

## ORIGINAL RESEARCH

## Health Policy

# Effect of the COVID-19 pandemic on the frequency of emergency department visits in Portugal: An interrupted time series analysis until July 2021

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**Abstract**

**Objectives:** This study aims to evaluate the effect of the COVID-19 pandemic on the frequency of emergency department (ED) visits in Portugal between March 2020 and July 2021.

**Methods:** We used data on the monthly number of visits for all public hospitals' EDs from mainland Portugal between January 2017 and July 2021. We studied the impact of the pandemic overall, by type of ED (general, pediatric, and obstetric) and by Manchester Triage System color (red, orange, yellow, green, and blue) using an interrupted time series analysis. The prepandemic period corresponded to the months from January 2017 to February 2020 and the pandemic period to the months from March 2020 to July 2021.

**Results:** We observed over 26 million ED visits, the majority in general EDs (74.0%) and triaged yellow (48.4%) or green (38.4%). During the pandemic period, ED visits decreased 45.7% (95% confidence interval [CI]: -39.8% to -51.2%) and pediatric ED visits decreased by 72.4% (95% CI: -64.6% to -78.6%). A decrease was observed for all colors but tended to be progressively smaller as the priority increased. There was an increase in ED visits during the pandemic period (2.3%; 95% CI: 1.4% to 3.2%), eventually returning to prepandemic values.

**Conclusion:** Our data indicate a considerable and long-lasting effect of the COVID-19 pandemic affecting mainly pediatric and milder cases, which were returning toward prepandemic values as the pandemic progressed. In a country with frequent use of EDs, the health system may need to be prepared to respond to prepandemic baseline ED demand, together with additional demand because of long-term sequels of COVID-19 cases and delayed care for chronic and acute conditions.

**KEYWORDS**

COVID-19, emergency service, hospital, interrupted time series analysis

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## 1 | INTRODUCTION

### 1.1 | Background

The COVID-19 pandemic declared on March 11, 2020,<sup>1</sup> brought an abrupt decrease in emergency department (ED) visits. In March 2020 usage of EDs had fallen 48% in Portugal.<sup>2</sup> A decrease was also observed in the United States in March and April 2020, ranging from 30.9% to 45%.<sup>3,4</sup> In Northern Italy, between March and May 2020, the lockdown period showed the largest decrease in ED visits: 66.2%.<sup>5</sup>

As the pandemic evolved, a trend for reduced ED use persisted, according to studies from Canada,<sup>6</sup> China,<sup>7</sup> Italy,<sup>8</sup> Scotland,<sup>9</sup> and the United States.<sup>10</sup> In the National Health Service Scotland, between January and June 2020, ED visits decreased 40.7% (95% confidence interval [CI]: -47.7% to -33.7%). However, these ED visits have been increasing, returning to the 2018–2019 average baseline.<sup>9</sup> A study in Italy, including 147,446 ED visits between January and August 2020, showed decreases of 25.4%, 25.3%, and 23.5% in the early, mid-, and late post-wave periods, respectively. In contrast, the authors found a fall of 66.4% during the first wave, greater than the decrease observed in the second and third periods.<sup>8</sup> When considering the evolution of ED visits, a study from China described an overall decrease of 22.6% (95% CI: -27.53% to -17.36%) in the period January 23–September 6, 2020.<sup>7</sup> Including data until September 23, 2020, a study from Canada described an incident rate ratio (IRR) of ED visits of 0.65 (95% CI: 0.62–0.67).<sup>6</sup> Based on data up to November 15, 2020, a study from the United States reported that ED visits had partially returned to baseline but were still 23% below the number of visits expected (IRR: 0.77; 95% CI: 0.76–0.78).<sup>10</sup>

In Portugal, ED care has an open-door policy<sup>11</sup> and payment of a small flat rate is required, but around 60% of the population is exempted (eg, for health or socioeconomic reasons).<sup>12</sup> There is a National Health System with universal access,<sup>12</sup> including primary care, but demand for urgent care is highly concentrated in acute care providers<sup>11</sup> and very frequent when compared to other countries.<sup>13</sup> A report from 2019 highlighted the major constraints affecting ED care in Portugal: the lack of an appropriate model of the organization of ED department resources; high affluence, with many non-urgent situations that could be safely cared for elsewhere; and long patient stays owing to delayed transfer for inpatient care.<sup>11</sup>

### 1.2 | Importance

Since the beginning of the pandemic and until July 2021, there have been considerable context changes. In Portugal, the first case of COVID-19 was confirmed on March 2, 2020 with the peaks of daily incidence occurring on November 16, 2020 (823 per million inhabitants) and January 28, 2021 (1616 per million inhabitants).<sup>14</sup> Case numbers fell thereafter and on July 31, 2021, there were 255 new confirmed cases per million inhabitants.<sup>14</sup> The first full lockdown started in March 2020 and a second followed, in response to the COVID-19 wave that reached its peak in January 2021.<sup>12</sup> Simultane-

#### The Bottom Line

In a large, national data set of emergency department (ED) visits in Portugal, there was a substantial sudden decrease in ED visit volume, in particular for pediatric ED visits, with the onset of the COVID-19 pandemic. By July 2021, ED use remained lower than prepandemic levels, except for those triaged as the lowest acuity, demonstrating the lasting effect of the COVID-19 pandemic on the emergency care system in Portugal.

ously, the vaccination program progressed: by the end of July 2021, 69.5% of the Portuguese population was vaccinated, with 58.96% fully vaccinated.<sup>14</sup> However, by the end of that month, there were also 1707.43 deaths per million inhabitants.<sup>14</sup>

Decreases in ED use during the pandemic raised concerns, because some evidence indicates that these reductions also occurred for time-sensitive or emergent conditions.<sup>4,5</sup> The decision to visit ED resides mostly with the patient, and this demand, therefore, may be especially affected by contextual determinants.<sup>15</sup> In a pandemic context, uncertainty, fear of contagion, civil responsibility, mobility restrictions, and concern about placing an unnecessary burden on the health system may have driven patients to delay or avoid seeking care.

### 1.3 | Goals of this investigation

This study aims to evaluate the effect of the COVID-19 pandemic on the frequency of ED visits in Portugal between March 2020 and July 2021.

## 2 | METHODS

### 2.1 | Study design

To estimate the effect of the COVID-19 pandemic on the number of ED visits, we used an interrupted time series analysis.<sup>7,16,17</sup> The first COVID-19 case in Portugal was confirmed on March 2, 2020. For that reason, and also because the data were available per month, the prepandemic period was defined between January 2017 and February 2020 (38 months), and the pandemic period included March 2020 to July 2021 (17 months). We added more time points before the start of the pandemic to model the prepandemic trend, thereby creating our counterfactual, corresponding to the trend had the pandemic not occurred.

### 2.2 | Data sources

We used publicly available information from the *Portal da Transparência*,<sup>18</sup> an open online source with data on all EDs of

public hospitals from mainland Portugal. Data were organized in 2 separate files, one with data on total visits and per type of ED where the patient was treated (general, pediatric, obstetric, and psychiatric) and the other on visits per triage category. We extracted both files, selecting the period from January 2017 to July 2021. Extraction of these data occurred on August 30, 2021, and we computed monthly values from cumulative ones for the 40 hospitals with recorded data in mainland Portugal.

Data about the estimated average resident population, by sex and age, in mainland Portugal were extracted from Statistics Portugal.<sup>19</sup> Because population estimates for 2021 were unavailable, we assumed no variation between 2020 and 2021.

## 2.3 | Selection of participants

We extracted the total frequency of ED visits per type of ED and triage color from the open-source data. For our studied period (January 2017–July 2021), there were records of 26,384,594 ED visits overall.

To avoid differences in included hospitals throughout the period, we excluded those that did not report data for at least 95% of months in the pre-pandemic or pandemic period (38 and 17 months). In the triage color analysis, we excluded ED visits triaged white, corresponding to a problem suitable to resolution in a non-ED setting,<sup>20</sup> and non-triaged. Psychiatric visits were recorded for only 1 hospital and were not included in type of ED analysis.

## 2.4 | Measurements

### 2.4.1 | Exposure

Our exposure was the COVID-19 pandemic in Portugal starting on March 2020.

### 2.4.2 | Outcomes

As outcome variables, we considered the number of ED visits, total and stratified by type of ED where the patient was treated (general, pediatric, and obstetric) and triage category (red, orange, yellow, green, and blue). The Manchester Triage System is used in Portugal to categorize patients in terms of the maximum waiting time until being seen by a doctor, from immediate medical attention (red) to 240 minutes (blue).<sup>20</sup> All of these outcomes were measured by the total number of ED visits per month.

## 2.5 | Statistical analysis

We used absolute and relative frequencies to describe the number of ED visits by type of ED and triage color. We then used measures of central tendency (median) and dispersion (interquartile range) to describe

the monthly frequency of ED visits in the pre-pandemic and pandemic periods. These periods were not compared, but we estimated the IRRs and the respective 95% CI with the interrupted-time series, providing the effect and precision.

Owing to overdispersion of the outcomes, we fitted a quasi-Poisson generalized linear model, with time as a variable to model the trend before the pandemic. Because we hypothesized that the pandemic would have an immediate effect and usage would slowly increase over time, we added a level and slope change in our model. The level change corresponds to the effect of the pandemic, and a change in slope corresponds to the comparison between the monthly trend before the pandemic and after. We accounted for seasonal effects by adding the month as a spline variable and autocorrelation by adding first-order lagged residuals.<sup>21</sup> We used the population in mainland Portugal as an offset term to adjust for changes in population size over the years.<sup>22</sup> To model the pediatric subgroup we used the population of children and adolescents 0–17 years old, and the obstetric subgroup corresponds to women 15–49 years old. We reported the effect of these predictors as IRRs with a 95% CI. To facilitate interpretation, we discussed the results as a percentage increase or decrease. Diagnostics were performed for each regression model, plotting residuals, autocorrelation, and partial autocorrelation functions. All statistical analyses were performed using R 4.0.2.<sup>23</sup>

## 3 | RESULTS

Our study included 26,384,594 ED visits between January 2017 and July 2021, with 26,356,192 (99.9%) in type of ED visit analysis and 22,252,293 (84.3%) with triage color analysis (study selection flow chart included in [Supplementary Material](#)). General ED visits were the most frequent and accounted for 74.0% of ED visits (pediatric: 19.4%; obstetric: 6.6%) (Table 1). The majority of ED visits were triaged yellow (48.4%) and green (38.4%). Approximately 12% of the ED visits were included in the 2 most urgent groups (orange: 11.1%; red: 0.4%) and ED visits triaged blue were the least frequent (1.7%).

Descriptive analyses indicated that the monthly frequency of ED visits decreased drastically in the pandemic period as the total median number fell from 529,336 (interquartile range [IQR]: 516,200–542,748) to 340,893 (IQR: 329,940–388,644) (Table 1). There was a decrease in all types of ED, with the greatest observed in pediatric ED: falling from 115,155 ED visits per month (IQR: 96,248–122,368) to 47,655 (IQR: 36,752–63,818). A decrease in the median volume of ED visits was observed for all triage priorities from red to green. In ED visits that were triaged blue, we observed an increase (median: from 6957 to 7694).

The observed frequencies of ED visits oscillated during the pandemic period, from March 2020 to July 2021 (Figures 1 and 2). A sudden drop in ED visits was observed at the start of the pandemic period, overall and for all types of ED visits and triage colors. The lowest number of ED visits was observed in April 2020, which increased thereafter until October, when it started to fall again, reaching its second lowest value in February 2021. This pattern was similar by type of ED

**TABLE 1** Frequency of ED visits, during the study, prepandemic and pandemic periods—total, per type of ED and per triage color

	Study period (January 2017 – July 2021) Total (% of total)	Pre-pandemic period (January 2017 – February 2020) Median (IQR) per month	Pandemic period (March 2020 – July 2021) Median (IQR) per month
Total	26,384,594 (100.0%)	529,336 (516,200–542,748)	340,893 (329,940–388,644)
Type of ED			
General	19,496,868 (74.0%)	384,953 (374,939–400,013)	273,592 (257,238–306,482)
Pediatric	5,121,994 (19.4%)	115,155 (96,248–122,368)	47,655 (36,752–63,818)
Obstetric	1,737,330 (6.6%)	34,074 (32,722–35,329)	26,480 (24,360–28,971)
Triage color			
Red	85,956 (0.4%)	1635 (1563–1742)	1297 (1209–1407)
Orange	2,467,237 (11.1%)	47,767 (46,399–50,534)	36,185 (34,252–37,246)
Yellow	10,773,857 (48.4%)	217,473 (209,786–222,892)	146,685 (129,097–161,385)
Green	8,539,729 (38.4%)	170,544 (166,455–176,251)	114,770 (105,556–131,996)
Blue	385,514 (1.7%)	6957 (6406–7227)	7694 (6110–8636)

Note: Percentages of total were calculated considering the sum of included categories (those presented in the table). Abbreviations: ED, emergency department; IQR, interquartile range.

visit and triage color. April 2020 and February 2021 were the months with the 2 lowest frequencies for most of the subgroups studied (general, pediatric, obstetric, red, orange, and yellow). After February 2021 all showed a growing trend.

The interrupted time series analysis indicated a decrease of 45.7% (95% CI: –39.8% to –51.2%) in the number of ED visits in mainland Portugal during the COVID-19 pandemic, as compared to the prepandemic period (Table 2). However, there was a growing trend of ED visits during the pandemic period (2.3%; 95% CI: 1.4% to 3.2%).

The most pronounced decrease during the pandemic was observed for pediatric ED visits, with a decrease of 72.4% (95% CI: –64.6% to –78.6%) (Table 2). However, this subgroup also presented the fastest growing trend thereafter, with an estimated increase of 6% (95% CI: 3.7% to 8.2%) during the pandemic period. Obstetric ED visits had the smallest decrease compared to other types of ED, with a 32.5% decrease after the pandemic started (95% CI: –27.6% to –37.1%). However, the rising trend during the pandemic was also smaller (0.7%; 95% CI: 0.1% to 1.3%).

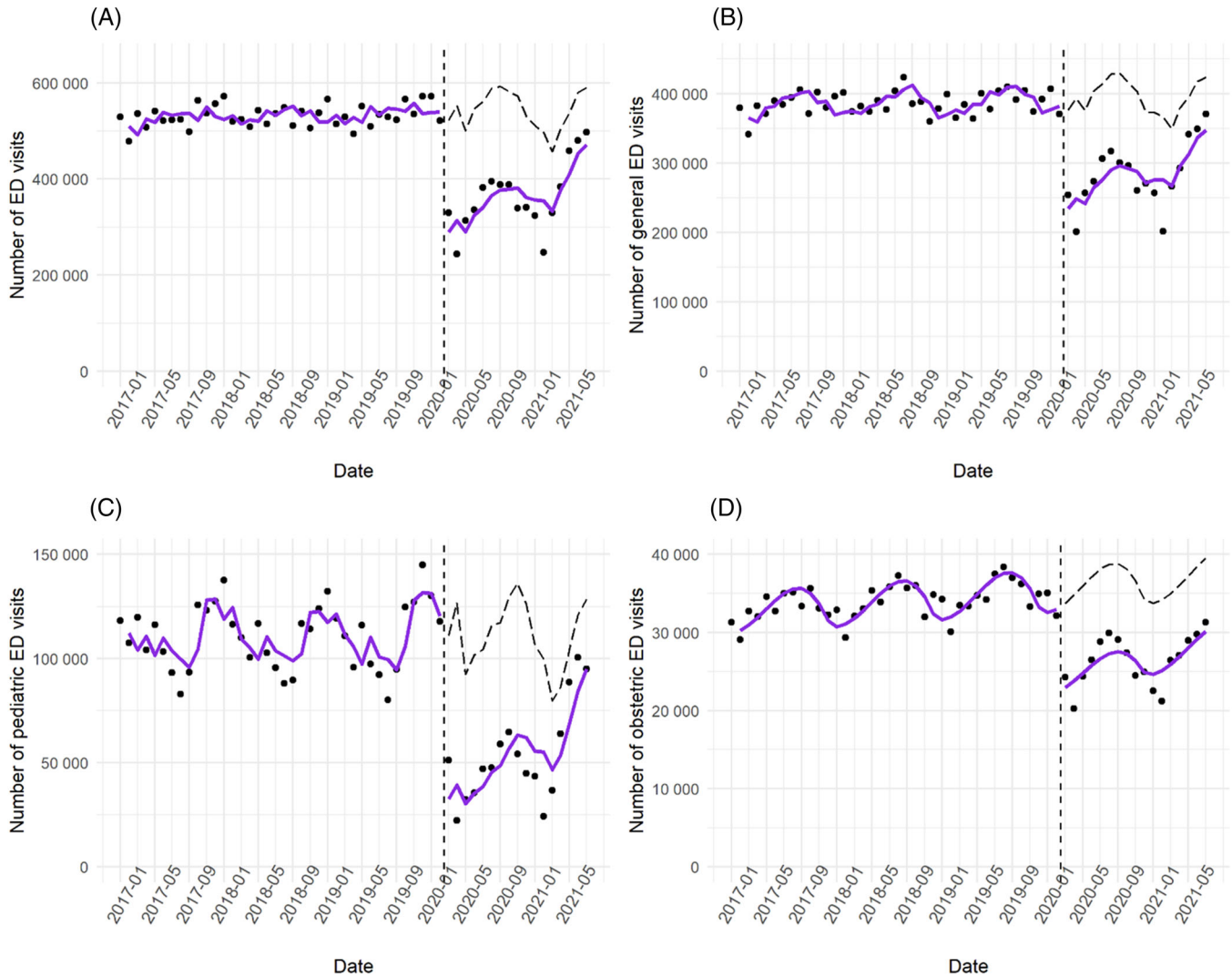
The number of ED visits triaged green decreased 48.9% (95% CI: –42.2% to –54.9%), similarly to those triaged yellow (–46.7%; 95% CI: –41.2% to –51.7%) (Table 2). Excluding the group triaged blue, the decrease in the number of ED visits was progressively smaller as the priority of visits increased, but there were still notable decreases in those triaged red (–26.9%; 95% CI: –20.0% to –33.2%) and orange (–36.6%; 95% CI: –30.7% to –41.9%). The monthly frequency of ED visits triaged blue showed the smallest decrease (–14.3%; 95% CI: –4.5% to –23.1). Analysis by triage color showed increases during the pandemic period, more marked in the subgroups that had seen greater decreases (from blue: 0.9%; 95% CI: 0.003% to 1.8%; to green: 2.8%; 95% CI: 1.7% to 3.9%). However, only the ED visits triaged blue reached the estimated number according to the prepandemic period (dashed line in Figures 1 and 2).

## 4 | LIMITATIONS

This study has some limitations. First, visits recorded as non-triaged were excluded (10.0% of total), which may distort the values of the decrease/increase observed for each triage color analysis if the group composition changed after the pandemic. Second, available data did not have the granularity to identify subgroups with greater changes in ED visits, namely based on age and underlying reason (eg, behavioral, cardiovascular, or trauma). Third, inconsistencies and delays in reporting data from hospitals to the national database may influence our results. We observed a growth in the number of visits in July 2021 compared to June 2021, but possible delays in reporting would lead to an underestimation of the growing trend during the pandemic. Fourth, because we could not isolate COVID-19 cases treated at ED, some of the described decreases may be underestimated. This additional usage for COVID-19 may include initial cases and treatment of sequels in “long-COVID” cases.<sup>24</sup> Fifth, our results may not apply to other countries, partly owing to differences in baseline frequency of ED care, how the incidence evolved during the pandemic, measures adopted by authorities, and social response to the pandemic. However, the data allowed us to conduct a study at the national level for a long pandemic period (18 months until July 2021) and have more robust estimates of ED demand decrease.

## 5 | DISCUSSION

Our study on the use of EDs in the Portuguese National Health Service included over 26 million ED visits between January 2017 and July 2021. We observed a decrease of the overall use of emergency care during the pandemic (–45.7%; 95% CI: –39.8% to –51.2%), reaching the greatest decreases in April 2020 and February 2021. Decrease was



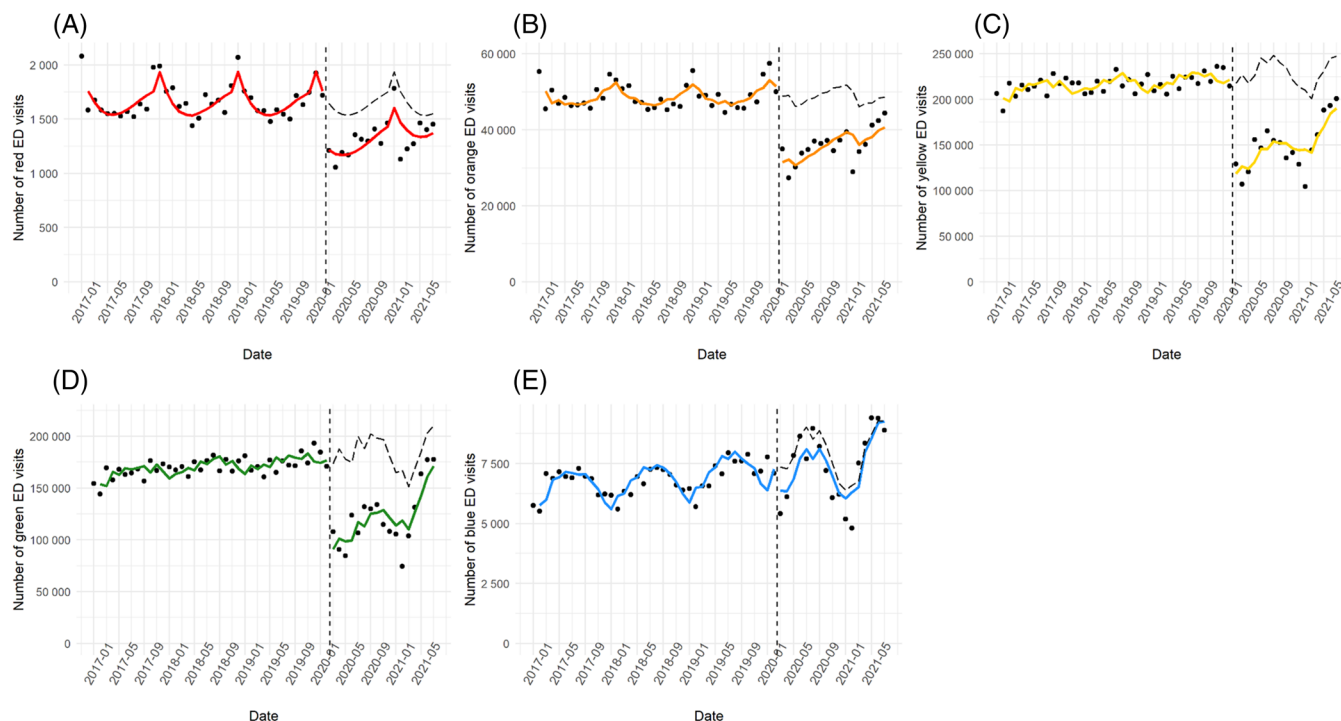
**FIGURE 1** Observed and estimated number of emergency department visits, total and per type of ED, during the prepandemic and pandemic periods. The dots represent the observed number of ED visits in each month and the vertical line represents the beginning of the COVID-19 pandemic (which started in March 2020). The purple lines represent the estimated number of ED visits each month, and the dashed line represents the counterfactual—an estimate of the number of ED visits had the pandemic not occurred. (A) total ED visits, (B) general ED visits, (C) pediatric ED visits, (D) obstetric ED visits. Abbreviation: ED, emergency department.

observed for all analyses (by type of ED and triage color), mostly for pediatric visits and those triaged yellow or green. There was a trend of increasing use during the pandemic period studied (2.3%; 95% CI: 1.4% to 3.2%), even though the number of ED visits in July 2021 did not reach prepandemic values for any of the subgroups, except for those triaged blue.

The COVID-19 pandemic has affected the demand for emergency care globally. A study in Italy described that ED visits decreased 66.2% in March–May 2020, and reductions from 30.9%–45% were described in March–April 2020 in the United States.<sup>3,5</sup> Data for January–June 2020 from Scotland indicate a fall of 40.7%.<sup>9</sup> The scale of these reductions is comparable to or even higher than what we described in Portugal. However, these studies focus on the first pandemic wave period, when sudden drops occurred in a few weeks. Other studies, which also included later phases of the pandemic, showed a smaller

reduction in ED visits than we observed for Portugal. Two studies from China and Canada that included data until September 2020 observed a 22.6% and 35% drop, respectively.<sup>6,7</sup> In Italy, a 23.5% reduction was observed in the late post-wave period (August 18–31),<sup>8</sup> whereas in the United States, the reduction until November was 23%.<sup>8,10</sup> In our data, April 2020 and February 2021 were the months with the 2 lowest frequencies for most of the series subgroups, so the inclusion of a longer period, during which there was a new drop in use, may justify the larger decrease we observed in our study.

In our study, the pandemic led to a decrease of 45% in ED visits, which is a sign of a major and long-lasting change in ED care, in a country known for its frequent use of emergency care<sup>13</sup> and where ED is sometimes seen as a gateway to enter the health system.<sup>11</sup> Despite a smaller change than for other triage colors, the most urgent cases (red and orange; for which there is a higher risk of mortality) also



**FIGURE 2** Observed and estimated number of emergency department visits, per triage color, during the prepandemic and pandemic periods. The dots represent the observed number of ED visits in each month and the vertical line represents the beginning of the COVID-19 pandemic (which started in March 2020). The colored lines represent the estimated number of ED visits each month, and the dashed line represents the counterfactual—an estimate of the number of ED visits had the pandemic not occurred. (A) ED visits triaged red, (B) ED visits triaged orange, (C) ED visits triaged yellow, (D) ED visits triaged green, (E) ED visits triaged blue. Abbreviation: ED, emergency department.

experienced a decrease during the pandemic, thus suggesting potential risks for both chronic and acute diseases. Previous studies report that during the pandemic there were delayed diagnosis<sup>25</sup> and increased mortality,<sup>26</sup> but a possible link with the decreased use of ED needs additional research.

A previous study reports that people avoided going to ED because of fear of being infected and lack of confidence in response to conditions other than COVID-19.<sup>27</sup> We observed that during the initial phase of the pandemic (March and April 2020) and when incidence reached a peak (January 2021), there was a comparatively lower frequency of ED visits. We hypothesized that fear and lack of confidence were more intense in the initial phase of the pandemic—people recoiling from a sudden and unknown threat—and during a high-incidence period, leading to larger decreases in ED use in those periods. Additionally, the return to prepandemic values may reflect changes due to the following: fear of infection because of high vaccination rates, pandemic fatigue, reductions in virulence, or all these factors. These hypotheses merit further study.

The pediatric ED visits decreased dramatically to nearly one third of prepandemic values ( $-72.4\%$ ; 95% CI:  $-64.6\%$  to  $-78.6\%$ ). Compared to our results, several studies describe a smaller decrease and/or for shorter periods.<sup>28,29</sup> In a German hospital, only for the 4 weeks after the lockdown began, the observed drop in pediatric emergency health care use was 63.8%.<sup>28</sup> In a study including 2.2 million visits in 18 US states, the largest drop in ED visits was described for children under 10

years (74% reduction through mid-April 2020), but by the final week in June visits had returned to 50% of prepandemic values for that group.<sup>29</sup> School closure, reduced mobility, and social distancing may have implied reduced risk factors for trauma and infections.<sup>30</sup> However, it is unlikely that the smaller disease burden due to those changes in risk factors was the only reason for such a sharp decrease. Hospitals and/or parents may have found alternative responses to ED, but there is still concern about the possibility that the health system failed to capture children in need of ED care and whether there were groups disproportionately affected.

As described in a recent systematic review,<sup>31</sup> we also found greater decreases for less severe patients (triaged yellow and green). Historically, in Portugal there have been several attempts to reduce the share of ED visits triaged with low priority, including higher priority to those with a referral from a primary care provider. However, in 2019, a report indicated socioeconomic characteristics and patients' expectations combined with an insufficient integration between acute and primary care providers and community institutions as possible reasons for the persistence of that situation.<sup>11</sup> Considering initiatives to contain ED visits before the pandemic,<sup>32</sup> it is worth studying further the factors underlying the decision to avoid ED and its consequences for patients' health outcomes. From the perspective of health providers, it would be interesting to describe initiatives to divert ED demand to other care settings (hospital or primary care) and their sustainability after the pandemic. This is especially so because visits

**TABLE 2** Effect of the COVID-19 pandemic on the frequency of emergency department visits in Portugal: Results from interrupted time series

Subgroups/Parameter	Incidence rate ratio (IRR)	95% confidence interval
<b>Total</b>		
COVID-19 pandemic	0.543	(0.488–0.602)
Trend	1.023	(1.014–1.032)
<b>General</b>		
COVID-19 pandemic	0.612	(0.559–0.669)
Trend	1.017	(1.010–1.025)
<b>Pediatric</b>		
COVID-19 pandemic	0.276	(0.214–0.354)
Trend	1.060	(1.037–1.082)
<b>Obstetric</b>		
COVID-19 pandemic	0.675	(0.629–0.724)
Trend	1.007	(1.001–1.013)
<b>Red</b>		
COVID-19 pandemic	0.731	(0.668–0.800)
Trend	1.011	(1.003–1.019)
<b>Orange</b>		
COVID-19 pandemic	0.634	(0.581–0.693)
Trend	1.016	(1.009–1.024)
<b>Yellow</b>		
COVID-19 pandemic	0.533	(0.482–0.588)
Trend	1.022	(1.013–1.030)
<b>Green</b>		
COVID-19 pandemic	0.511	(0.450–0.578)
Trend	1.028	(1.017–1.039)
<b>Blue</b>		
COVID-19 pandemic	0.857	(0.769–0.955)
Trend	1.009	(1.000–1.018)

Note: Values for “COVID-19 pandemic” indicate the relative/percentage variation between observed number of ED visits and estimated number of ED visits had the pandemic not occurred (counterfactual). Values for “Trend” indicate the relative/percentage variation of the number of ED visits during the COVID-19 pandemic period. The IRR is discussed in the results as percentage increase or decrease to facilitate interpretation. Abbreviation: ED, emergency department.

triaged green—frequent and milder—had the fastest increasing trend during the pandemic. This increase may raise additional concerns if motivated by a lack of response of primary care and/or ambulatory hospital care other than ED. In Portugal, there was a legal determination to cancel or delay scheduled care, so that more professionals were available to respond to COVID-19, whose effects may span long periods. A survey conducted by the World Health Organization at the end of 2020 with 112 countries found that primary care was predominantly affected during the pandemic, with many countries reporting disruptions in routine scheduled visits.<sup>33</sup>

The decision to visit ED is multifactorial.<sup>34</sup> However, investing in the education of patients to recognize when they need urgent care may help reduce avoidance of necessary care during a pandemic or other crises and contain inappropriate demand in the post-pandemic period.

This might be extremely important considering the epidemiological evolution of the pandemic. In January 2022 the incidence increased in Portugal (3892 new cases per million inhabitants),<sup>14</sup> so it is important to reassure those needing urgent care that visiting ED is safe, but at the same time to ensure that non-urgent cases receive appropriate care while avoiding ED crowding.

In summary, our data indicate a considerable and long-lasting effect of the COVID-19 pandemic in ED visits, affecting mainly pediatric and milder cases, which were returning toward prepandemic values as the pandemic progressed. In a country with frequent use of ED, the health system may need to be prepared to respond to pre-pandemic baseline ED demand, together with additional demand because of long-term sequels of COVID-19 cases and delayed care for chronic and acute conditions.

#### AUTHOR CONTRIBUTION

Study design: Sílvia Lopes, Patrícia Soares, and Rui Santana. Data acquisition: Sílvia Lopes and Joana Santos Sousa. Data analysis and interpretation: Sílvia Lopes and Patrícia Soares. Draft manuscript: Sílvia Lopes, with João Victor Rocha. Funding acquisition: Rui Santana. Critical revision of the manuscript: All authors.

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#### CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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