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## Statewide declines in myocardial infarction and stroke emergency department visits during COVID-19 restrictions in North Carolina

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In the United States, efforts to control the coronavirus disease (COVID)-19 pandemic brought sweeping social change, with stay-at-home orders and physical distancing mandates in 43 of 50 states by April 2020. Although these public health measures were intended to curb the spread of COVID-19, their impact on individuals with other health conditions was largely unknown. Initial anecdotal reports described precipitous decreases in emergency department (ED) visits for acute cardiovascular outcomes and were replicated by the results of several larger observational analyses [1–3]. However, these studies relied primarily on data from select health systems or medical groups and few reported on the impact of the pandemic past May 2020. Now, more than a year since the US confirmed its first case of COVID-19, our objective is to provide an understanding of the pandemic's longer-term impact on ED utilization for acute cardiovascular disease. We hypothesized that (1) acute myocardial infarction (AMI) and stroke/transient ischemic attack (TIA)-related ED visits in North Carolina (NC) decreased substantially after a statewide stay-at-home order was announced on March 27, 2020 and that (2) ED visits decreased considerably over the course of 2020 in comparison to 2019.

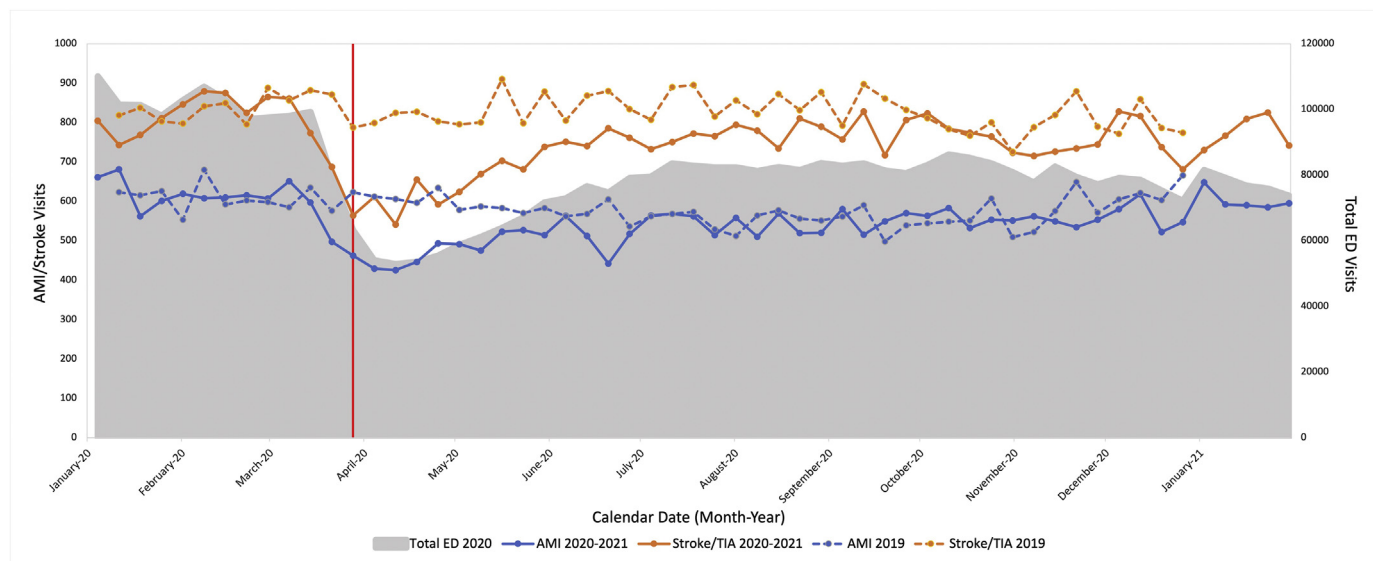
We used data from the North Carolina Disease Event Tracking and Epidemiologic Collection Tool (NC DETECT), a syndromic surveillance system that captures ED data in near-real time for all 126 civilian, hospital-affiliated EDs in NC, to analyze statewide ED utilization from January 4, 2020 to January 30, 2021. Counts of ED visits for AMI and stroke/TIA were tabulated using ICD-10-Clinical Modification diagnosis codes (AMI: I21–I22.9, Stroke/TIA: I60–I63, I66, I67.84, I67.89, I97.81–I97.82, G45.1–G45.2, G45.8–G46, G97.3). We compared the weekly count of AMI and stroke/TIA ED visits recorded before versus after NC's stay-at-home order, and also compared the weekly count of ED visits in 2020 to those recorded over the same period in 2019.

In the months preceding the statewide stay-at-home order (January–March 2020), NC reported an average of 96,778 ED visits per week, including 598 AMI and 792 stroke/TIA visits per week, similar to that reported during the same period in 2019. However, in the months immediately afterwards (April–May 2020), weekly ED visits

for AMI and stroke/TIA fell abruptly (Fig. 1). By April 11th, ED visits reached a nadir at 425 AMI and 541 stroke/TIA visits, reflecting 29% and 32% reductions in visits for each outcome, respectively. In April–May 2020, overall ED visits also decreased by 38%. In contrast, from January to May 2019, no noteworthy changes in overall ED, AMI, or stroke/TIA visits were observed. By mid-May 2020, ED visits began to rebound and by July 2020, AMI visits rose to levels comparable to those of July 2019. However, stroke/TIA visits did not experience a full recovery until December 2020. In January 2021, NC reported an average of 77,416 ED visits per week, demonstrating a 20% reduction in total ED volume when compared to pre-pandemic levels.

Based on a statewide surveillance system that captures all civilian, acute care hospital-affiliated ED visits, we observed that overall ED volume and visits for acute cardiovascular outcomes declined sharply after the establishment of a stay-at-home order in NC. Although AMI ED visits returned to expected levels after a couple of months, and stroke/TIA visits recovered following a similar pattern a few months later, by the beginning of 2021, total ED volume remained substantially lower than prior to the pandemic. These findings suggest that care seeking behaviors for acute emergency health conditions are affected by evolving social distancing guidelines, and that these changes in behavior can be sustained for long periods of time. In the United Kingdom, a second lockdown in November 2020 resulted in a decrease in ED visits for AMI and heart failure that were similar in magnitude to those recorded after the country's first lockdown [4]. This result suggests that the appreciable decline in ED visits reported in our study could be observed again during future interventions to enforce social distancing. Unlike in the United Kingdom, most American states used a multi-phased approach to gradually re-open after initial stay-at-home orders were put in place in March–April 2020. NC did not re-enter a second lockdown, which is possibly why only one sharp decline in ED visits was observed in our study. Given that cardiovascular deaths have also increased in the wake of the pandemic [5], our observed reductions in ED visits for acute cardiovascular outcomes likely reflect a widespread avoidance of critical emergency medical care rather than a decrease in occurrence of cardiovascular emergencies. Our findings highlight the need for improved public health messaging to encourage appropriate care-seeking behaviors for emergency conditions. Public health recommendations must specify that individuals experiencing acute symptoms should continue to seek timely emergency medical care and that hospitals have proper measures in place to minimize potential transmission of COVID-19.

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**Fig. 1.** Statewide trends in myocardial infarction and stroke/transient ischemic attack emergency department visits in North Carolina. Weekly counts of emergency department (ED) visits in North Carolina (2019–2021). After the announcement of a stay-at-home order on March 27, 2020 (red vertical line), overall ED, acute myocardial infarction (AMI), and stroke/transient ischemic attacks (TIA) visits decreased abruptly. AMI and stroke/TIA visits slowly recovered in the following months, but overall ED volume remained low into January 2021.

**References**

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