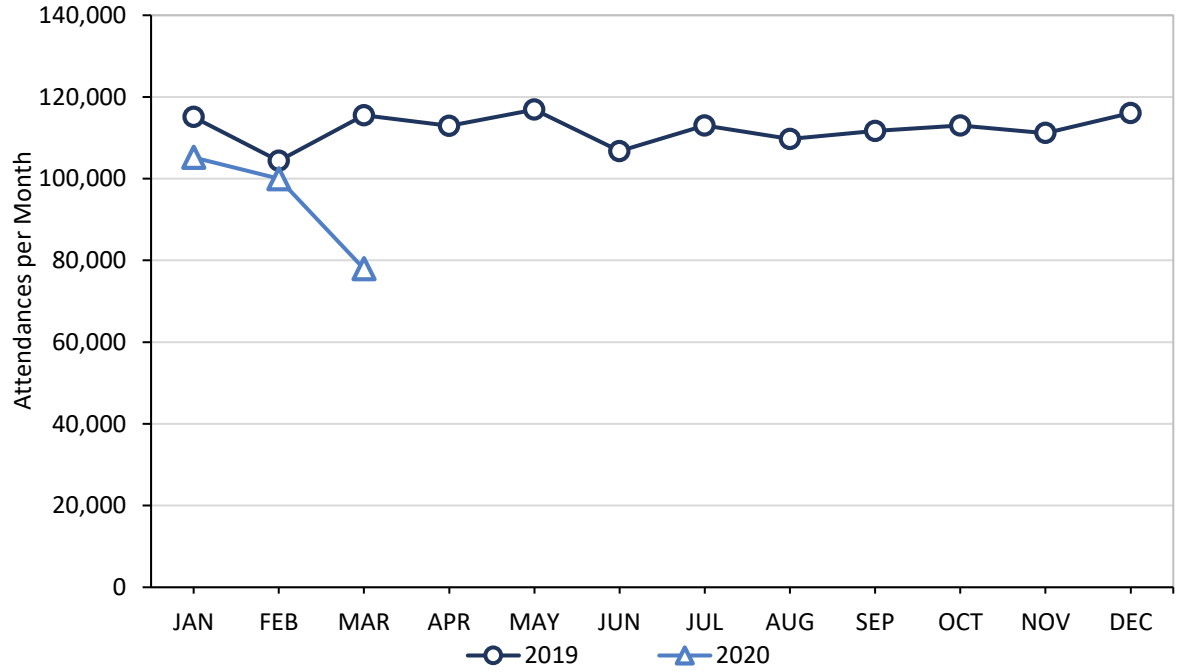
6 While the PET file has data on triage for a selection of hospitals in 2019 some larger hospitals did not report until January 2020. For this reason, our analysis focuses on February and March 2020 when the largest number of hospitals (16 hospitals) were reporting.

3. FINDINGS

3.1 Attendances

Figure 2 illustrates the total number of attendances in Irish public hospital EDs between 1 January 2019 and 31 March 2020. In January and February year-on-year decreases in the number of attendances were observed, 8.6 per cent and 4.2 per cent respectively (6.7 per cent excluding 29 February). The number of attendances in March 2020 (n=77,932) was 32.5 per cent less than in March 2019 (n=115,497). There is some variation in these figures from year to year (see Appendix Figure A.1); however the sizeable further reduction in March 2020 is likely to be associated with the initial response to the COVID-19 pandemic.

FIGURE 2 ED ATTENDANCES JANUARY 2019 – MARCH 2020

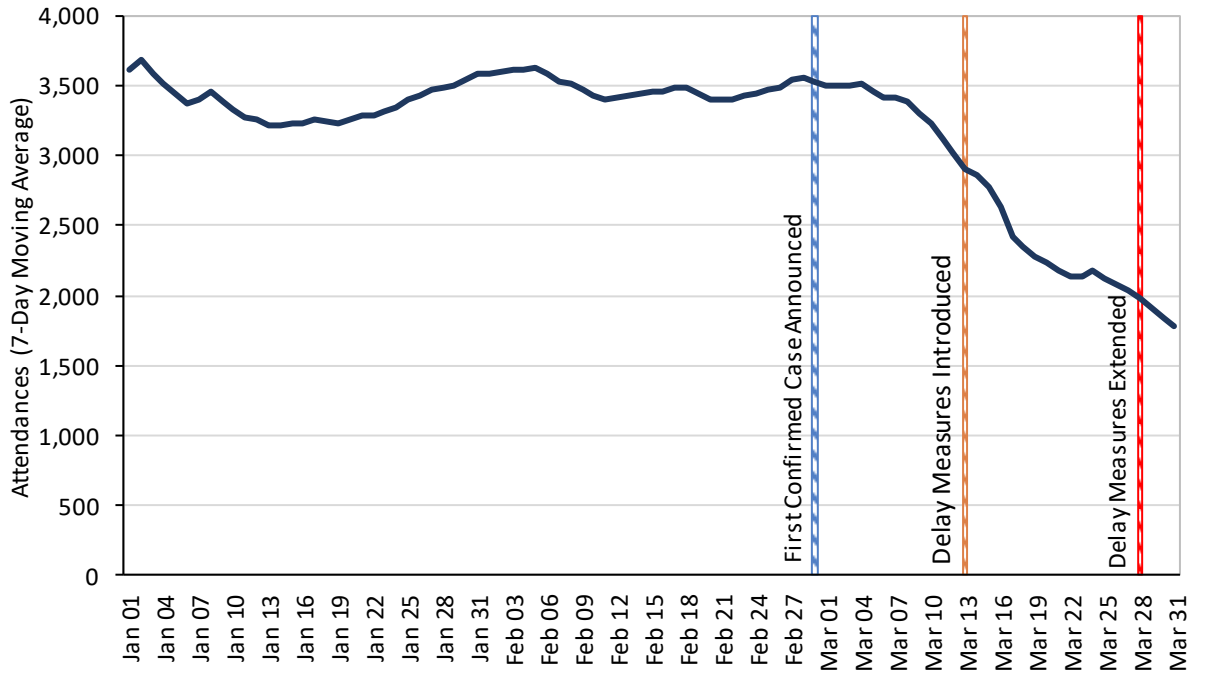


Source: HSE Patient Experience Time Database.

Although Figure 2 shows a noticeable reduction in ED attendances in March 2020, delay measures were only introduced in mid-March. To help illustrate the time profile of the decline over shorter time periods, Figure 3 presents a seven-day moving average of daily ED attendances from 1 January to 31 March across the 30 EDs. The data are presented as a seven-day average to smooth fluctuations in attendances that happen at weekends in the normal course of events, and to provide for a more interpretable trend over time. Between 1 January and 29 February, the number of attendances averaged between 3,200 and 3,700 per day. The average number of daily attendances in the week ending Sunday 1 March was 3,503 compared to 1,912 in the week ending Sunday 29 March, a decrease of 45.4 per cent.

Figure 3 indicates that the number of attendances began to decrease approximately one week before the first delay measures were introduced and a few days after the first confirmed case was announced.[7]

FIGURE 3 ED ATTENDANCES 01 JANUARY 2020 – 31 MARCH 2020



Source: HSE Patient Experience Time Database.

3.2 Referral patterns

The main pathways to the ED in Ireland are through a General Practitioner (GP) referral (surgery or out-of-hours), or a self-referral, with self-referral being the predominant route. In Q1 of 2019, 36.0 per cent of attendances were referred by a GP (Table 1) with a further 51.9 per cent self-referring. In Q1 2020, there was a decrease in the proportion of GP referrals to 33.6 per cent and an increase in the proportion of self-referrals to 55.6 per cent. Looking at March in particular, the introduction of COVID-19 delay measures appears to be associated with a reduction in the number of attendances across all referral sources; a reduction in the proportion of attendances referred by a GP from 35.1 per cent to 30.2 per cent; and an increase in self-referrals from 54.6 per cent to 58.9 per cent between March 2019 and March 2020. This may be indicative of lower GP use in March 2020, though no information is available to examine this directly.

[7] Similar trends can be seen across regions of hospitalisation (see Appendix Figure A.2).

TABLE 1 TOTAL ATTENDANCES BY SOURCE OF REFERRAL, Q1 2019/20

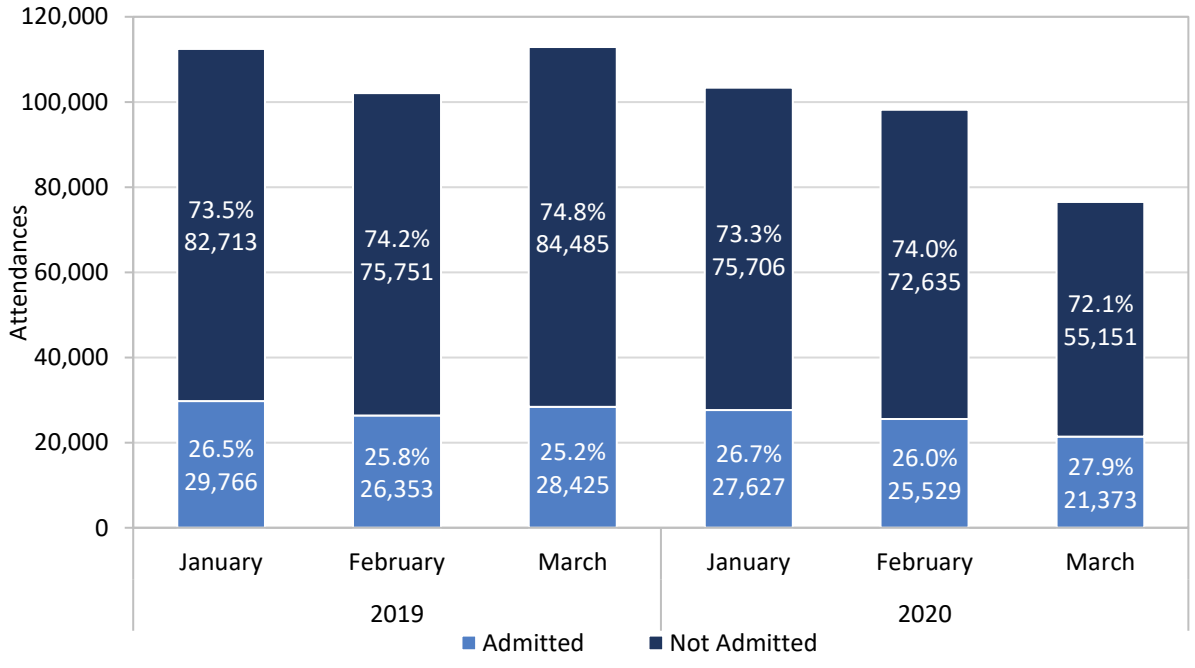
	2019						2020					
	GP Referral		Self-Referral		Other		GP Referral		Self-Referral		Other	
	N	%	N	%	N	%	N	%	N	%	N	%
January	40,898	36.4	54,353	48.3	17,165	15.3	36,275	35.4	55,287	53.9	11,046	10.8
February	37,411	36.7	53,945	52.9	10,574	10.4	33,635	34.5	53,316	54.7	10,454	10.7
March	39,687	35.1	61,769	54.6	11,621	10.3	22,892	30.2	44,632	58.9	8,292	10.9
Q1 Total	**117,996**	**36.0**	**170,067**	**51.9**	**39,360**	**12.0**	**92,802**	**33.6**	**153,235**	**55.6**	**29,792**	**10.8**

Source: HSE Patient Experience Time Database.
Note: Totals across tables/figures may vary due to missing values for particular variables.

3.3 Admissions to hospital

Figure 4 shows that in general just over one in every four of those attending at EDs are subsequently admitted to the hospital. The numbers admitted to hospital and not admitted (the majority are discharged home) both saw reductions in March 2020. Figure 4 shows that the number of patients admitted from EDs in March 2020 was 25 per cent lower than the number admitted from EDs in March 2019, and 16 per cent lower than were admitted from EDs in February 2020. Admitted patients did compose a slightly larger proportion (27.9 per cent) of ED attendances in March 2020 than earlier months.

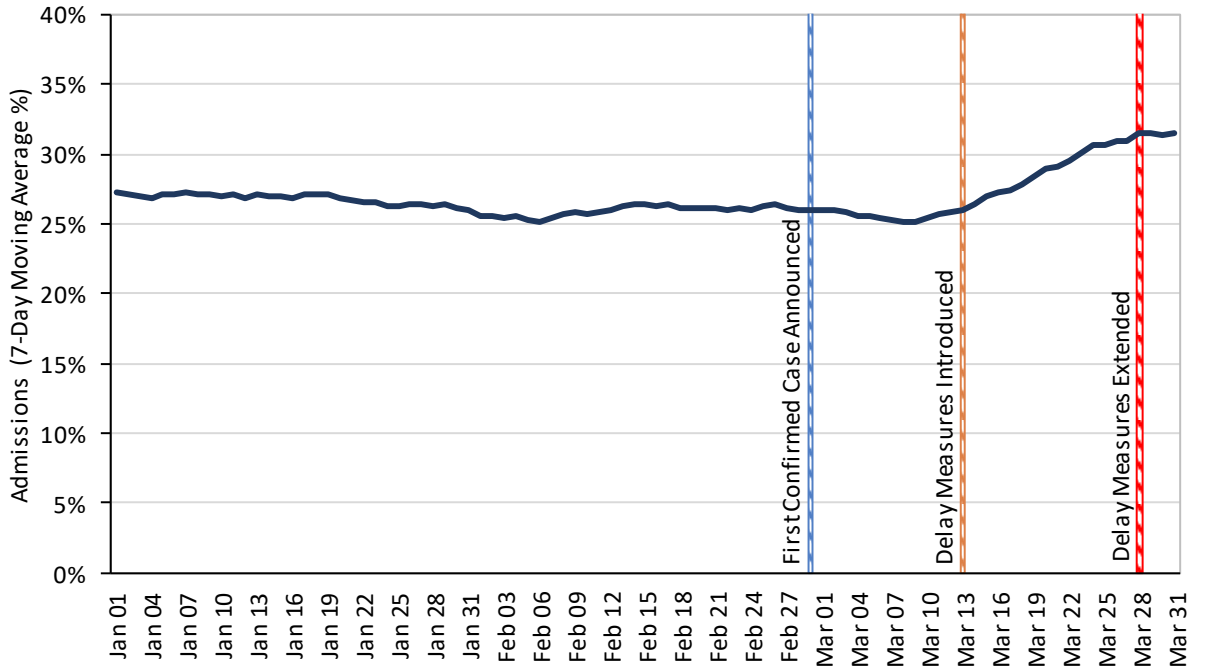
FIGURE 4 ED ATTENDANCES BY ADMISSION STATUS, Q1 2019/2020



Source: HSE Patient Experience Time Database.
Note: Totals across tables/figures may vary due to missing values for particular variables.

Figure 5 shows that the rise in the proportion of ED attendances admitted to hospital was concentrated in the last two weeks of March. This increase began in a more modest way immediately prior to the introduction of the first delay measures and increased thereafter. This increase may, in part, be driven by COVID-19 admissions; however a total of just over 600 COVID-19 positive patients (HSE, 2020) had been admitted to hospital as of 31 March, so COVID-19 is unlikely to be the main driver behind this increase.

FIGURE 5 ADMISSIONS AS A PROPORTION OF TOTAL ED ATTENDANCES, 01 JANUARY 2020 – 31 MARCH 2020

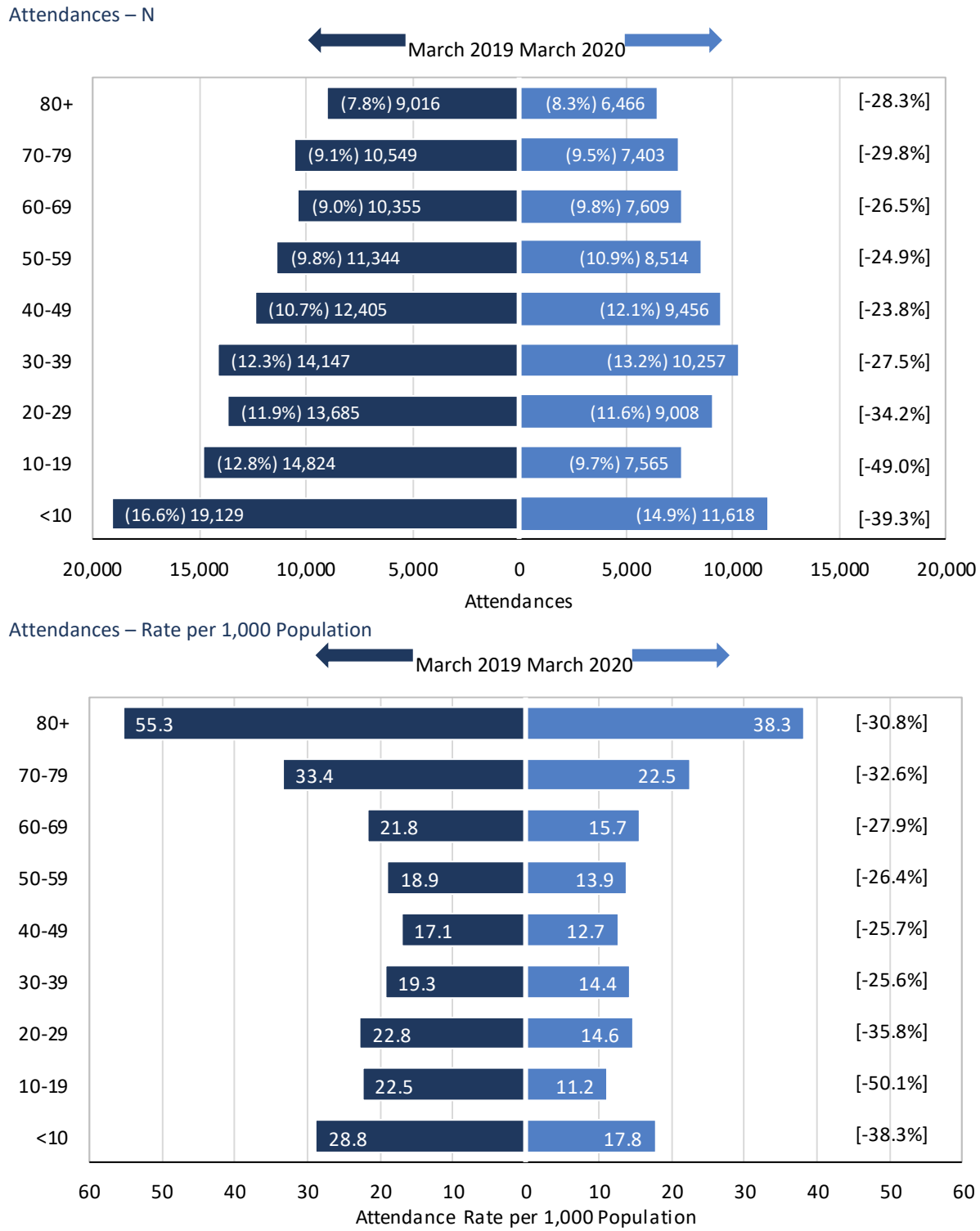


Source: HSE Patient Experience Time Database.
Note: Presented as a seven-day moving average.

3.4 Age profile

The reduction in the number of ED attendances was not evenly distributed across age groups. The largest reductions were seen in the three youngest age groups (Figure 6) with 36 per cent to 50 per cent reductions in attendances per 1,000 population between March 2019 and March 2020.

FIGURE 6 ED ATTENDANCES BY AGE GROUP, N AND RATE PER 1,000 POPULATION, MARCH 2019/2020



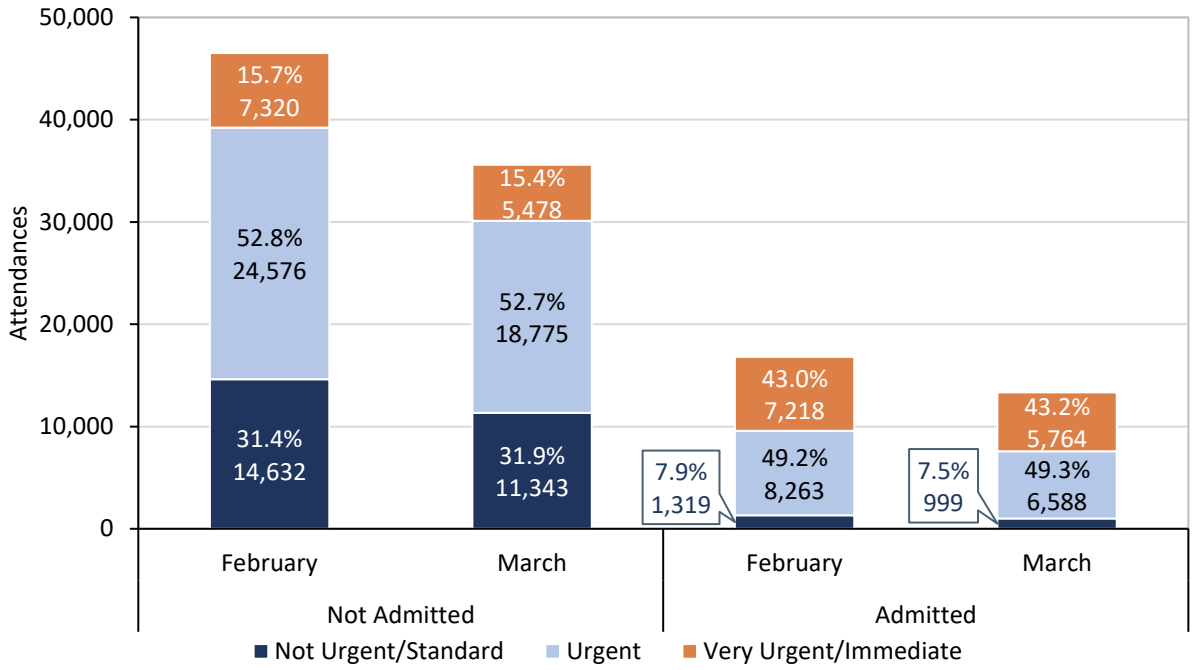
Source: HSE Patient Experience Time Database.

Notes: Totals across tables/figures may vary due to missing values for age. Percentage change in square brackets. Population calculations based on ESRI population estimates for 2019 and 2020.

3.5 Triage

With a large decrease in the number of attendances between February and March 2020 we might expect that the average level of severity was increasing over the period; that is, only the sickest patients were attending the ED. Figure 7 shows that while the number of attendances per month decreased substantially, the proportion of patients within the aggregated triage categories actually remained stable.

FIGURE 7 ED ATTENDANCES BY TRIAGE CATEGORY, FEBRUARY – MARCH 2020



Source: HSE Patient Experience Time Database.
Note: Totals across tables/figures may vary due to missing values for particular variables.

Table 2 shows the proportion of admitted and not admitted attendances in the first and last two weeks of March 2020 with a triage category of 'very urgent/ immediate' by age group. This shows that older patients tend to present more acutely unwell with a higher proportion in the 'very urgent/immediate' triage category.

There has been little change in the proportion of 'very urgent/immediate' attendances in the not admitted group for all age categories, with the exception of the 80 years and older group where the proportion decreased by almost 5 percentage points. For those who were admitted there was an increase in the proportion in the 'very urgent/immediate' category for almost all age groups.

TABLE 2 PROPORTION OF VERY URGENT/IMMEDIATE ATTENDANCES BY ADMISSION STATUS AND AGE GROUP, MARCH 2020

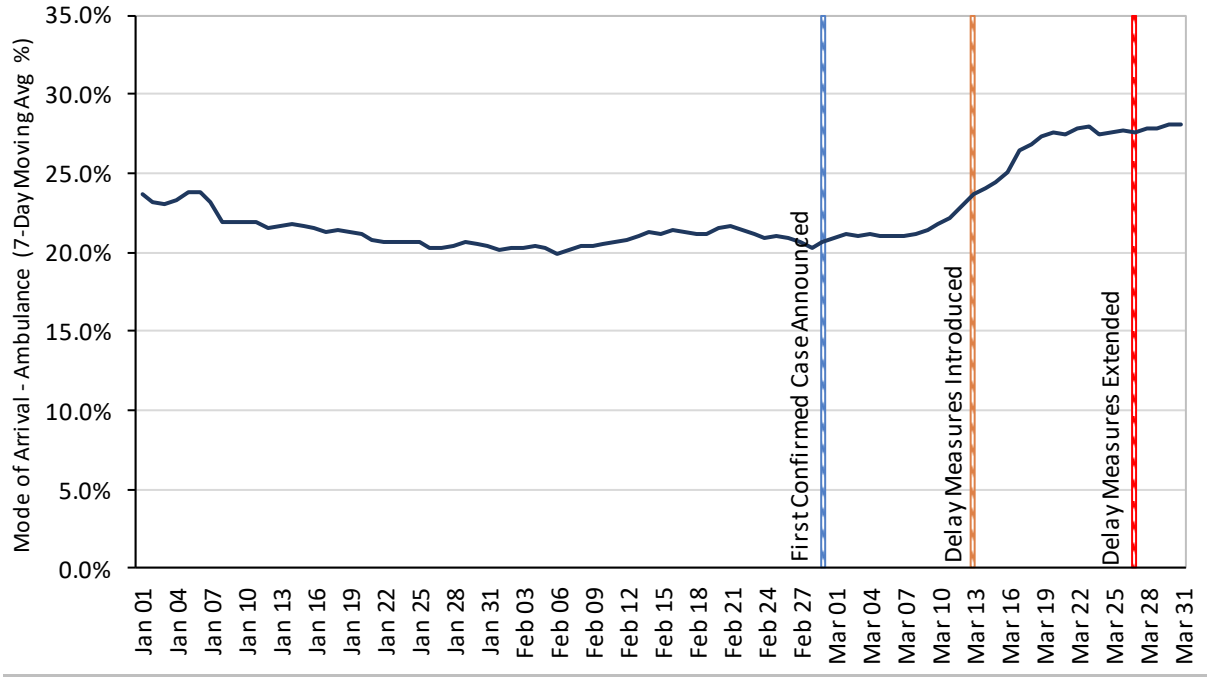
	Not Admitted		Admitted		Total	
	Mar 1-15	Mar 16-31	Mar 1-15	Mar 16-31	Mar 1-15	Mar 16-31
<10 years	15.4	14.6	43.6	42.6	19.9	18.6
10-19 Years	14.6	15.0	37.9	41.5	18.2	20.5
20-29 Years	14.1	14.7	35.3	37.2	17.2	18.6
30-39 Years	15.0	14.9	34.6	37.1	18.6	19.2
40-49 Years	14.6	15.3	37.3	39.9	19.8	20.8
50-59 Years	16.2	16.6	44.8	41.0	24.6	24.2
60-69 Years	16.4	17.0	47.5	46.0	28.5	28.9
70-79 Years	16.5	16.9	45.1	47.6	30.8	33.4
80+ Years	19.9	15.3	45.4	49.6	34.9	37.0
Total	**15.4**	**15.4**	**42.6**	**44.0**	**22.5**	**23.6**

Source: HSE Patient Experience Time Database.
Note: Totals across tables/figures may vary due to missing values for particular variables.

3.6 Mode of arrival

Figure 8 shows a seven-day moving average of the proportion of attendances to arrive at the ED via ambulance from 1 January 2020 to 31 March 2020. It shows that the proportion arriving by ambulance was around 24 per cent in the first few days of January but fell to around 20-21 per cent until 27 February. From 1 March the proportion has increased steadily to an average of just under 30 per cent. There were several days in the last two weeks of March where over one-third of attendances arrived via ambulance. Ambulance arrivals of this magnitude were last seen during Storm Emma at the beginning of March 2018 (see Appendix Figure A.3).

FIGURE 8 PROPORTION OF ATTENDANCES ARRIVING VIA AMBULANCE, 01 JANUARY 2020 – 31 MARCH 2020



Source: HSE Patient Experience Time Database.

Notes: Presented as a seven-day moving average. Three large hospitals currently have a large number of missing values for the admission source variable and have been excluded from the figure. This removes approximately 9 per cent of attendances between 1 January and 31 March 2020.

4. CONCLUSIONS

The number of ED attendances has noticeably declined since the onset of the COVID-19 pandemic. ED attendances almost halved during March. Attendances have decreased across all age groups and have fallen consistently across triage categories – even the most urgent ones.

There are several possible reasons that might be contributing to the decline in attendance and admissions to EDs. First, some patients requiring urgent medical care may have been deterred from attending the ED for fear of acquiring COVID-19 or that they are adding to the pressure on the health service. Second, and related to this first explanation, some individuals may not have attended GPs to obtain a referral to the hospital, or some GPs may have become less likely to refer patients to hospital. Such behavioural explanations probably explain at least part of the reduction; one piece of evidence supporting this view is that ED attendances began to decline about one week before the first delay measures were introduced. Reductions observed are similar to those seen in the UK (NHS England, 2020). For a more in-depth exploration of this aspect of the reduction, data on numbers of patients and types of cases presenting at GP practices would be required, as well as the proportion referred onwards to hospital. These data were not available for analysis.

A third possible reason for the decline is that the probability of injury or illness may have fallen as a result of reduced travel, sport, and social contact. Evidence from the Royal College of General Practitioners (RCGP) in England has shown that less social contact has reduced GP attendances for respiratory infections by more than half between beginning and mid-March, and the reduction occurred prior to the UK 'lockdown' (Jefferson and Heneghan, 2020). Reduced frequency and duration of social interactions may also reduce the spread of respiratory and gastrointestinal diseases, and thereby some ED attendances, particularly amongst children. Lower sports participation may also be reducing injury rates, especially amongst children and young adults. Declines in driving could have reduced traffic accidents. Here too, disentangling the relative contributions of various demand-side factors to the reductions in average admissions would require additional data (on the mix of ED hospital admissions associated with non-COVID infectious diseases, trauma etc.). Such data should eventually be available from the Hospital In-Patient Enquiry (HIPE) database.

While some hospitalised COVID-19 patients are no doubt captured in these data, it is not possible to separate them out as no diagnosis information is available in the data. However, as of 31 March, just over 600 COVID-19 confirmed patients were hospitalised (HSE, 2020). This implies that even if each patient were admitted through ED, the broad conclusions presented here would not be affected. The absence of individuals with less severe COVID-19 symptoms, who might at other times have attended an ED with these symptoms but who are now self-isolating at home, is also unlikely to explain the large reduction in attendances in March.

COVID-19 affects all age groups, however the older population have much higher mortality rates. As a consequence of this, the 27 March guidelines advised cocooning for vulnerable populations and those aged 70 years and older. We do find slightly larger reductions in attendance rates for those aged 70 years and older compared to younger adults. However, across all age groups, children saw the largest percentage reductions in ED attendance rates.

This analysis has examined the initial impacts of the COVID-19 crisis on ED attendance using data to the end of March 2020. However, it is possible that patterns of ED attendance may have continued to change in recent weeks as the COVID-19 crisis has intensified. We understand that there has been some recovery in ED attendances in April, with further recovery likely in May as restrictions are eased, but we do not have the data to show the scale of any reversal as yet.

While there may be a number of reasons for reducing demand for ED care, peoples' behaviour is likely to be the main factor. Further public information campaigns may be required to encourage and reassure people with symptoms to contact their GP or attend an ED where appropriate. Further work on the stabilisation and hopefully

recovery in the number of ED attendances will be possible in future as newer data become available.

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APPENDIX

TABLE A.1 PUBLIC HOSPITAL EMERGENCY DEPARTMENTS BY HOSPITAL GROUP

Children's Hospital Group	Dublin Midlands Hospitals Group
CHI at Crumlin	MRH Portlaoise
CHI at Tallaght	MRH Tullamore
CHI at Temple St	Naas General Hospital
	St. James's Hospital
	Tallaght University Hospital
Ireland East Hospitals Group	**South/South West Hospitals Group**
Mater Misericordiae University Hospital	Cork University Hospital
MRH Mullingar	Mercy University Hospital
Our Lady's Hospital, Navan	South Tipperary General Hospital
St. Luke's General Hospital, Kilkenny	UH Kerry
St. Michael's Hospital[a]	UH Waterford
St. Vincent's University Hospital	
Wexford General Hospital	
RCSI Hospitals Group	**Saolta Hospital Group**
Beaumont Hospital	Galway University Hospitals
Cavan General Hospital	Letterkenny University Hospital
Connolly Hospital	Mayo University Hospital
Our Lady of Lourdes Hospital	Portiuncula University Hospital
	Sligo University Hospital
University of Limerick Hospitals Group	
UH Limerick	

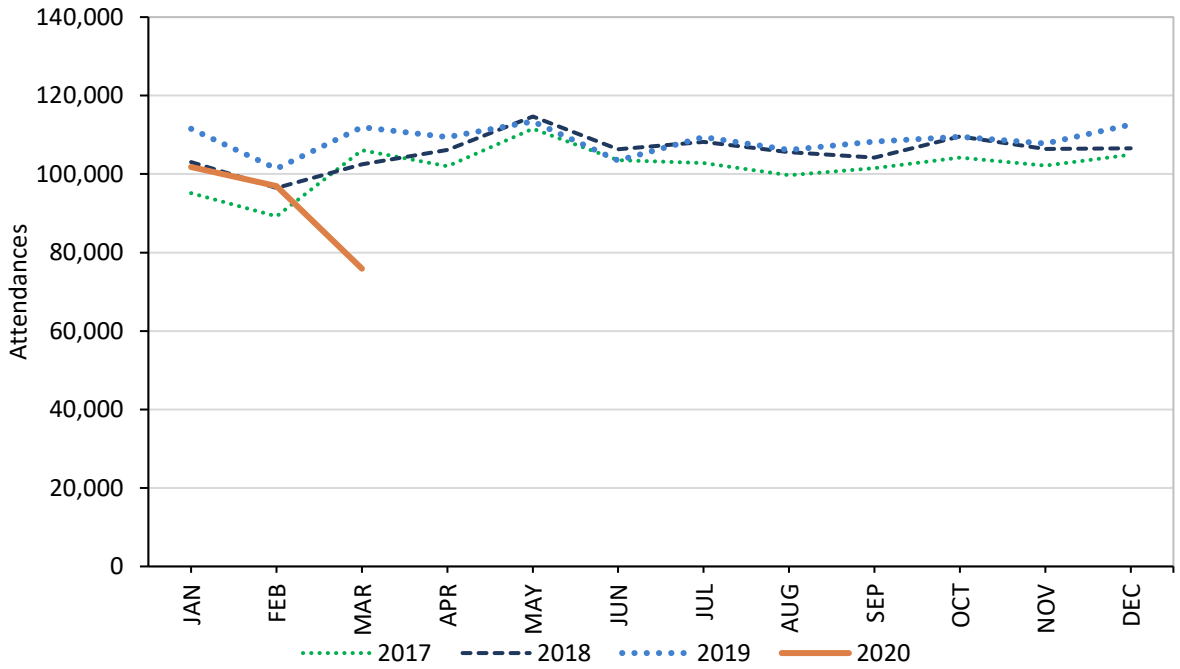
Notes: a Open 08:00 to 20:00 seven days per week.

TABLE A.2 ANALYSIS INCLUSIONS AND EXCLUSIONS, Q1 2019/2020

	2019			2020		
	Include	Exclude	Total	Include	Exclude	Total
	N	N (%)	N	N	N (%)	N
January	115,092	1,866 (1.6%)	116,958	105,201	1,543 (1.4%)	106,744
February	104,366	1,468 (1.4%)	105,834	99,989	1,206 (1.2%)	101,195
March	115,497	1,519 (1.3%)	117,016	77,932	1,205 (1.5%)	79,137
April	112,937	1,572 (1.4%)	114,509			
May	116,898	1,565 (1.3%)	118,463			
June	106,754	1,198 (1.1%)	107,952			
July	113,020	1,677 (1.5%)	114,697			
August	109,715	1,293 (1.2%)	111,008			
September	111,654	1,449 (1.3%)	113,103			
October	113,006	1,464 (1.3%)	114,470			
November	111,161	1,282 (1.1%)	112,443			
December	116,057	1,213 (1.0%)	117,270			
Total	**1,346,157**	**17,566 (1.3%)**	**1,363,723**	**283,122**	**3,954 (1.4%)**	**287,076**

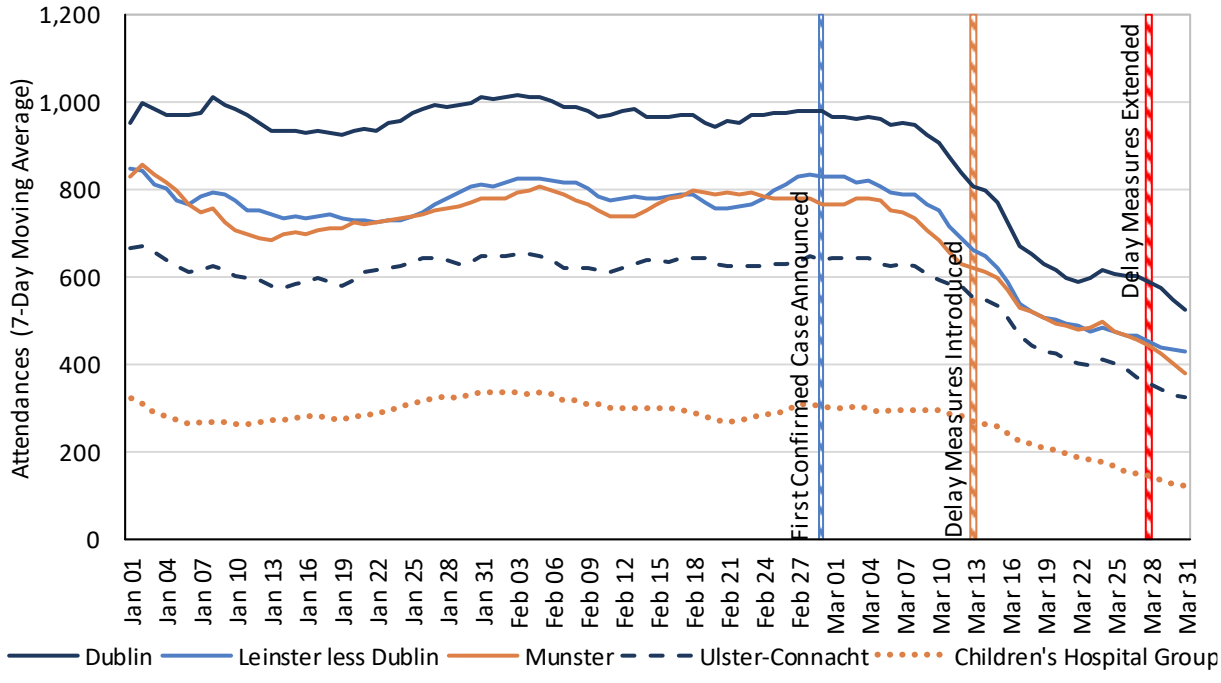
Source: HSE Patient Experience Time Database.

FIGURE A.1 ED ATTENDANCES JANUARY 2017 – MARCH 2020



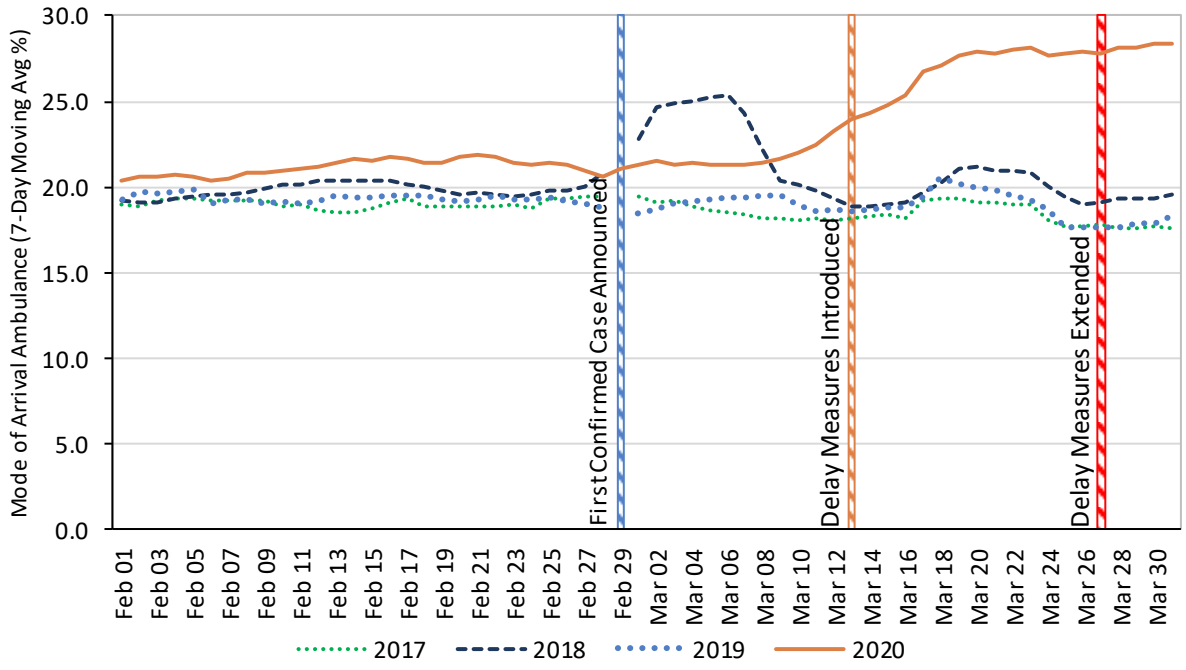
Source: HSE Patient Experience Time Database.
Note: Totals across figures/tables may vary due to missing values for particular variables. Two hospitals are excluded from the analysis in this figure to provide a consistent trend as they only began reporting to the PET in 2019.

FIGURE A.2 ED ATTENDANCES BY REGION OF HOSPITALISATION, DAILY, Q1 2020



Source: HSE Patient Experience Time Database.
Note: Totals across figures/tables may vary due to missing values for particular variables. Presented as a seven-day moving average.

FIGURE A.3 PROPORTION OF ATTENDANCES ARRIVING VIA AMBULANCE, DAILY, FEBRUARY AND MARCH 2017 – 2020



Source: HSE Patient Experience Time Database.

Note: Totals across figures/tables may vary due to missing values for particular variables. Presented as a seven-day moving average. Three large hospitals currently have a large number of missing values for the admission source variable and have been excluded from the figure. Two hospitals are excluded from the analysis in this figure to provide a consistent trend as they only began reporting to the PET in 2019.