



Kentucky Board of Emergency Medical Services

A Retrospective Comparison of EMS Stroke Cases

2019 vs. COVID-19 Year 2020

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Report Overview

An estimated 40.9% of U.S. Adults reported avoiding medical care during the Pandemic, including 12% who avoided urgent or emergency care^[1]. In 2020, Kentucky's EMS run volume experienced a notable decrease in comparison to 2019 EMS Run Volume. During the start of the Pandemic (April & May 2020), KY EMS Incidents decreased 11.6% compared to the previous year.

This report identifies normal EMS 911 call volume for Stroke vs. 911 Callers for Stroke during COVID-19. More specifically, this report takes a close look at stroke incidents to determine if there are any disparities between patient demographics, geographic areas of importance, peak incident times, average response times, air transports, and medications administered during Covid-19 year 2020.

The data within this report is from the Kentucky State Ambulance Reporting System (KSTARS).

Stroke Inclusion Criteria

The KBEMS Cardiac & Stroke Care Subcommittee's Stroke Workgroup created the below inclusion criteria to determine Stroke Incidents submitted to KSTARS.

Response Type of Service Requested is equal to 911 response
AND
Incident Complaint Reported by Dispatch Contains Any <ul style="list-style-type: none"> Stroke/CVA, Falls, Seizure, Overdose, Psychiatric Problem/Abnormal Behavior, Eye Problem, Headache, Sick Person, Unconscious, Unknown Problem
AND
Situation Provider Primary Impression Contains Any <ul style="list-style-type: none"> Stroke, TIA
OR
Situation Provider Secondary Impression Contains Any <ul style="list-style-type: none"> Stroke, TIA
OR
Vitals Stroke Scale Score is Equal to Positive

^[1] Czeisler MÉ, Marynak K, Clarke KE, et al. Delay or Avoidance of Medical Care Because of COVID-19–Related Concerns — United States, June 2020. MMWR Morb Mortal Wkly Rep 2020;69:1250–1257. DOI: <http://dx.doi.org/10.15585/mmwr.mm6936a4external icon>.

2019 vs. 2020 911 EMS Data at a Glance

Data Metrics:

Incident Date 01/01/2019 - 12/31/2020

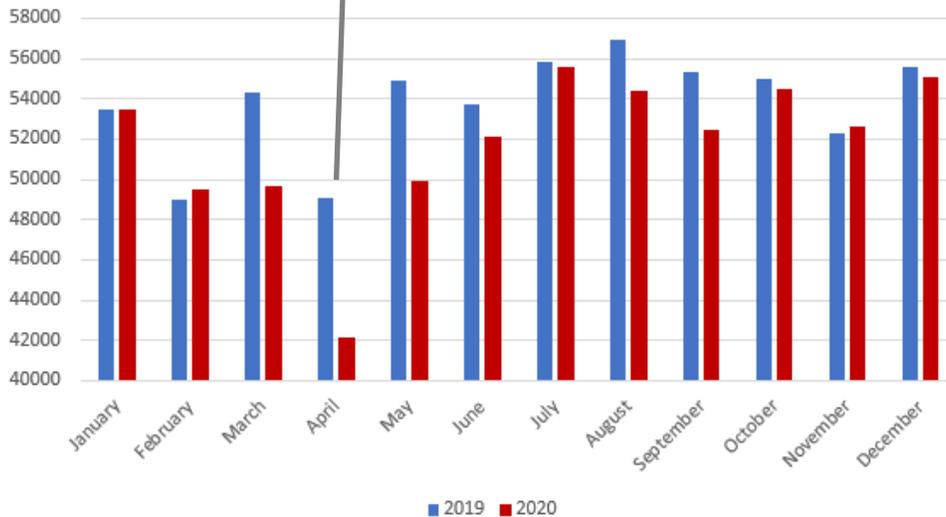
911 Scene Response

Run Volume

2019 911 Incidents = 645,515

2020 911 Incidents = 621,376

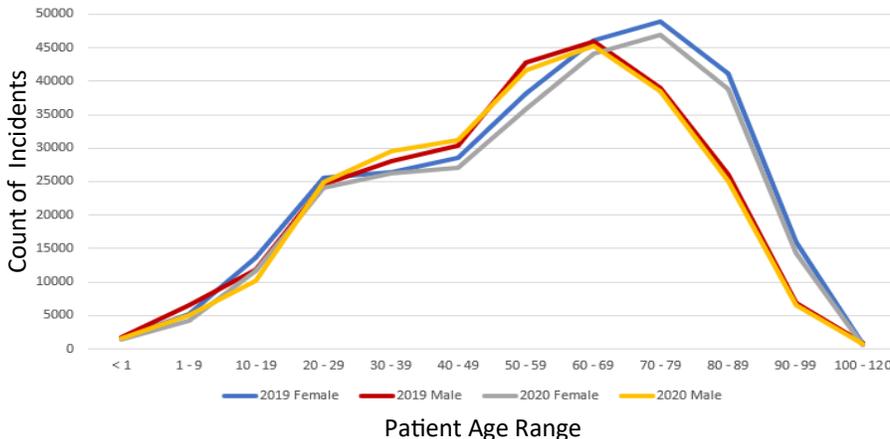
Percent Change = ↓ 3.8%



This data does not include interfacility transports or mutual aid incidents. When analyzing all response types submitted to KSTARS in 2020, incidents decreased 6.7% compared to 2019. In 2019, there were roughly 890,000 incidents, whereas calendar year 2020 only received roughly 831,000 incidents; a decrease of more than 59,000 EMS incidents in Kentucky.

Patient Demographics

911 Response Patient Age Range & Gender



Age Range	2019	2020
< 1	.6%	.5%
1 - 9	2.1%	1.7%
10 - 19	4.6%	4.1%
20 - 29	9.0%	9.2%
30 - 39	9.8%	10.4%
40 - 49	10.6%	10.9%
50 - 59	14.5%	14.5%
60 - 69	16.5%	16.7%
70 - 79	15.8%	15.9%
80 - 89	12.1%	11.9%
90 - 99	4.1%	3.9%
100 - 120	.3%	.3%

2019:
Female = 52.4% , Male = 47.6%

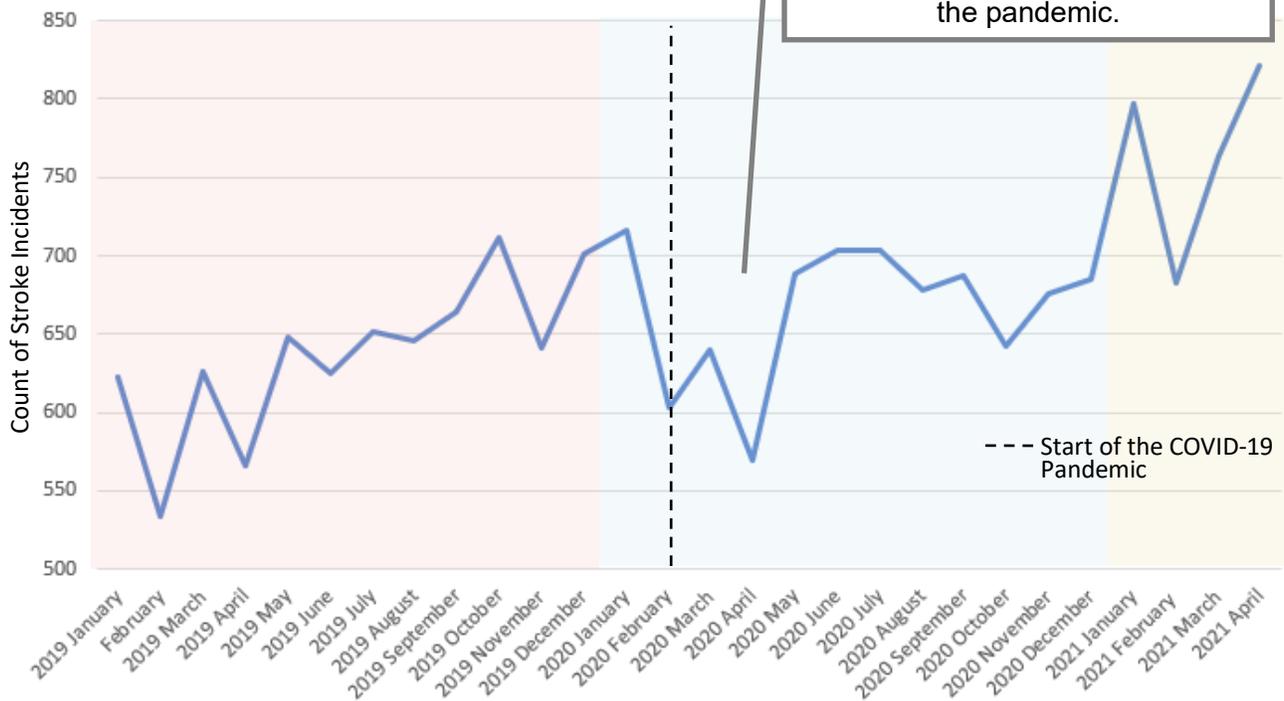
2020:
Female = 51.4% , Male = 48.6%

2019, 2020, & 2021 KY EMS Stroke Incidents

Incident Date 01/01/2019 - 04/30/2021

911 Scene Response

Stroke Incidents



Month	2019	2020	2019 vs. 2020	2021	2020 vs. 2021
January	623	716	↑ 14.9%	797	↑ 11.3%
February	534	603	↑ 12.9%	683	↑ 13.3%
March	626	640	↑ 2.2%	763	↑ 19.2%
April	566	570	↑ .7%	821	↑ 44%
May	648	688	↑ 6.1%	-	-
June	625	704	↑ 12.6%	-	-
July	652	703	↑ 7.8%	-	-
August	646	678	↑ 4.9%	-	-
September	664	687	↑ 3.4%	-	-
October	712	652	↓ 8.4%	-	-
November	641	684	↑ 6.7%	-	-
December	701	692	↓ 1.2%	-	-
Total	7,638	8,017	↑ 4.9%	-	↑ 21.9%

In total, despite COVID-19, stroke incidents increased 4.9% in 2020. However, when considering 2021 stroke incident counts, the data suggests that 2020 stroke incidents would have trended higher if not for COVID-19.

During 2021 (January – April), stroke incidents increased a drastic 21.9%! But why are we seeing a trend of increased stroke incidents with each passing year? Could it be better reporting by EMS agencies, an ever aging population, an increase in unhealthy behaviors, or an increase in education of 911 resources? More research needs to be conducted to answer this crucial question.

Taking a Closer Look: April 2020 Stroke Patients

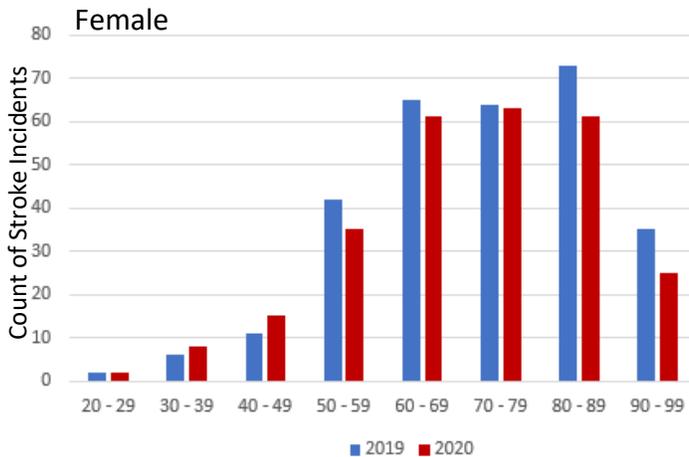
Incident Date (04/01/2019 - 04/30/2019) & (04/01/2020 - 04/30/2020)

911 Scene Response

Stroke Incidents

The below data attempts to expose the patient demographics who were more inclined to avoid 911 resources during April 2020; the month with the lowest count of stroke incidents and the start of the Pandemic.

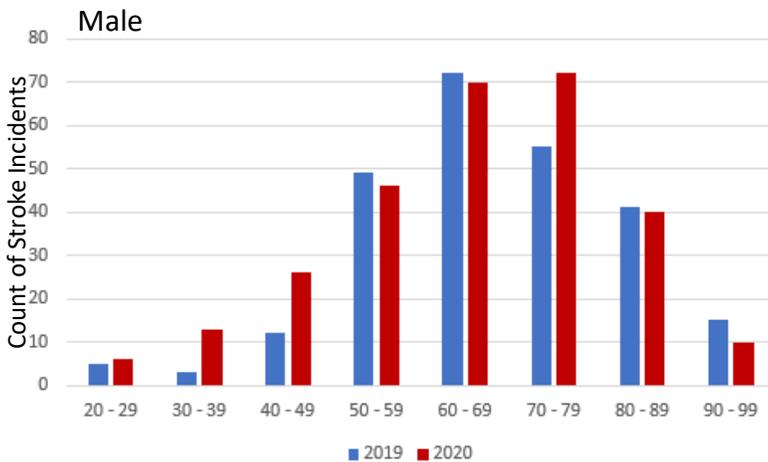
Gender / Age Range



Female Incidents	
Age Range	2019 vs. 2020 Percent Change
20 - 29	0%
30 - 39	↑ 33%
40 - 49	↑ 36%
50 - 59	↓ 16%
60 - 69	↓ 6%
70 - 79	↓ 1%
80 - 89	↓ 16%
90 - 99	↓ 28%

According to the data, female stroke patients 50 + years of age declined on average 13.4%. Their male counterparts did not experience the same decrease in incidents. In fact, male patients between the ages of 70 - 79 increased in incidents 50%! The only notable decrease in incidents for male encounters occurs for those aged 90+.

Stroke patients between the ages of 30 - 49, both males and females, increased in count of incidents during April 2020 when compared to 2019 stroke data.



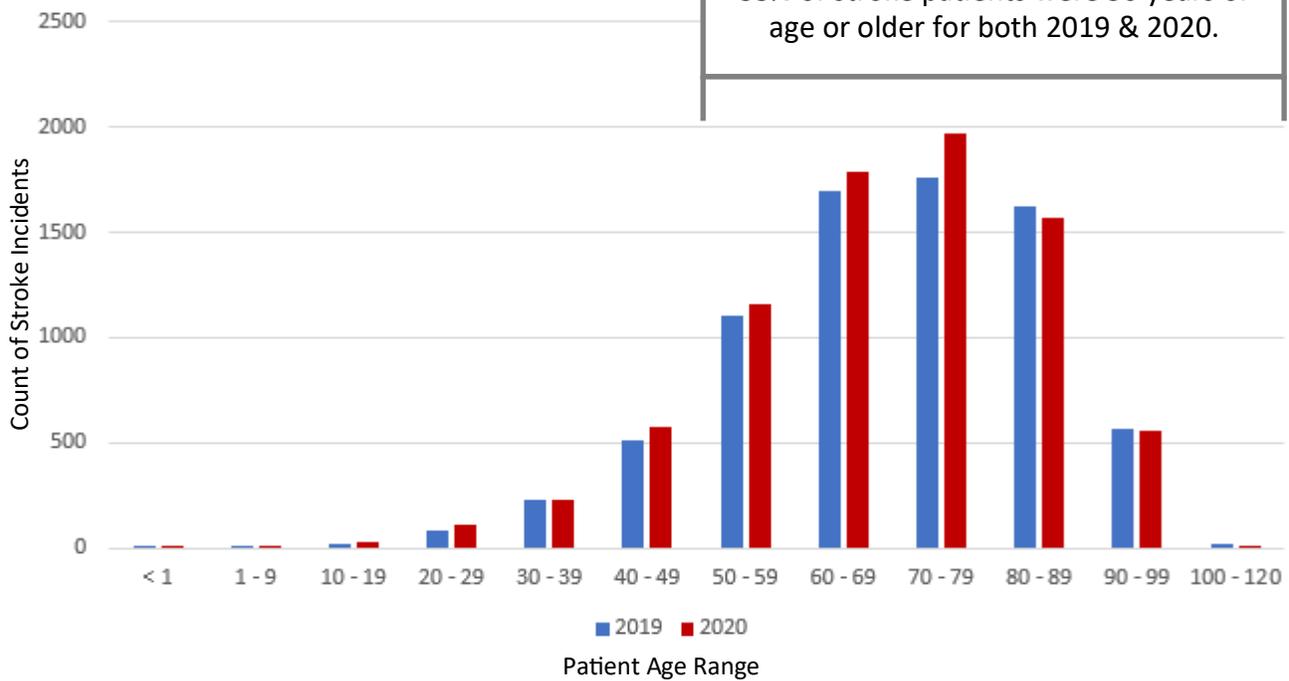
Male Incidents	
Age Range	2019 vs. 2020 Percent Change
20 - 29	↑ 20%
30 - 39	↑ 333%
40 - 49	↑ 116%
50 - 59	↓ 6%
60 - 69	↓ 2.7%
70 - 79	↑ 50%
80 - 89	↓ 2%
90 - 99	↓ 33%

Stroke Patient Demographics: Age Range

Incident Date 01/01/2019 - 12/31/2020

911 Scene Response

Stroke Incidents



Patient Age Range	2019	%	2020	%
<1	2	<1%	3	<1%
1 - 9	5	<1%	9	<1%
10 - 19	21	<1%	33	<1%
20 - 29	85	1%	109	1%
30 - 39	229	3%	228	3%
40 - 49	513	7%	575	7%
50 - 59	1,101	14%	1,161	14%
60 - 69	1,693	22%	1,787	22%
70 - 79	1,760	23%	1,966	24%
80 - 89	1,624	21%	1,570	20%
90 - 99	565	7%	554	7%
100 - 120	23	<1%	13	<1%

In 2020, 25% of all stroke patients were between the ages of 70 - 79.

There is no statistically significant difference between COVID-19 year 2020 and the previous year, in regards to stroke patient age range.

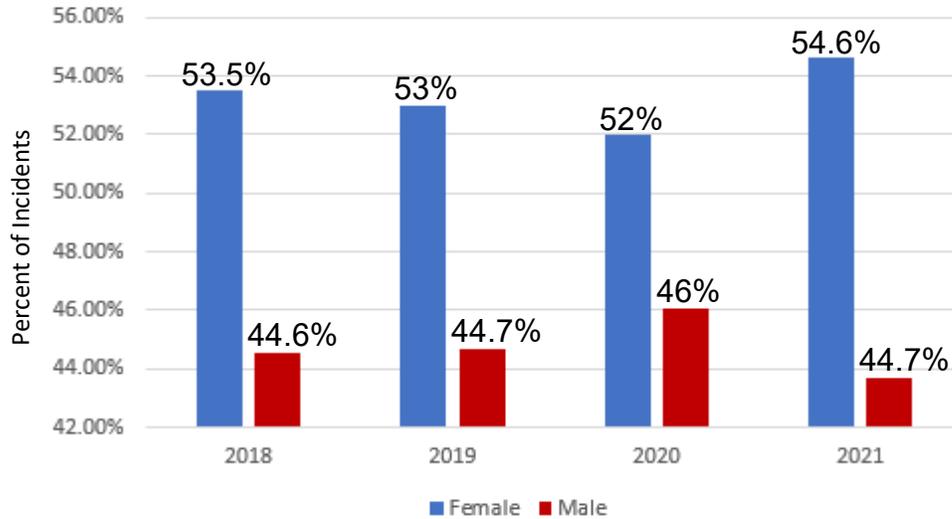
Stroke Patient Demographics: Gender & Race

Incident Date 01/01/2018 - 04/30/2021

911 Scene Response

Stroke Incidents

Patient Gender



Patient Gender	2018	2019	2020	2021	Gender in Kentucky <small>Data from 2019 Census Bureau</small>
Female	53.5%	53%	52%	54.6%	50.7%
Male	44.6%	44.7%	46%	44.7%	49.3%
Not Recorded	1.9%	2.3%	2%	1.7%	-

There was a slight gender disparity within COVID-19 year 2020 for stroke patients. Female incidents slightly declined while male incidents slightly increased, when compared to other years. Year 2020 was the only year between 2018 - 2021 where female stroke patients dropped below 53% and male stroke patients rose above 44%. This data suggests that potential female stroke patients, more than males, avoided 911 EMS resources during COVID-19.

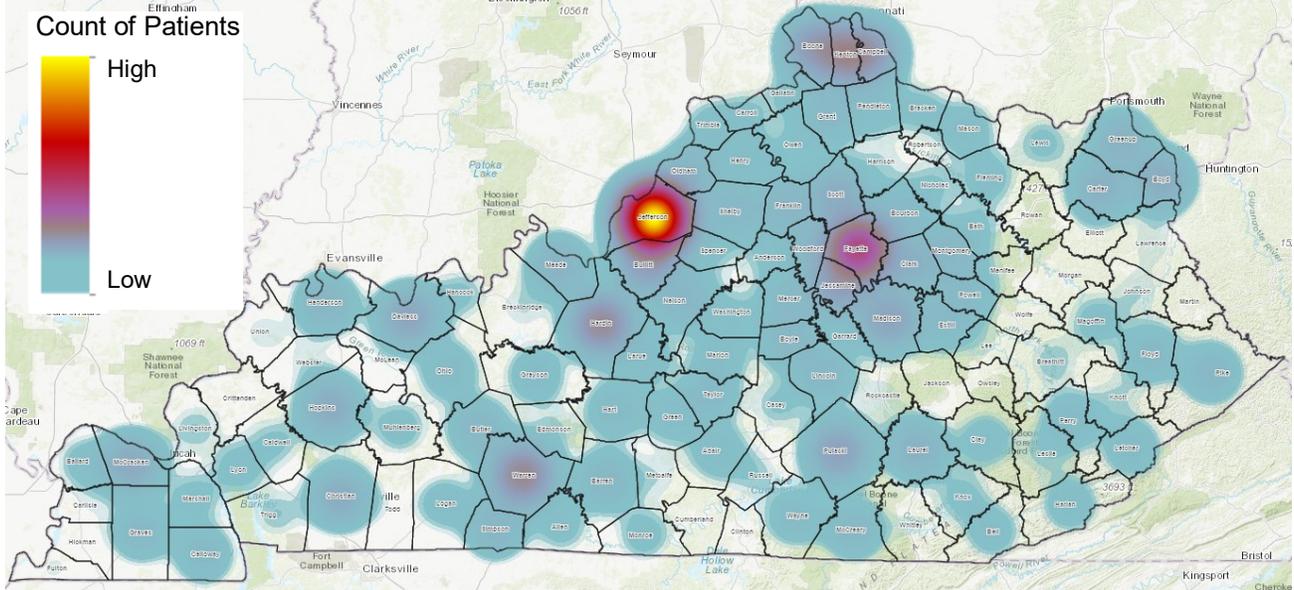
Patient Race

Race	2018	2019	2020	2021	Race in Kentucky <small>Data from 2019 Census Bureau (2% 2 or more races)</small>
American Indian or Alaska Native	0%	0%	0%	0%	.3%
Asian	.2%	.2%	.4%	.4%	1.6%
Black or African American	11.2%	11.3%	11.7%	10.9%	8.5%
Hispanic or Latino	.4%	.4%	.5%	.8%	3.9%
Native Hawaiian or Other Pacific Islander	0%	.1%	0%	.1%	.1%
White	88.1%	88%	87.3%	87.8%	87.5%

There was no notable change in patient race during COVID-19 year 2020.

Stroke Patient Demographics: County of Residence

2019

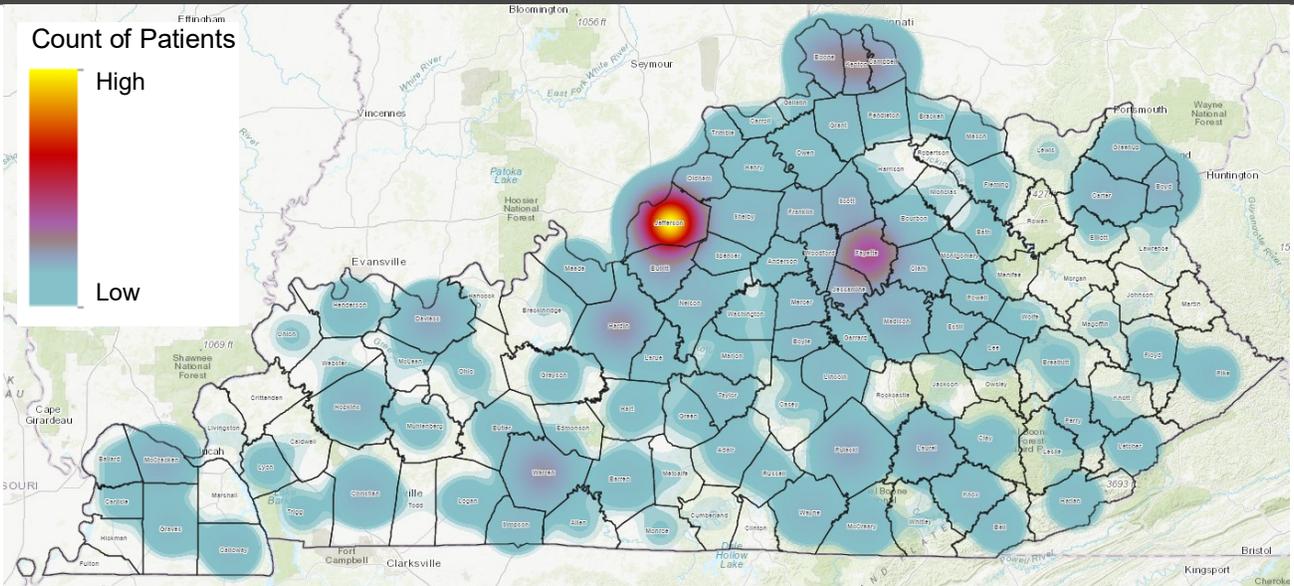


Top 10 Patient Counties of Residence

1. Jefferson County	2. Fayette County	3. Warren County	4. Hardin County	5. Kenton County
6. Boone County	7. Pulaski County	8. Madison County	9. Campbell County	10. Jessamine County

Stroke patient county of residence counts were higher within urban and more populated areas.

2020



Top 10 Patient Counties of Residence

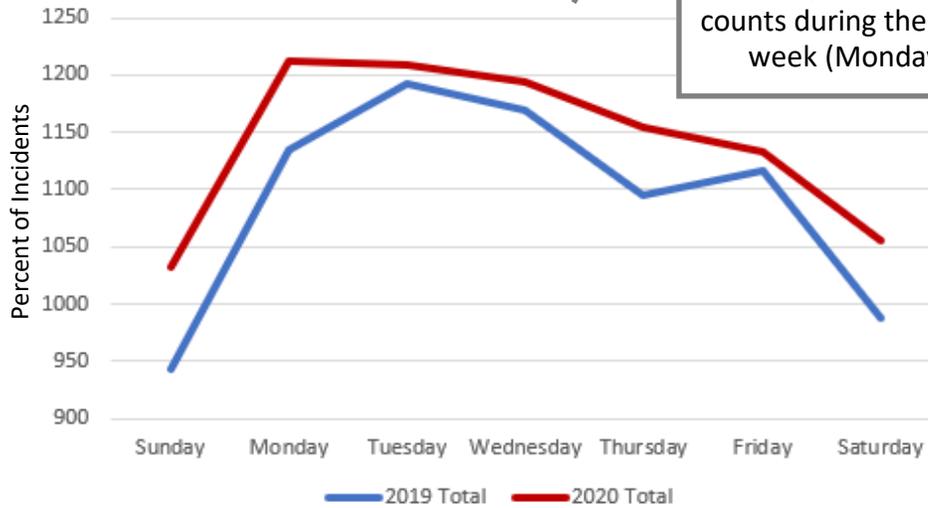
1. Jefferson County	2. Fayette County	3. Hardin County	4. Warren County	5. Kenton County
6. Boone County	7. Pulaski County	8. Daviess County	9. Jessamine County	10. Campbell County

Daviess County replaced Madison County within the top 10 counties of residence for 2020.

Incident Peak Times

Incident Date 01/01/2019 - 12/31/2020
 911 Scene Response
 Stroke Incidents

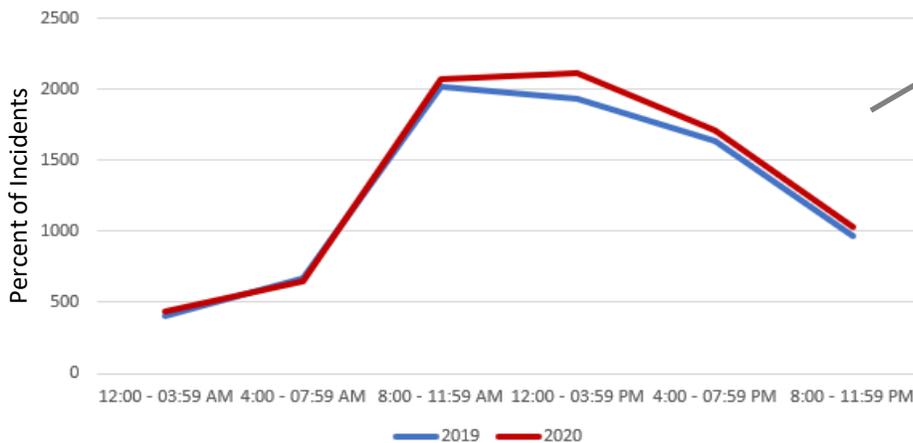
Incident Day of Week



Both 2019 & 2020 share the same trends. Incident counts decrease over the weekend (Saturday & Sunday), and hit peak incident counts during the beginning of the week (Monday & Tuesday).

Incident Year	Incident Week Day						
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
2019	12.3%	14.8%	15.6%	15.3%	14.3%	14.6%	12.9%
2020	12.9%	15.2%	15.1%	14.9%	14.5%	14.2%	13.2%

Incident Hour Range

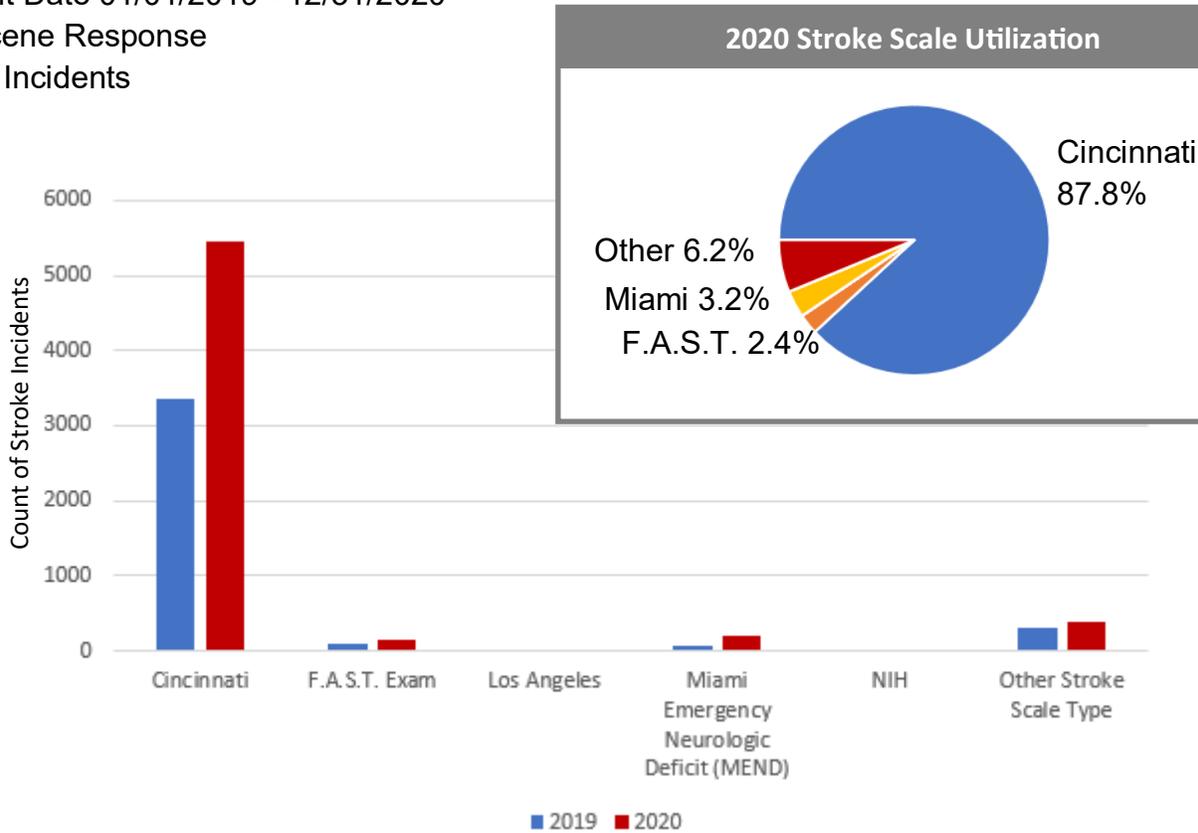


Both 2019 & 2020 stroke incidents have peak incident counts during the middle of the day and drop drastically during the late evening and overnight hours.

Incident Year	Incident Hour Range					
	12:00 - 3:59 AM	4:00 - 7:59 AM	8:00 - 11:59 AM	12:00 - 3:59 PM	4:00 - 7:59 PM	8:00 - 11:59 PM
2019	5.3%	8.8%	26.4%	25.3%	21.5%	12.7%
2020	5.4%	8.1%	25.9%	26.4%	21.4%	12.9%

Stroke Scale Type

Incident Date 01/01/2019 - 12/31/2020
 911 Scene Response
 Stroke Incidents



Stroke Scale Type	2019		2020	
	#	%	#	%
Cincinnati	3,367	87.7%	5,449	87.8%
F.A.S.T. Exam	91	2.4%	152	2.4%
Los Angeles	2	.1%	14	.2%
Miami Emergency Neurologic Deficit (MEND)	71	1.8%	201	3.2%
NIH	5	.1%	8	.1%
Other Stroke Scale Type	302	7.9%	382	6.2%

The Cincinnati stroke scale was the most widely utilized when assessing stroke patients, accounting for 87.8%.

Medications Given & Transport Type

Incident Date 01/01/2019 - 12/31/2020

911 Scene Response

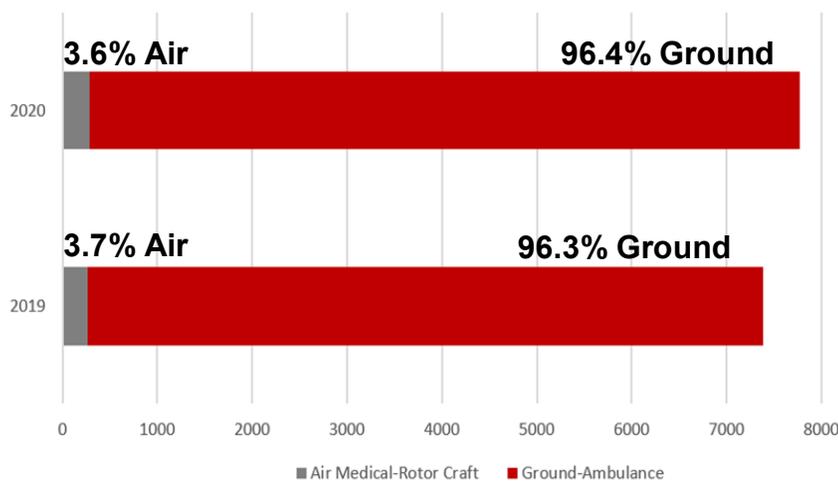
Stroke Incidents

Medications Given

2019		
Medication	#	% of Total Stroke Incidents
1. Oxygen	2,246	29.4%
2. Sodium Chloride	222	2.9%
3. Naloxone	194	2.5%
3. Ondansetron	175	2.3%
5. Midazolam	75	1%
6. Aspirin	39	<1%
6. D50	30	<1%
7. Glucose	27	<1%
9. Fentanyl	25	<1%
10. Lorazepam	24	<1%

2020		
Medication	#	% of Total Stroke Incidents
1. Oxygen	2,087	26%
2. Sodium Chloride	225	2.8%
3. Ondansetron	223	2.8%
4. Naloxone	222	2.8%
5. Midazolam	63	<1%
6. D50	33	<1%
7. Glucose	27	<1%
8. Aspirin	19	<1%
9. Fentanyl	19	<1%
10. Atropine	17	<1%

Air vs. Ground Transports



	2019 Incident Counts	2020 Incident Counts
Ground-Ambulance Transports	7,116	7,477
Air Medical-Rotor Craft Transports	267	289

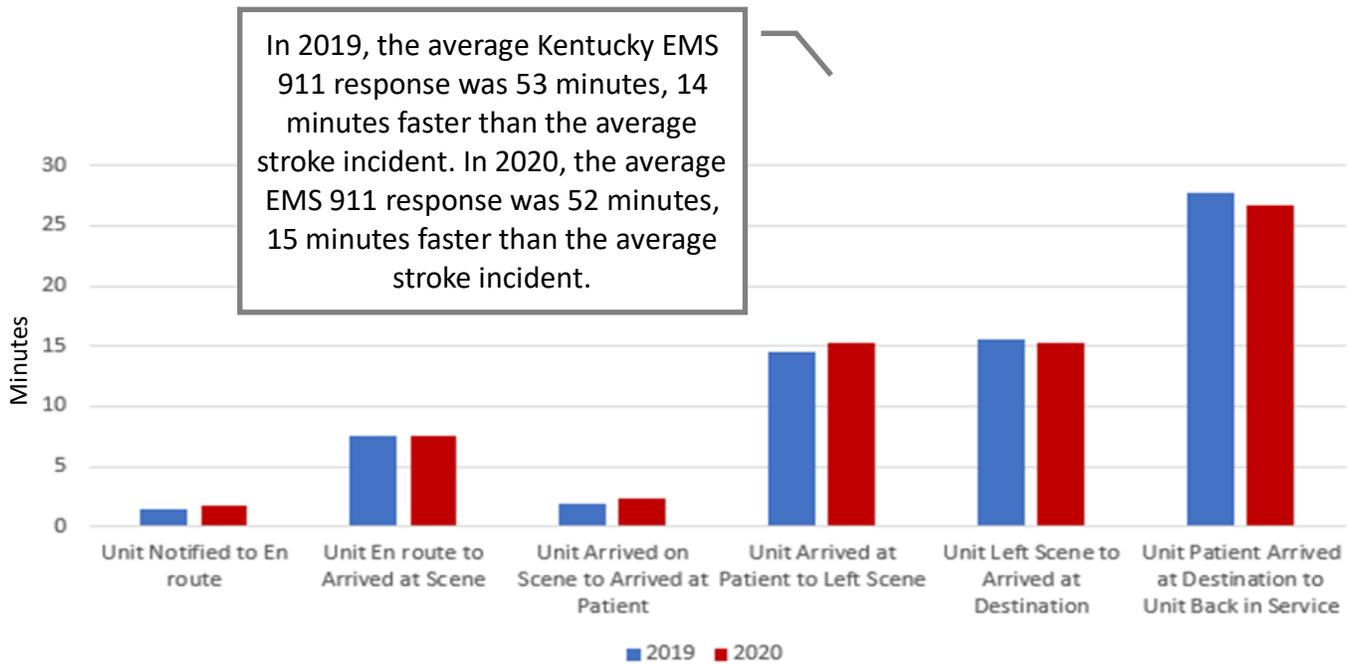
Data does not include blank, not recorded, or not applicable incidents. eDisposition.16 is not a mandatory NEMSIS element.

Average Response Times

Incident Date 01/01/2019 - 12/31/2020

911 Scene Response

Stroke Incidents



Average Response Times	2019	2020
Unit Notified to En route	1.5 Minutes	1.7 Minutes
Unit En route to Arrived on Scene	7.5 Minutes	7.6 Minutes
Unit Arrived on Scene to Arrived at Patient	1.9 Minutes	2.3 Minutes
Unit Arrived at Patient to Left Scene	14.5 Minutes	15.2 Minutes
Unit Left Scene to Arrived at Destination	15.5 Minutes	15.2 Minutes
Unit Patient Arrived at Destination to Unit Back in Service	27.7 Minutes	26.7 Minutes
Average Unit Notified by Dispatch to Unit Back in Service	1 Hr 7.3 Minutes	1 Hr 7.2 Minutes

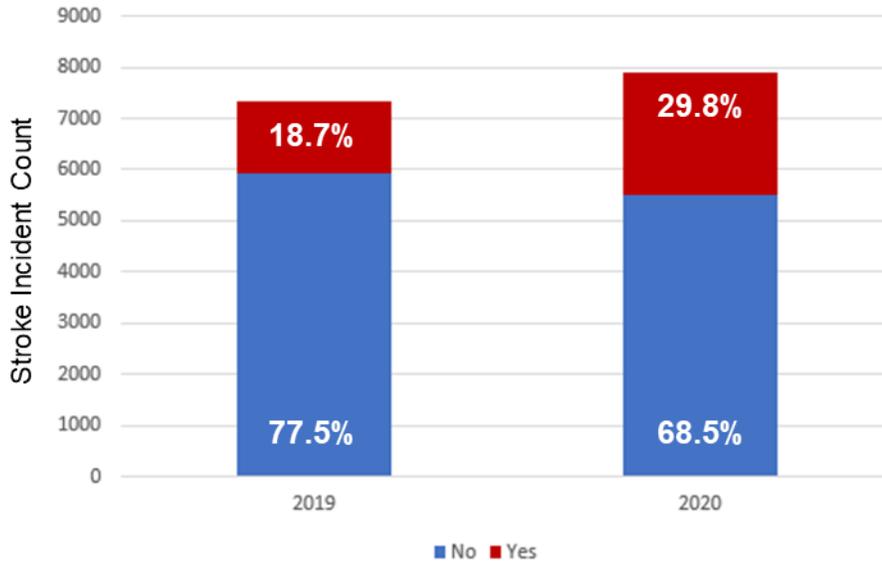
Destination Stroke Team Pre-arrival Activation

Incident Date 01/01/2019 - 12/31/2020

911 Scene Response

Stroke Incidents

In 2020, destination stroke team pre-arrival activations increased by 11.1%.



Destination Stroke Team Pre-Arrival Activation	2019		2020	
	#	% Of Total Stroke Incidents	#	% Of Total Stroke Incidents
Yes	1,432	18.7%	2,388	29.8%
No	5,919	77.5%	5,494	68.5%

*Data does not include blank, not recorded, or not applicable incidents; eDisposition.24 is not a mandatory NEMSIS element.

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