

Trends and Disparities in 2021 EMS Responses to Opioid Overdoses Among Michigan Residents

Executive Summary

Background

Emergency medical services (EMS) data show trends in opioid overdoses before other data sources, such as hospitalization and death records, are available. Since 2019, Michigan has experienced an increase in EMS responses to probable opioid overdoses,¹ peaking in 2020 after the COVID-19 pandemic began, decreasing, and rising again in 2021. This data brief highlights trends and disparities in probable opioid overdoses in 2021. More than one year after the COVID-19 pandemic began, the number and rate of opioid overdose EMS responses continue to be elevated compared to previous years in Michigan.

Key Findings

EMS responses to probable opioid overdoses in Michigan increased 18.8% in 2020 compared to 2019 and 9.3% in 2021 compared to 2020.

Demographics

- In 2021, the rate of EMS responses to probable opioid overdoses in Michigan was:
 - More than double for non-Hispanic Black residents (245.3 per 100,000) compared to non-Hispanic white residents (113.1 per 100,000);
 - By age, highest among 30-39-year-old residents (326.5 per 100,000);
 - More than double for male residents (193.9 per 100,000) compared to female residents (93.1 per 100,000); and
 - By age, sex, and race, highest among non-Hispanic Black males between the ages of 60-69 (1,178.8 per 100,000).
- From 2020 to 2021, Hispanic residents saw the largest increase (39.5%) in the rate of EMS responses to probable opioid overdoses as compared to other demographic groups.

Geography

- In 2021, counties in Southeast Michigan and urban counties saw the highest rates of EMS responses to probable opioid overdoses (168.4 per 100,000 in Southeast Michigan; 187.5 per 100,000 in urban counties). Counties in Northwest Michigan saw the largest increase (28.8%) in the rate of EMS responses to probable opioid overdoses, comparing 2020 to 2021.

Transport Refusal

- In 2019, an average of 11.9% of general EMS responses indicated that the patient refused transport compared to 8.6% of EMS responses to probable opioid overdoses.

¹ Opioid overdoses are estimated using data from the Michigan Emergency Medical Services Information System (MiEMSIS), which collects data on all EMS responses in Michigan. Responses are designated as probable opioid overdoses based on vital signs, provider impressions, initial complaint, medications administered, procedures performed, and information in the patient care narrative. The Michigan case definition is available online: [Michigan EMS case definition 1.13.2022 746082 7.pdf](#)

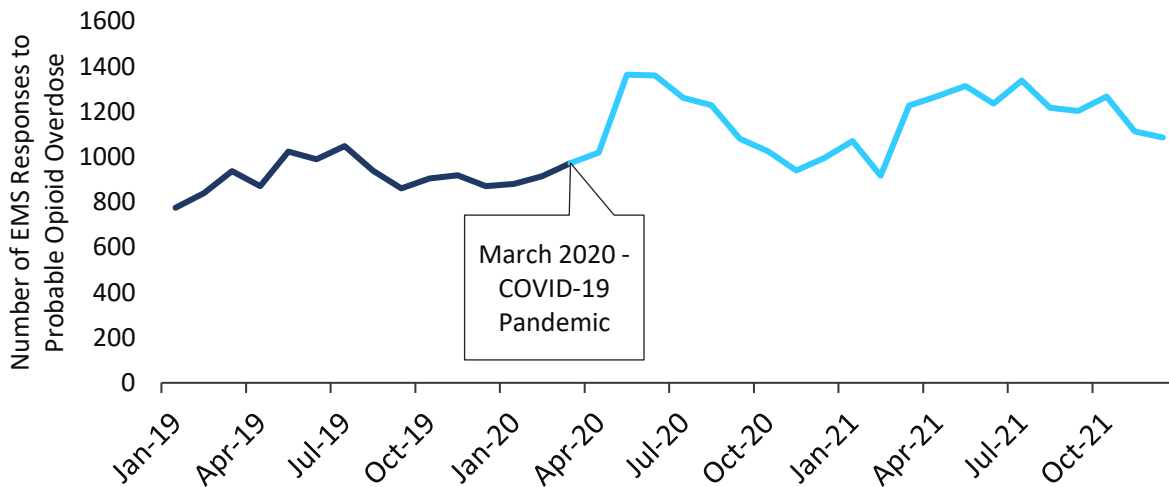
- During 2020-2021, transport refusals increased overall, but especially for EMS responses to probable opioid overdoses. As of the fourth quarter of 2021, the percent of EMS responses to probable opioid overdoses where the patient refused transport (13.0%) surpassed that of general EMS responses (12.8%) for the first time since at least 2019.

Results

Trends

The number of EMS responses to probable opioid overdoses began substantially increasing in April-June 2020, after the start of the COVID-19 pandemic in March 2020. After a decrease in the fall-winter months of 2020-2021, the number of EMS responses to probable opioid overdoses in the spring-summer months of 2021 again increased and approached the peak of 2020, continuing to be elevated at the end of 2021 (Figure 1).

Figure 1. EMS Responses to Probable Opioid Overdoses in Michigan, January 2019 - December 2021



Disparities

From 2019-2021, rates of EMS responses to probable opioid overdoses were not evenly distributed among all Michiganders. Table 1 shows the count of rate (per 100,000 Michigan residents) of EMS responses to probable opioid overdoses by demographic group, with the highest rates highlighted in red. Figures 2-5 show disparities by race/ethnicity; age and sex; age, sex, and race; and geography.

From 2019-2021, the rates of EMS responses probable opioid overdose were highest among non-Hispanic, Black residents; males; residents between the ages of 30 to 39; counties in the Southeast Lower Peninsula of Michigan; and urban counties.

Table 1. Count and Rate (per 100,000 Michigan Residents) of EMS Responses to Probable Opioid Overdoses in Michigan by Demographic Group, 2019-2021^{2, 3, 4, 5, 6}

		2019		2020		2021	
		Count	Rate	Count	Rate	Count	Rate
Race/ Ethnicity	American Indian/Alaska Native, NH	34	47.9	47	66.0	59	82.9
	Asian/Pacific Islander, NH	33	9.2	41	11.3	42	11.6
	Black, NH	2,590	177.6	2,931	201.2	3,574	245.3
	White, NH	7,044	93.1	8,334	110.6	8,519	113.1
	Hispanic	189	35.4	269	49.6	375	69.2
	Other, NH	31	--	26	--	53	--
	Unknown	1,054	--	1,395	--	1,637	--
Sex	Female	4,005	79.0	4,254	84.1	4,709	93.1
	Male	6,950	141.3	8,761	178.5	9,518	193.9
Age Group	0-9	23	2.0	29	2.5	26	2.3
	10-19	168	13.4	183	14.8	203	16.4
	20-29	2,064	149.6	2,494	183.6	2,540	187.0
	30-39	2,879	237.2	3,808	309.7	4,014	326.5
	40-49	1,692	143.5	2,155	185.3	2,337	200.9
	50-59	1,672	123.8	1,908	143.7	2,122	159.8
	60-69	1,571	123.1	1,631	126.3	1,958	151.6
	70-79	480	62.6	503	63.1	670	84.0
	80+	326	79.1	267	64.2	331	79.6
Michigan Region	Northeast Lower Peninsula	266	61.9	428	99.7	512	119.2
	Northwest Lower Peninsula	321	54.3	405	68.4	522	88.1
	Southeast Lower Peninsula	8,313	132.0	9,563	154.9	10,398	168.4
	Southwest Lower Peninsula	1,922	81.1	2,487	107.0	2,635	113.4
	Upper Peninsula	153	51.2	160	35.8	192	42.9
County Urbanicity	Urban	7,633	146.7	8,860	170.8	9,729	187.5
	Suburban	2,303	77.1	2,945	98.7	3,124	104.7
	Rural	1,039	57.8	1,238	69.0	1,406	78.3

² Rates per 100,000 Michigan residents use bridged-race population estimates from CDC WONDER (2019, 2020) as denominators.

³ NH – Non-Hispanic

⁴ Records with missing geographic information are excluded from analyses (2% of all EMS responses from January 2019-December 2021).

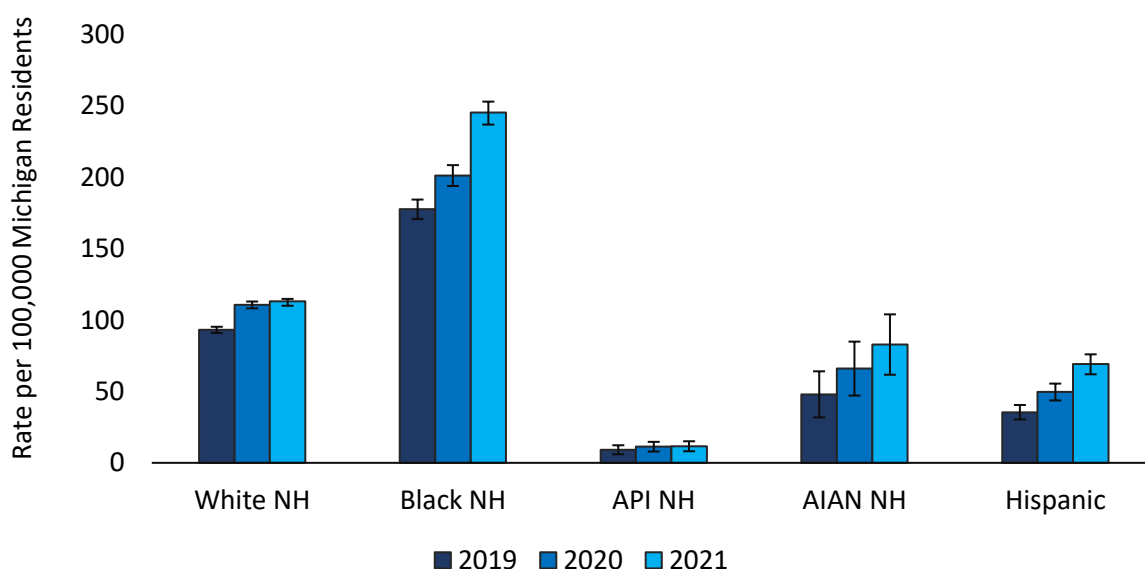
⁵ “Urbanicity” follows the National Center for Health Statistics (NCHS) 3-level urbanicity classification. See Data Notes.

⁶ (--) Rates are not calculated for “Other” and “Unknown” racial groups due to lack of a denominator population estimate.

Disparities – Race/Ethnicity

For each year during 2019-2021, rates of EMS responses to probable opioid overdoses were significantly higher for non-Hispanic Black residents than other racial/ethnic groups, and significantly higher for non-Hispanic Black residents in 2021 compared to previous years (Figure 2, Table 1).^{7,8} From 2020 to 2021, across racial and ethnic groups, Hispanic residents saw the largest increase in the rate of EMS responses to probable opioid overdoses (39.5%). From 2019-2021, 10.6% of EMS responses to probable opioid overdoses were missing information for race and ethnicity, with the Northwest and Southwest Lower Peninsula having more complete race/ethnicity information (8.6% and 5.2% missing, respectively) compared to the Southeast (11.9%) and Northeast Lower Peninsula (12.2%), and the Upper Peninsula (15.6%). Missing race/ethnicity information results in undercounting, and geographic differences in data completeness could bias results.

Figure 2. Rate of EMS Responses to Probable Opioid Overdose per 100,000 Michigan Residents, by Race and Ethnicity, 2019-2021⁷



Disparities – Age/Sex

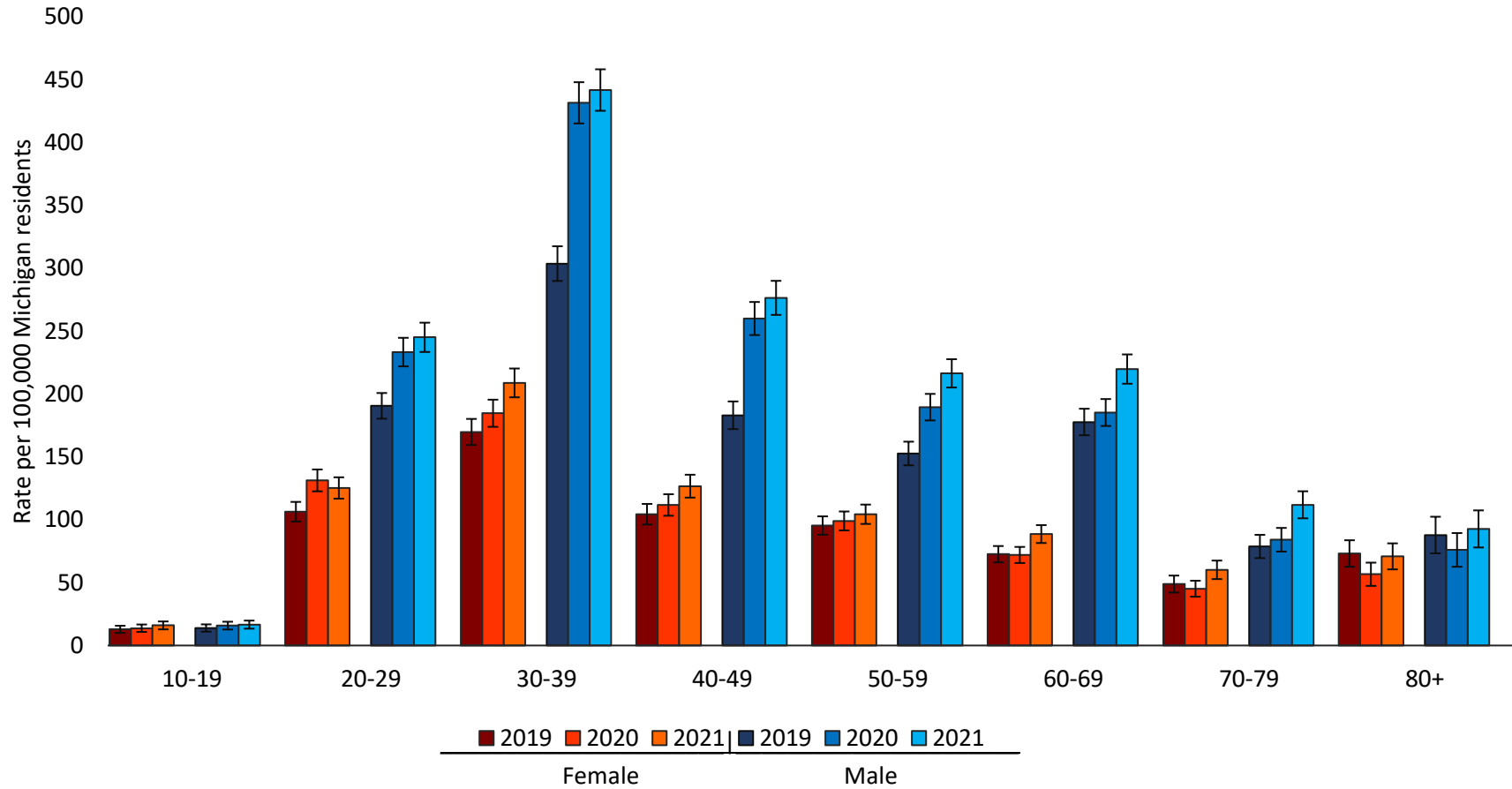
From 2019-2021, for both males and females, the rate of EMS responses to probable opioid overdoses was highest among the 30-39 age group (Figure 3)^{9,10} and significantly higher than all other age groups each year. In 2021, the rate for males ages 30-39 (441.8 per 100,000 residents) was more than double that for females in the same age group (208.8 per 100,000). From 2020 to 2021, several age groups had significant increases in the rate of EMS responses to probable opioid overdoses: females ages 30-39; males ages 50-59; and males and females between the ages of 60-69 and 70-79. The 70-79 age group saw the largest increase in the rate of EMS responses to probable opioid overdoses from 2020 to 2021 (32.9% for males and 33.5% for females).

⁷ Error bars represent 95% confidence intervals for crude rates. Where confidence intervals do not overlap, there is significant ($p < 0.05$) difference between groups and timeframes.

⁸ Abbreviations: NH – non-Hispanic; API – Asian/Pacific Islander; AIAN – American Indian/Alaska Native

⁹ Rates of EMS responses to probable opioid overdoses for ages 0-9 are not displayed in Figure 3 for legibility.

Figure 3. Rate of EMS Responses to Probable Opioid Overdose per 100,000 Michigan Residents, by Sex and Age Group, 2019-2021

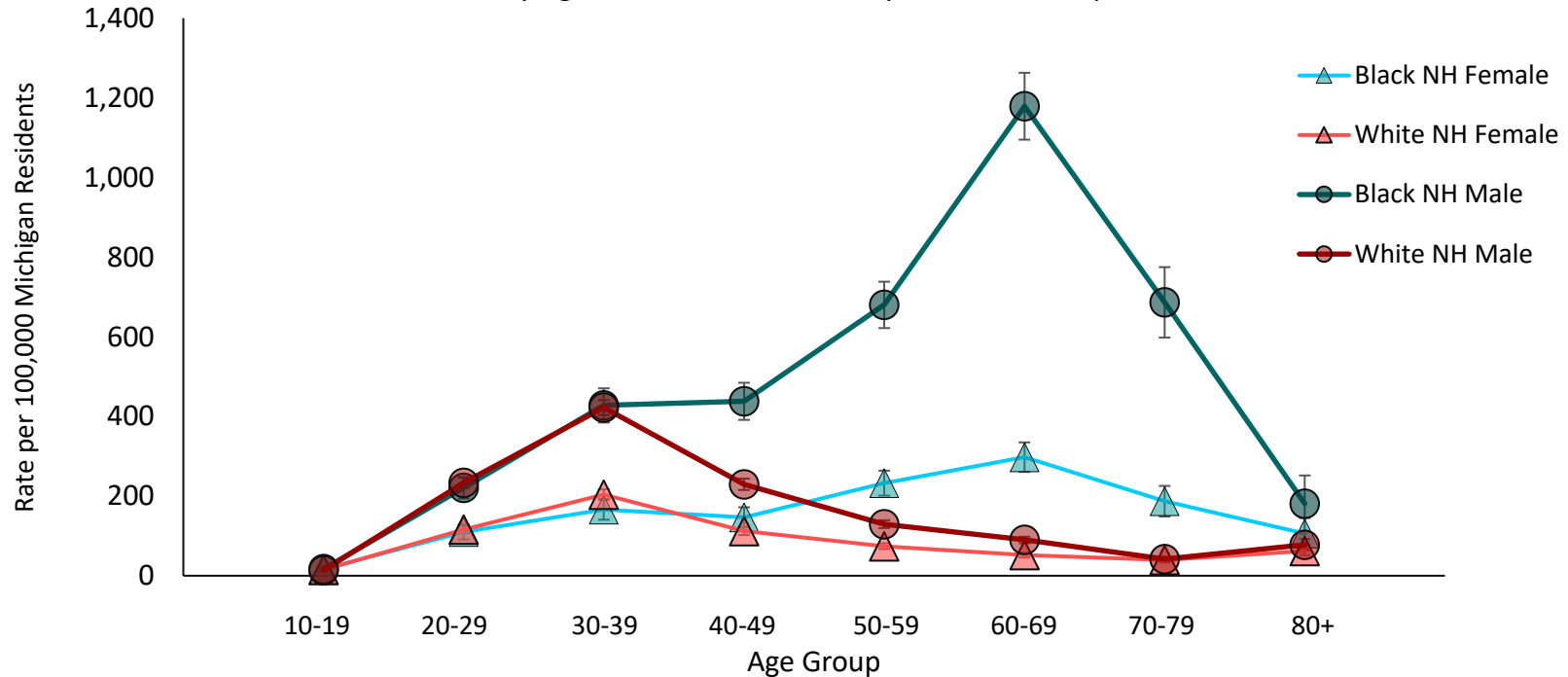


¹⁰ Error bars represent 95% confidence intervals for crude rates. Where confidence intervals do not overlap, there is significant ($p < 0.05$) difference between groups and time frames.

Disparities — Age, Sex, and Race/Ethnicity

The rate of EMS responses to probable opioid overdoses among all Michigan residents in 2021 was 143.1 per 100,000 but was much higher among some demographic groups (Figure 4).^{11,12} The rate of EMS responses to probable opioid overdoses in 2021 was significantly highest among non-Hispanic Black males between the ages of 60-69 (1,178.8 per 100,000 residents). The rates for non-Hispanic Black male residents were significantly higher for ages 40-49, 50-59, 60-69, and 70-79 compared to non-Hispanic Black females, non-Hispanic white males, and non-Hispanic white females of the same ages. The rates for non-Hispanic Black female residents, ages 50-59, 60-69, and 70-79, were significantly higher than non-Hispanic white males and non-Hispanic white females of the same ages.

Figure 4. Rate of EMS Responses to Probable Opioid Overdoses per 100,000 Michigan Residents by Age, Sex, and Race/Ethnicity for Select Groups, 2021^{11,12}



¹¹ Error bars represent 95% confidence intervals for crude rates. Where confidence intervals do not overlap, there is significant ($p < 0.05$) difference between groups.

¹² Groups are shown in Figure 4 where rates can be calculated across ages 10-80+. See Table 2 for all rates by age group, sex, and race/ethnicity.

Disparities — Age, Sex, and Race/Ethnicity (continued)

In Table 2, by sex and age, the demographic group with the highest rate of EMS responses to probable opioid overdoses in 2021 is highlighted.

Table 2. Count and Rate (per 100,000 Michigan Residents) of EMS Responses to Probable Opioid Overdoses in 2021, by Race/Ethnicity, Sex, and Age Group^{13,14,15,16,17}

Race/Eth	Sex	Age Group															
		10-19		20-29		30-39		40-49		50-59		60-69		70-79		80+	
		Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate
AIAN NH	Female	*	*	11	191.4	*	*	*	*	*	*	*	*	0	0	0	0
	Male	0	0	10	174.9	11	245.6	8	198.3	*	*	*	*	*	*	0	0
API NH	Female	*	*	*	*	*	*	*	*	0	0	0	0	*	*	0	0
	Male	*	*	**	**	*	*	*	*	*	*	6	49.4	0	0	0	0
Black NH	Female	17	16.4	130	110.1	160	166.4	134	146.9	211	232.4	247	297.7	91	187	28	105.7
	Male	18	16.8	260	220.5	382	427.6	339	437.9	524	680	757	1178.8	231	686.3	25	180.8
Hispanic	Female	*	*	16	35.1	35	96.2	21	63.9	15	64.8	*	*	*	*	*	*
	Male	7	12.9	57	118.3	72	180.3	61	180.8	54	225.3	13	87.6	*	*	*	*
White NH	Female	62	14.8	538	116.2	905	203.7	484	112	398	74.2	287	51.6	144	39.7	135	61.9
	Male	61	13.8	1144	233.6	1921	422.2	996	229.5	683	129.5	471	89.9	133	41.8	110	77.8

¹³ By sex and age, the demographic group with the highest rate is highlighted.

¹⁴ Abbreviations: NH – non-Hispanic; API – Asian/Pacific Islander; AIAN – American Indian/Alaska Native

¹⁵ (*) Counts between 1 and 5 are suppressed to protect the identities of individuals, and rates are not calculated where counts are between 1-5 due to statistical instability.

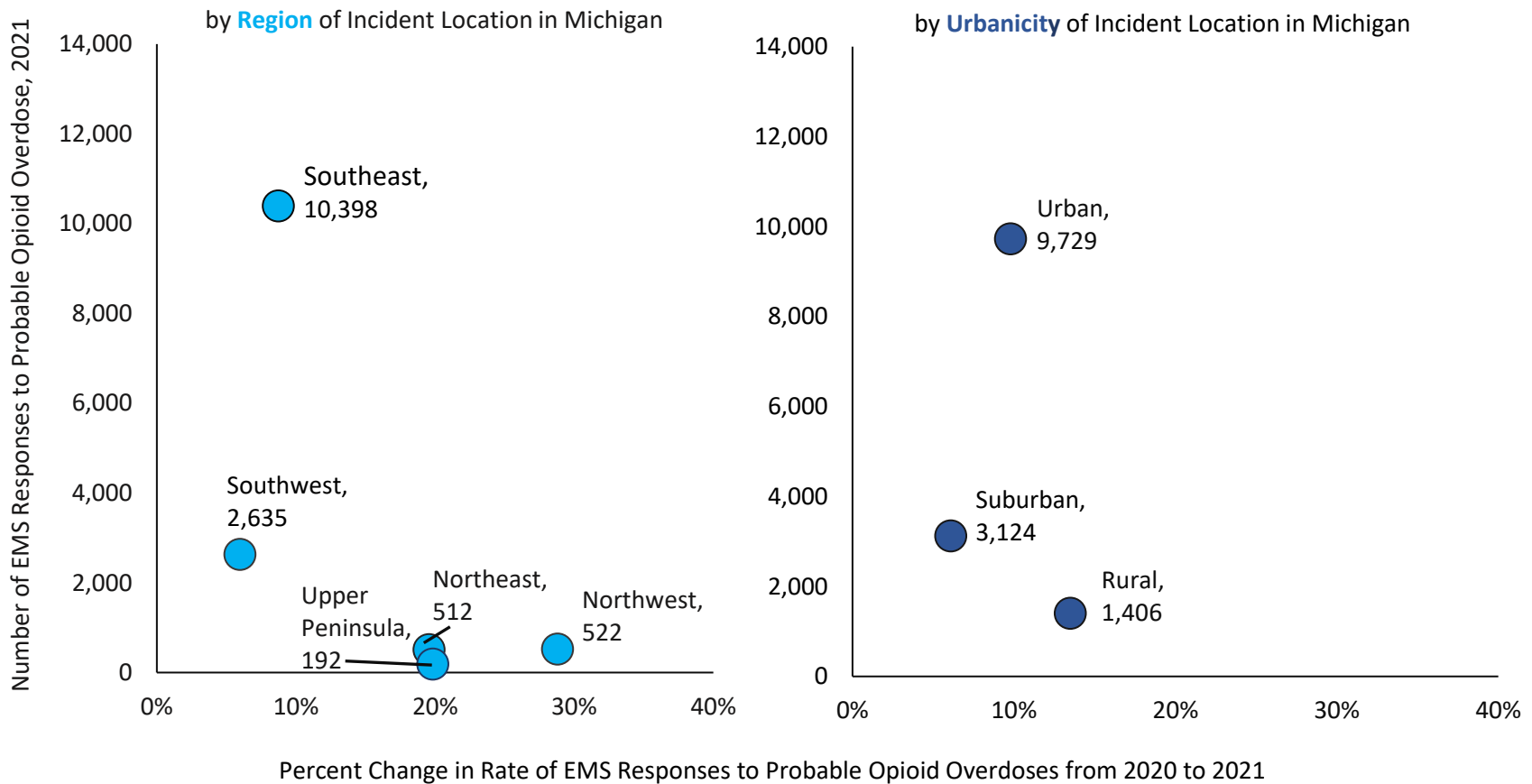
¹⁶ (**) Additional suppression has been applied to prevent back-calculation of suppressed values.

¹⁷ Counts and rates for ages 0-9 are not included in Table 2 as most groups have suppressed counts.

Disparities — Geography

By incident location, counties in Southeast Michigan and urban counties had the highest counts and rates of EMS responses to probable opioid overdoses from 2019-2021 (Figure 5, Table 1). Less populated areas of the state—counties in the Northeast and Northwest Lower Peninsula, Upper Peninsula, and rural areas—saw the largest increases in EMS responses to probable opioid overdose rates from 2020 to 2021. From 2020 to 2021, all Michigan regions and urbanicity designations saw an increase in the number and rate of EMS responses to probable opioid overdoses.

Figure 5. Number of EMS responses to Probable Opioid Overdoses in 2021 vs Percent Change in Rate from 2020 to 2021 by Geography

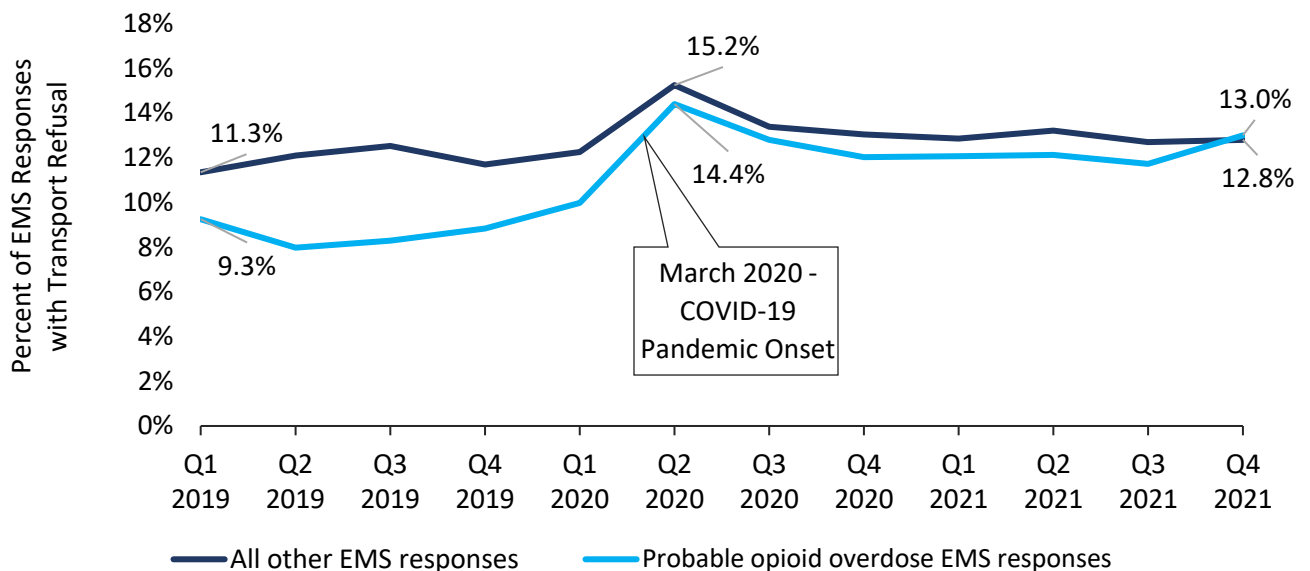


Transport Refusal

In 2019, an average of 11.9% of general EMS responses indicated that the patient refused transportation to the hospital compared to 8.6% of EMS responses to probable opioid overdoses. The percent of patient transport refusal increased at the onset of the COVID-19 pandemic, reaching a peak of 14.4% among EMS responses to probable opioid overdoses and 15.2% for all other EMS responses in the second quarter of 2020 (Figure 6).

From 2019-2020, the transport refusal gap between general EMS responses and EMS responses to probable opioid overdoses narrowed. However, as of the fourth quarter of 2021, the percent of EMS responses to probable opioid overdoses where the patient refused transport (13.0%) surpassed that of general EMS responses (12.8%) responses for the first time since 2019.

Figure 6. Percent of EMS Responses with Transport Refusal, among Probable Opioid Overdose EMS Responses and All Other EMS Responses, January 2019 - December 2021



Recommendations

- The EMS Leave Behind Naloxone Program should be supported and expanded, providing life-saving medication to people who have experienced an overdose.
- Harm reduction and prevention programs should continue addressing disparities by working with communities to create strategies that are tailored, accessible, and relevant to residents.
- Support of harm reduction and prevention services is needed across Michigan, but especially in Southeast Michigan and urban counties—where the number of opioid overdose EMS responses are highest. In less-populated areas where opioid overdose EMS responses are increasing, strengthening of services is needed.
- Communities across Michigan need support in recovering from issues exacerbated by the COVID-19 pandemic: unemployment, isolation, and inability to seek support in traditional ways.

Resources

Listed below are resources that can help connect individuals struggling with substance use disorder or otherwise at risk for overdose to programs that can help.

If you or someone you know uses drugs:

- Practicing safer drug use (safety practices that prevent overdose deaths) can help save a life. More information is available in [Safer Drug Use during the COVID-19 Outbreak](#).
- Individuals and organizations can request free naloxone, a medication that can reverse opioid overdoses, online at nextdistro.org/michigan. Naloxone will be mailed discretely to the requestor at no cost.
- Individuals can also receive naloxone without a prior prescription at pharmacies participating in the MDHHS Naloxone Standing Order. [Find a participating pharmacy near you](#).
- Find a [Syringe Service Program near you](#) that can provide sterile needles, naloxone, testing for HIV and Hepatitis C, and other life-saving resources.
- [Access resources to support the mental and physical health](#) of those with substance use disorder during the COVID-19 pandemic.
- Contact your primary care provider before you run low on necessary medications. If you need access to a medical provider, contact your nearest [Federally Qualified Health Center](#) for support.

If you or someone you know would like to seek substance use disorder treatment:

- Treatment centers continue to operate during COVID-19. [Find a center near you](#).

If you are a healthcare professional and would like more information about how you can help prevent overdoses:

- Access the [Michigan Safer Opioid Prescribing Toolkit](#) to learn more about managing acute and chronic pain and current opioid prescribing guidelines.
- Buprenorphine is one of several medications used to treat opioid use disorder. Learn more about how eligible providers can become approved to [prescribe buprenorphine](#).

Technical Notes

Data Sources

- 2019-2021 Michigan Emergency Medical Services Information System (MiEMSIS), Michigan Department of Health and Human Services Bureau of EMS, Trauma, and Preparedness.
- National Center for Health Statistics (NCHS), Bridged-Race Population Estimates. Bridged-race Vintage 2019, 2020 (2010-2020) postcensal population estimates (released by NCHS on 9/22/2021).

Statistical Notes

- For Figures 2-4, 95% confidence intervals were calculated for crude rates using the Poisson distribution; Figure 6, 95% confidence intervals for test of given proportions. Analyses performed using R, Version 3.6.1.

Limitations

- Because of a data system transition (National EMS Information System 2, or NEMSIS2, to NEMSIS3), 2019 marks the beginning of the most complete EMS data for reporting in Michigan.
- The EMS responses to probable opioid overdose case definition may not capture all opioid overdoses.

- Manual adjudication of a statewide random sample indicated that 9% of cases designated as opioid overdoses by this case definition were not true opioid overdoses.
- An individual can appear in the dataset more than once if they had more than one overdose encounter with EMS in the given time frame.
- The data represent EMS responses to probable opioid overdoses that occurred (i.e., were responded to) in Michigan or the specified region and may not necessarily have occurred among residents of Michigan or specific region.
- For rates, the numerator (EMS responses to probable opioid overdoses) is based on occurrence location, not patient residence, due to a high percentage of missing data for patient residence. The denominator (number of residents) is based on residence of the Michigan population.
- In fall 2020, some EMS agencies experienced reporting issues that led to missing data; data from Muskegon County (September to November 2020) and Genesee County (September 2020) are likely underestimates. The degree of undercounting is unknown.

Definitions

- **Opioid overdoses** are estimated using Michigan Emergency Medical Services Information System (MiEMSIS) data, which houses information on all EMS responses in Michigan. Responses are designated as probable opioid overdoses based on vital signs, provider impressions, initial complaint, medications administered, procedures performed, and the patient care narrative.
- **Transport refusal** is defined where the patient disposition field includes refusal of treatment, transport, and/or evaluation/care.
- **Urbanicity** is defined at the county level, using the [NCHS Urbanicity Key](#), 3-level classification.

3-Level Classification	NCHS Classification	Description
Urban	Large central metro	• “Central” counties of metropolitan statistical areas (MSAs) of 1 million or more population
	Medium metro	• Counties with MSAs of 250,000 to 999,999 population
	Small metro	• Counties with MSAs of 50,000 to 249,999
Suburban	Large fringe metro	• “Fringe” counties of MSAs of 1 million or more population
Rural	Micropolitan	• Counties in micropolitan statistical areas
	Noncore	• Counties not within micropolitan statistical areas

- **Region** is defined at the county level, dividing Michigan into five regions (below).



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