

February 2019

MICHIGAN ASTHMA ATLAS:

Prevalence, Hospitalization, &
Mortality by Counties & Regions
among Michigan Adults & Children



Michigan Department of Health & Human Services

Michigan Asthma Atlas Overview

Introduction

Asthma is a chronic respiratory condition that is often characterized by difficulty in breathing, coughing, tightness of the chest, airflow limitation, and inflammation and hyperresponsiveness of the airways. Although asthma cannot be cured, asthma symptoms can be reduced through proper management and care.

Michigan has a high burden of asthma. As of 2016, Michigan had the sixth highest prevalence rate (10.9%)¹ of current asthma among adults compared to other US states.

This report details the distribution of asthma across Michigan counties and prosperity regions by several asthma indicators, including current asthma prevalence, lifetime asthma prevalence, asthma hospitalizations rates, and asthma mortality rates.

Table of Contents

Data Sources and Methods	2
Map of Michigan with County Names	3
Adult Lifetime Asthma Prevalence	4
Adult Current Asthma Prevalence	5
Map of Michigan with Prosperity Regions	6
Adult Asthma Hospitalizations	12
Child Asthma Hospitalizations	16
Asthma-Related Deaths	19

Purpose

Asthma does not impact Michigan residents equally, therefore, the purpose of this report is to show the geographic distribution of asthma prevalence, asthma hospitalizations, and asthma-related deaths by county or prosperity region throughout Michigan. The distribution of asthma is further presented for each asthma indicator by different demographic groups or healthcare access across the state.

More information related to information and data on asthma can be found at **www.Michigan.gov/asthma**.

Suggested citation: Barth O, Anderson B. Michigan Asthma Atlas: Asthma Prevalence, Hospitalization, and Mortality by Counties and Prosperity Regions among Michigan Adults and Children. Lansing, MI: Michigan Department of Health and Human Services, Lifecourse Epidemiology and Genomics Division, January 2019.

Michigan Asthma Atlas Data & Methods

The maps in this report were prepared in ArcGIS using data from the Michigan Behavioral Risk Factor Survey (MiBRFSS), the Michigan Inpatient Database, and the Michigan Resident Death Files. Below are the asthma indicator definitions, outlier calculation details, and data sources.

Lifetime Asthma

Lifetime asthma prevalence is defined as the percentage of respondents who report that they have ever been told by a doctor, nurse, or health professional that they have asthma.

Source: MiBRFSS 2012-2016²

Current Asthma

Current asthma prevalence is defined as the percentage of respondents who report that they have ever has asthma and still have asthma.

Source: MiBRFSS 2012-2016²

Asthma Hospitalization

Asthma hospitalization refers to Michigan residents that were hospitalized with a primary discharge diagnosis of asthma (ICD-9-CM = 493.XX). Hospitalization rates are age-adjusted to the 2000 US population by the direct standardization method and are reported as the rate per 10,000 individuals.

Source: Michigan Inpatient Database 2010-2014³

Asthma Mortality

Asthma mortality or asthma-related deaths refer to deaths in which the underlying cause death reported was asthma (ICD-9-CM = 493.XX). Mortality rates are age-adjusted to the 2000 US population by the direct standardization method and are reported as the rate per 10,000 individuals.

Source: Michigan Resident Death Files 2010-2014⁴

Outliers

In this report, an outlier is any county or prosperity region with an asthma indicator that is abnormally high. Counties and regions are considered to be outliers if the asthma indicator is greater than the outlier cutoff of $Q3 + 1.5 \times IQR$, where Q3 refers to the third quartile and IQR refers to the interquartile range ($Q3 - Q1$). These counties and regions are outlined in either red or yellow in the maps.

Data Sources

¹ Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Division of Population Health, BRFSS Prevalence & Trends Data [online]. 2016. <https://www.cdc.gov/brfss/brfssprevalence/>.

² Michigan Behavioral Risk Factor Survey. 2016. Michigan Department of Health and Human Services.

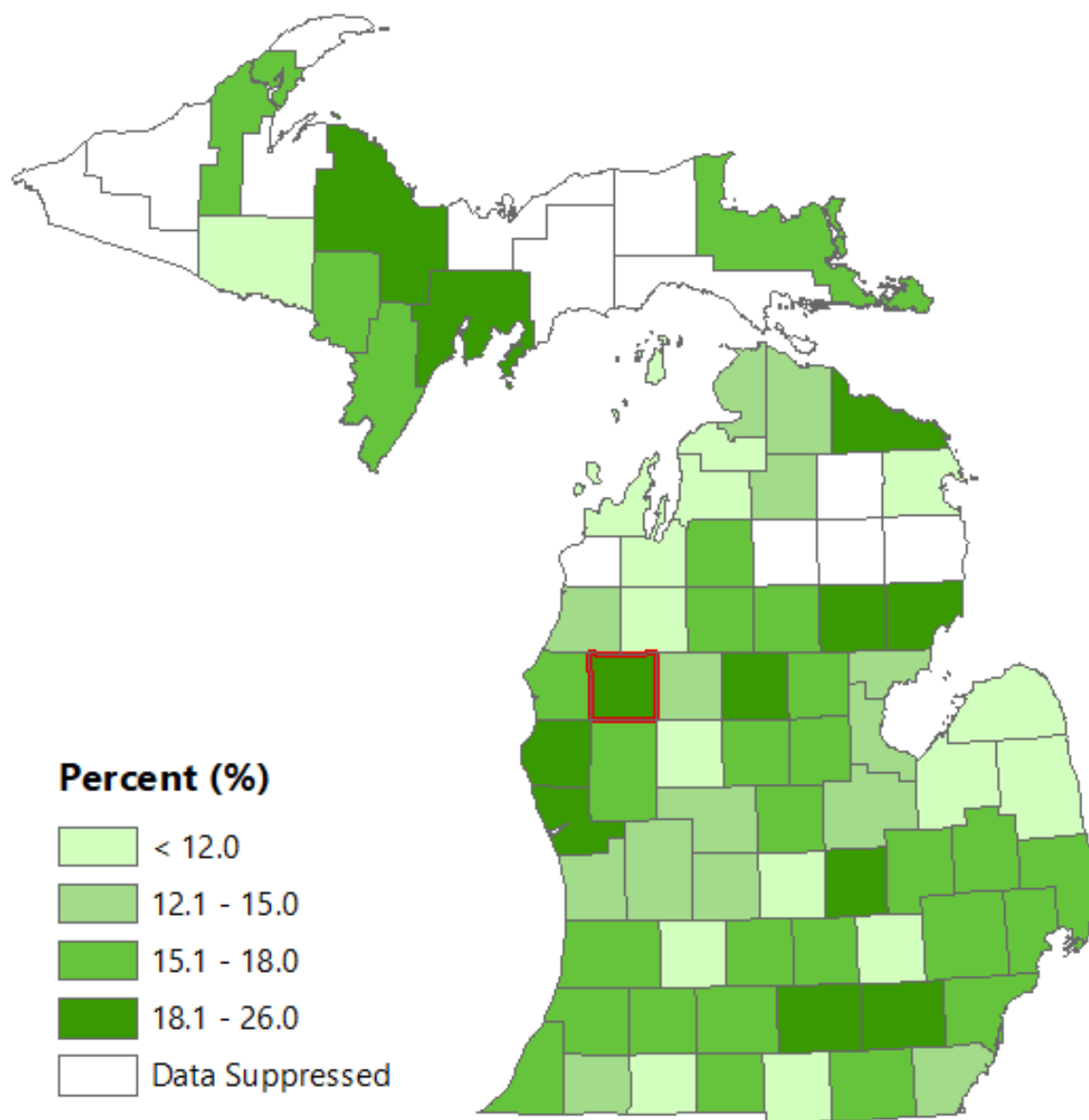
³ Michigan Inpatient Database. 2010-2014. Division for Vital Records and Health Statistics, Michigan Department of Health and Human Services.

⁴ Michigan Resident Death Files. 2010-2014. Division for Vital Records and Health Statistics, Michigan Department of Health and Human Services.

Map of Michigan with County Names



Adult Lifetime Asthma Prevalence

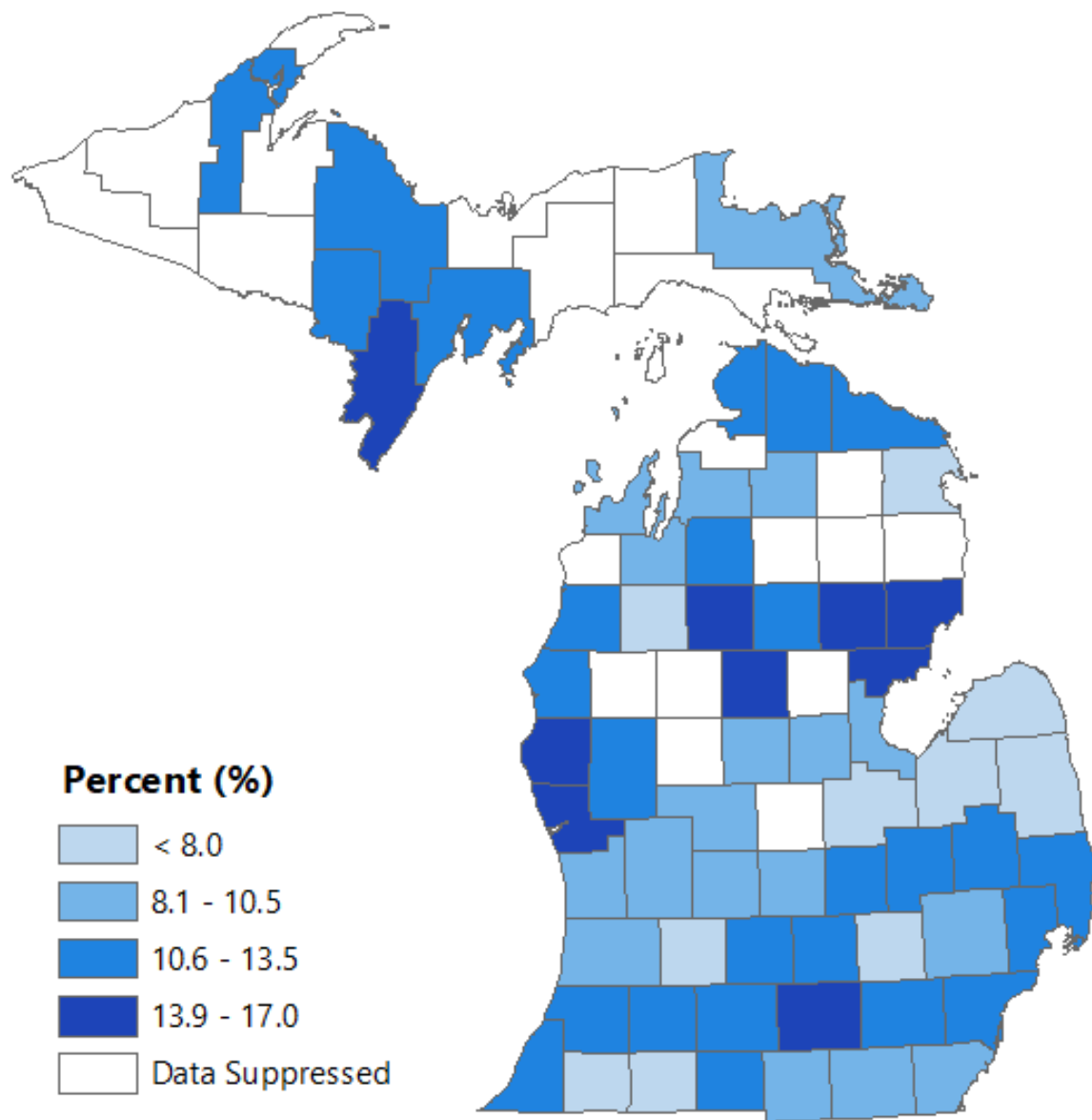


Prevalence of Lifetime Asthma Among Adults ^{a,b}			
County	Percent (%)	County	Percent (%)
Alcona	-	Lake	24.7 *
Alger	-	Lapeer	15.9
Allegan	15.9	Leelanau	11.7
Alpena	10.5	Lenawee	16.6
Antrim	10.7	Livingston	11.6
Arenac	14.7	Luce	-
Baraga	-	Mackinac	-
Barry	11.3	Macomb	16.1
Bay	14.1	Manistee	14.0
Benzie	-	Marquette	20.2
Berrien	15.7	Mason	15.7
Branch	16.4	Mecosta	12.0
Calhoun	16.3	Menominee	16.7
Cass	12.6	Midland	15.5
Charlevoix	10.4	Missaukee	17.5
Cheboygan	14.8	Monroe	14.4
Chippewa	15.7	Montcalm	12.1
Clare	21.8	Montmorency	-
Clinton	11.9	Muskegon	18.7
Crawford	-	Newaygo	16.6
Delta	20.5	Oakland	15.5
Dickinson	18.0	Oceana	19.0
Eaton	15.6	Ogemaw	19.1
Emmet	14.8	Ontonagon	-
Genesee	15.7	Osceola	13.9
Gladwin	16.5	Oscoda	-
Gogebic	-	Otsego	13.0
Grand Traverse	12.0	Ottawa	13.7
Graiot	17.9	Presque Isle	18.9
Hillsdale	12.0	Roscommon	17.4
Houghton	16.2	Saginaw	13.0
Huron	10.0	St Clair	16.1
Ingham	17.9	St Joseph	10.1
Ionia	14.6	Sanilac	11.2
Iosco	20.5	Schoolcraft	-
Iron	10.4	Shiawassee	18.1
Isabella	16.5	Tuscola	11.0
Jackson	21.3	Van Buren	16.8
Kalamazoo	17.0	Washtenaw	19.5
Kalkaska	15.6	Wayne	17.7
Kent	14.1	Wexford	7.8
Keweenaw	-	State of Michigan	15.9

Data Notes:

^a Prevalence data taken from the 2012-2016 Michigan Behavioral Risk Factor Survey (MiBRFS). ^b County rate suppressed if sample size < 50 or if the relative standard error > 30. ^c Counties defined as outliers (see page 2) are outlined in red on the map and indicated by an asterisk in the table.

Adult Current Asthma Prevalence



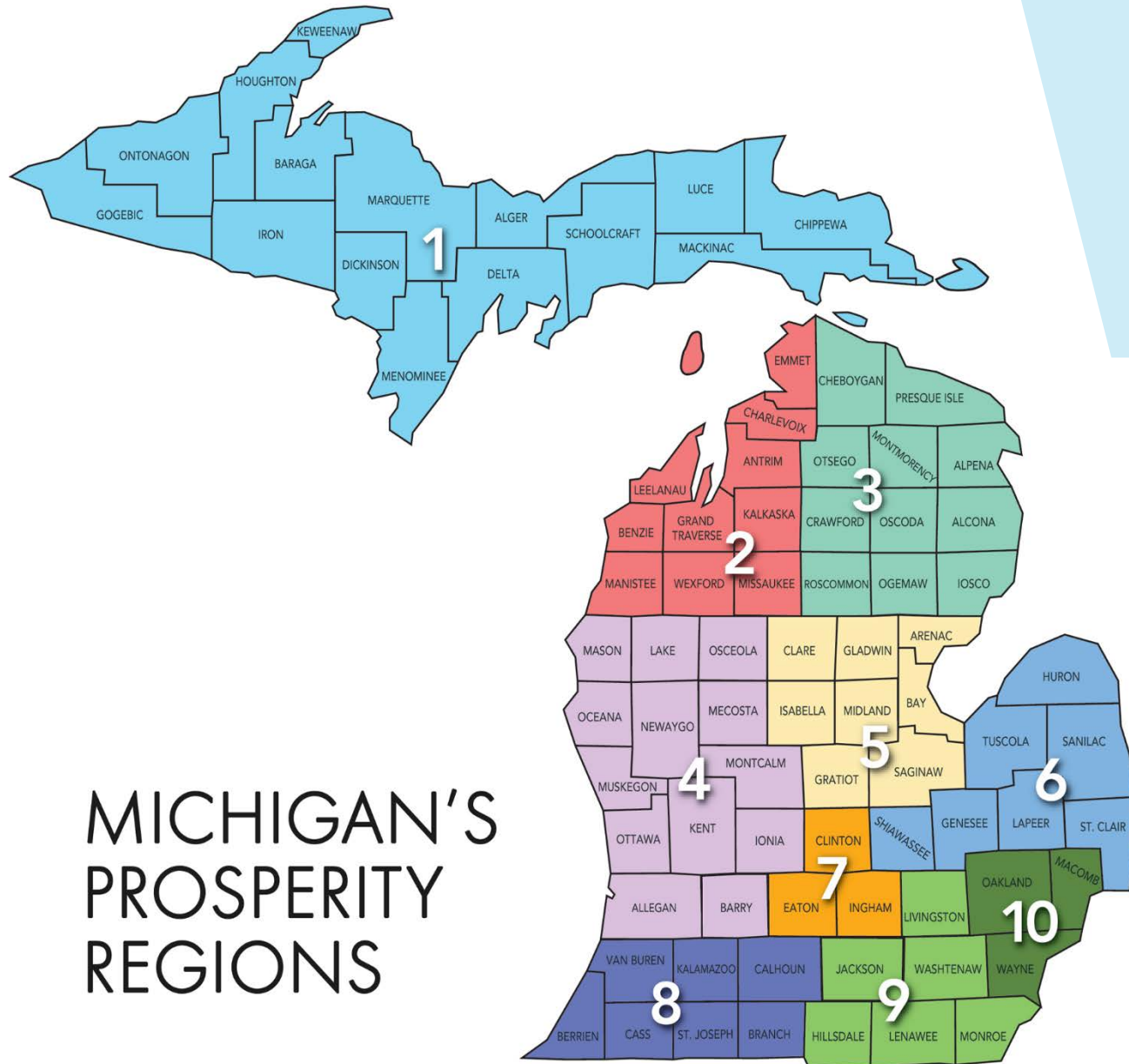
Prevalence of Current Asthma Among Adults ^{a,b}			
County	Percent (%)	County	Percent (%)
Alcona	-	Lake	-
Alger	-	Lapeer	11.8
Allegan	9.9	Leelanau	8.9
Alpena	7.4	Lenawee	8.5
Antrim	8.1	Livingston	7.9
Arenac	14.4	Luce	-
Baraga	-	Mackinac	-
Barry	6.6	Macomb	10.6
Bay	10.0	Manistee	12.4
Benzie	-	Marquette	11.9
Berrien	10.9	Mason	13.2
Branch	13.4	Mecosta	-
Calhoun	11.5	Menominee	15.9
Cass	7.3	Midland	9.6
Charlevoix	-	Missaukee	15.3
Cheboygan	11.0	Monroe	9.8
Chippewa	8.2	Montcalm	8.6
Clare	14.9	Montmorency	-
Clinton	8.1	Muskegon	13.9
Crawford	-	Newaygo	13.2
Delta	10.6	Oakland	10.3
Dickinson	12.6	Oceana	15.5
Eaton	12.6	Ogemaw	14.7
Emmet	11.2	Ontonagon	-
Genesee	11.9	Osceola	-
Gladwin	-	Oscoda	-
Gogebic	-	Otsego	9.3
Grand Traverse	8.9	Ottawa	8.3
Gratiot	-	Presque Isle	12.3
Hillsdale	8.6	Roscommon	10.6
Houghton	11.9	Saginaw	7.8
Huron	6.7	St Clair	11.8
Ingham	12.1	St Joseph	5.4
Ionia	9.1	Sanilac	6.1
Iosco	16.9	Schoolcraft	-
Iron	-	Shiawassee	13.0
Isabella	8.2	Tuscola	7.6
Jackson	14.0	Van Buren	13.5
Kalamazoo	12.1	Washtenaw	12.2
Kalkaska	12.0	Wayne	12.4
Kent	9.5	Wexford	6.4
Keweenaw	-	State of Michigan	10.9

Data Notes:

^a Prevalence data taken from the 2012-2016 Michigan Behavioral Risk Factor Survey (MiBRFS). ^b County rate suppressed if sample size < 50 or if the relative standard error > 30.

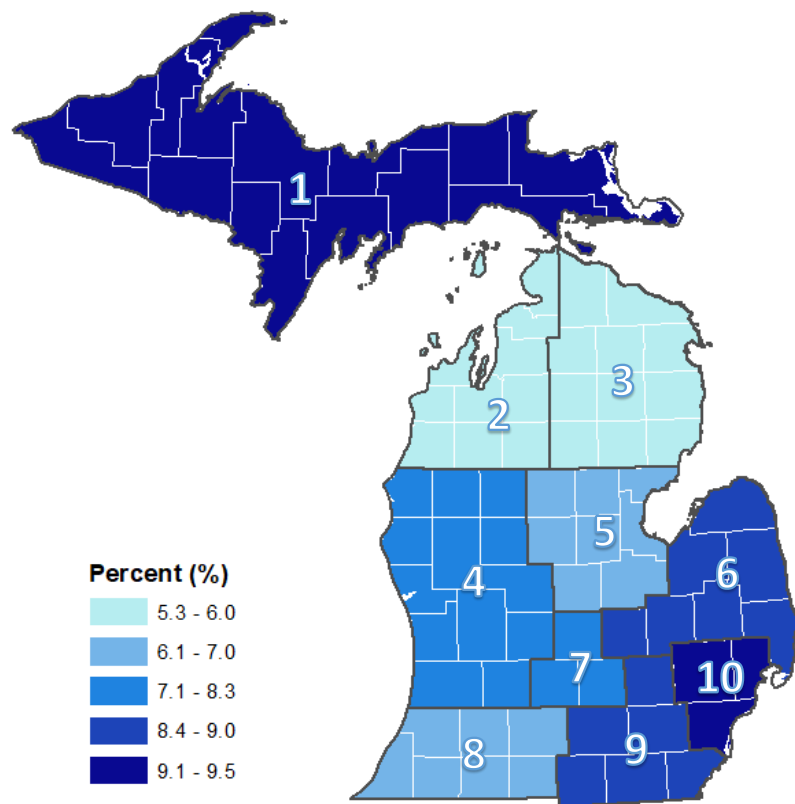
Note: To analyze the distribution of current asthma by demographics among Michigan residents, larger prosperity regions were used to minimize data suppression.

MICHIGAN'S PROSPERITY REGIONS



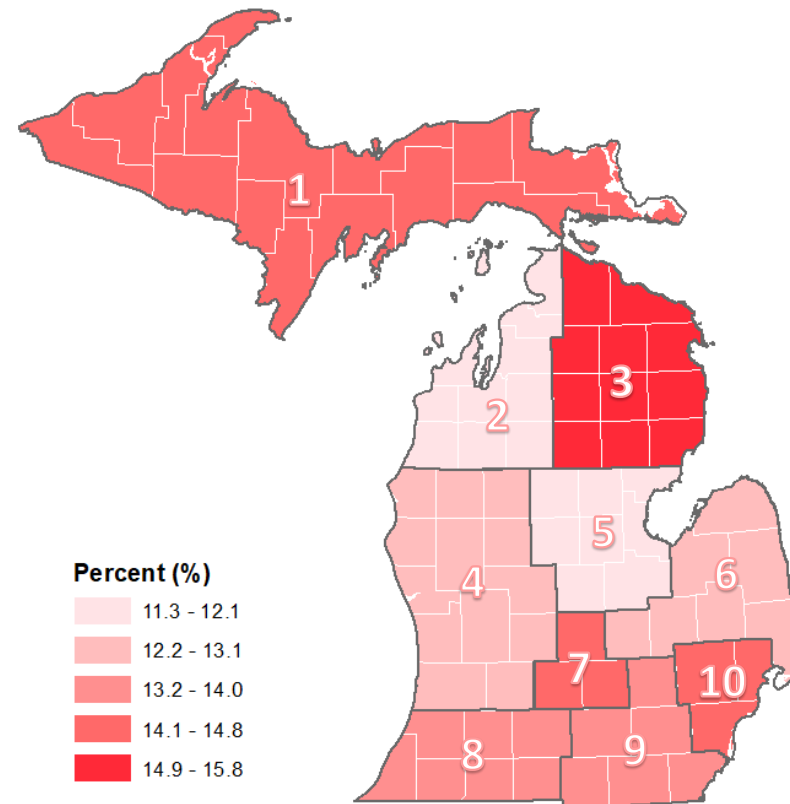
Adult Current Asthma by Sex

Male



Prevalence of Current Asthma Among Male Adults ^a			
Prosperity Region	Percent (%)	Prosperity Region	Percent (%)
1 – Upper Peninsula	9.5	7 – South Central	7.5
2 – Northwest	6.0	8 – Southwest	7.0
3 – Northeast	5.3	9 – Southeast Michigan	8.4
4 – West Michigan	8.3	10 – Detroit Metro	9.1
5 – East Central Michigan	6.3		
6 – East Michigan	8.4	State of Michigan	8.2

Female

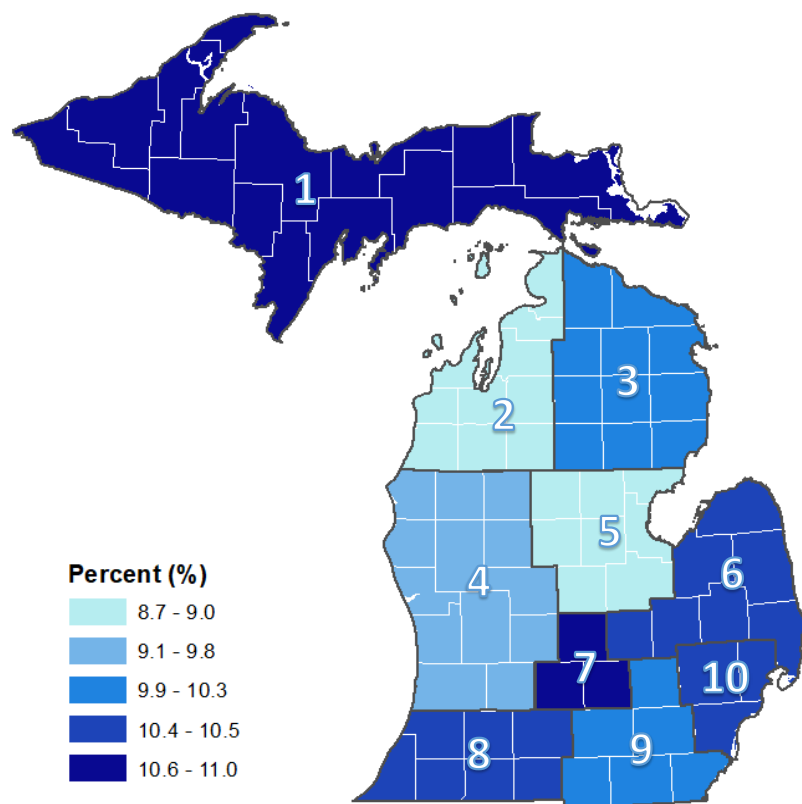


Prevalence of Current Asthma Among Female Adults ^a			
Prosperity Region	Percent (%)	Prosperity Region	Percent (%)
1 – Upper Peninsula	14.1	7 – South Central	14.7
2 – Northwest	12.1	8 – Southwest	13.6
3 – Northeast	15.8	9 – Southeast Michigan	13.4
4 – West Michigan	12.6	10 – Detroit Metro	14.4
5 – East Central Michigan	11.3		
6 – East Michigan	12.6	State of Michigan	13.6

Data Notes: ^a Prevalence data taken from the 2012-2016 Michigan Behavioral Risk Factor Survey (MiBRFS).

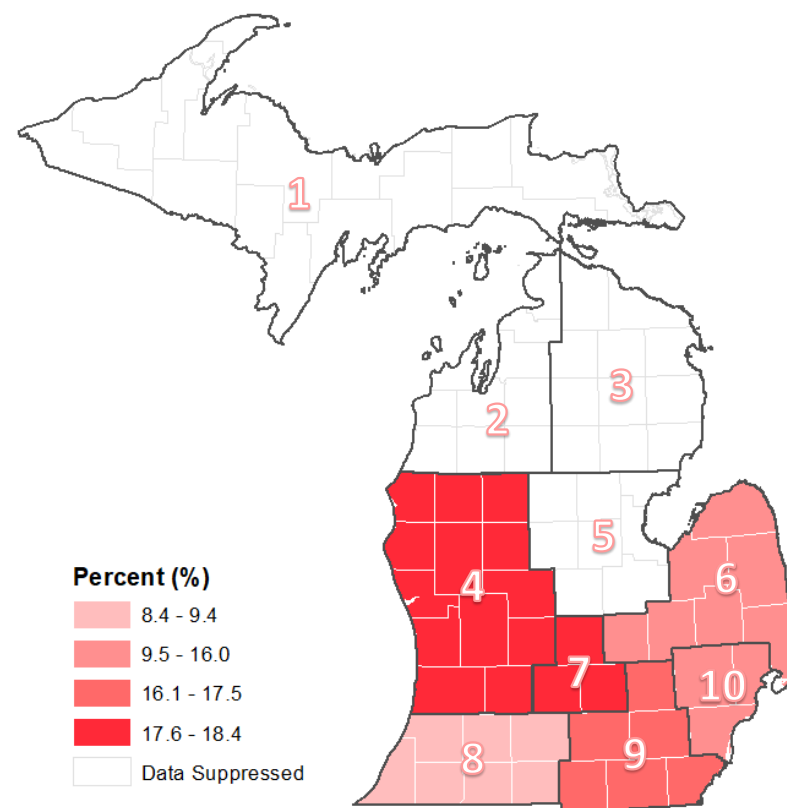
Adult Current Asthma by Race

White, non-Hispanic



Prevalence of Current Asthma Among White Adults ^{a, b}			
Prosperity Region	Percent (%)	Prosperity Region	Percent (%)
1 – Upper Peninsula	11.0	7 – South Central	10.8
2 – Northwest	8.7	8 – Southwest	10.4
3 – Northeast	9.9	9 – Southeast Michigan	10.3
4 – West Michigan	9.5	10 – Detroit Metro	10.4
5 – East Central Michigan	8.7		
6 – East Michigan	10.4	State of Michigan	10.1

Black, non-Hispanic

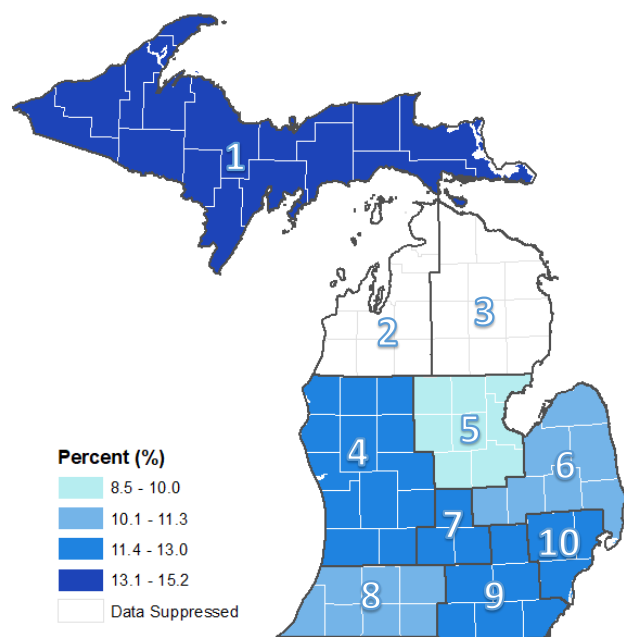


Prevalence of Current Asthma Among Black Adults ^{a, b}			
Prosperity Region	Percent (%)	Prosperity Region	Percent (%)
1 – Upper Peninsula	-	7 – South Central	18.0
2 – Northwest	-	8 – Southwest	8.4
3 – Northeast	-	9 – Southeast Michigan	17.2
4 – West Michigan	18.4	10 – Detroit Metro	15.3
5 – East Central Michigan	-		
6 – East Michigan	9.5	State of Michigan	14.7

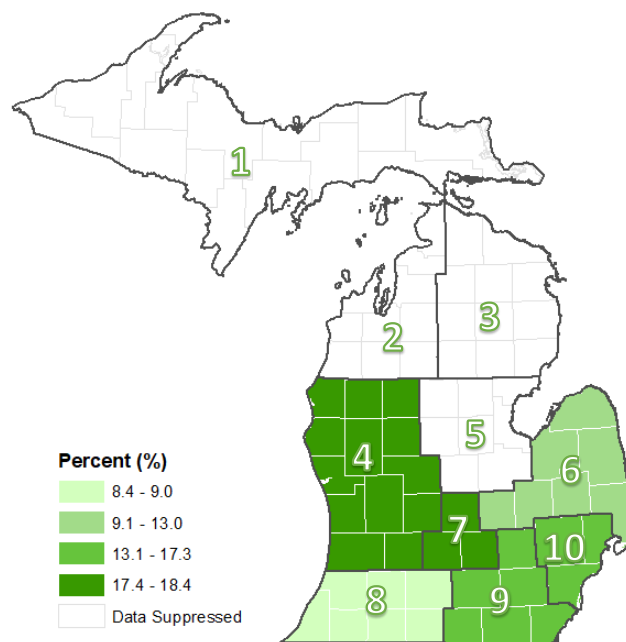
Data Notes: Data was suppressed for individuals identifying as "Hispanic" or "Other Race" due to small sample sizes. ^a Prevalence data taken from the 2012-2016 Michigan Behavioral Risk Factor Survey (MiBRFS). ^b Prosperity region rate suppressed if sample size < 50 or if the relative standard error > 30.

Adult Current Asthma by Age

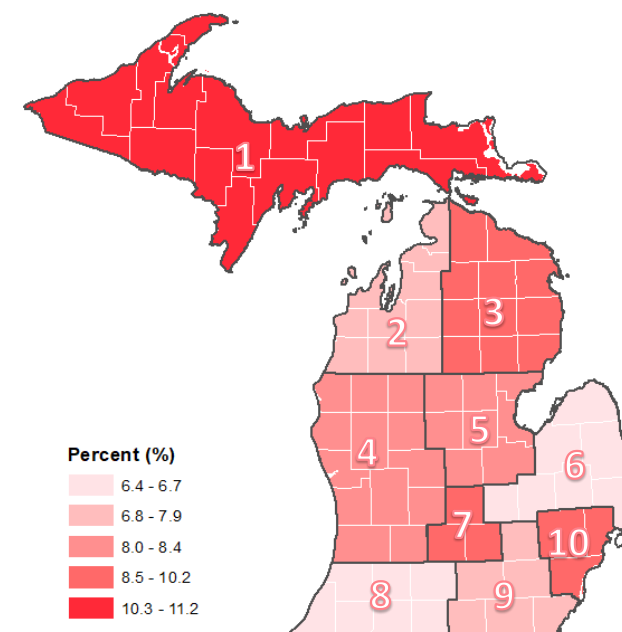
18 – 34



35 – 64



65 +



Prevalence of Current Asthma Among Adults
Between 18 and 34 Years of Age ^{a,b}

Prosperity Region	Percent (%)	Prosperity Region	Percent (%)
1 – Upper Peninsula	15.2	7 – South Central	12.7
2 – Northwest	-	8 – Southwest	11.3
3 – Northeast	-	9 – Southeast Michigan	12.5
4 – West Michigan	13.0	10 – Detroit Metro	13.0
5 – East Central Michigan	8.5		
6 – East Michigan	11.0	State of Michigan	12.3

Prevalence of Current Asthma Among Adults
Between 35 and 64 Years of Age ^{a,b}

Prosperity Region	Percent (%)	Prosperity Region	Percent (%)
1 – Upper Peninsula	-	7 – South Central	18.0
2 – Northwest	-	8 – Southwest	8.4
3 – Northeast	-	9 – Southeast Michigan	17.2
4 – West Michigan	18.4	10 – Detroit Metro	15.3
5 – East Central Michigan	-		
6 – East Michigan	9.5	State of Michigan	14.7

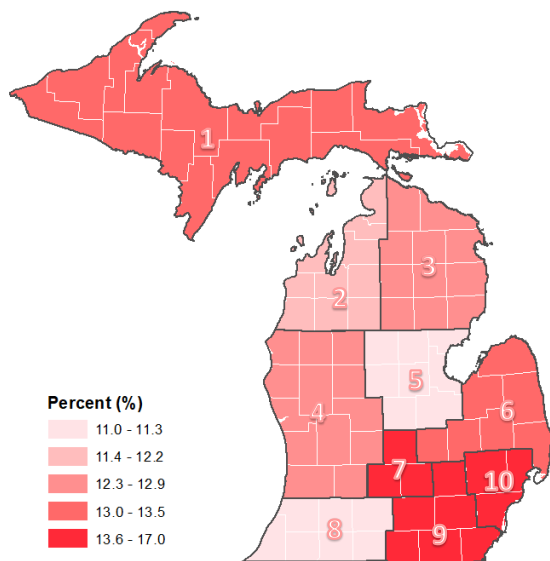
Prevalence of Current Asthma Among Adults
Over the Age of 65 ^a

Prosperity Region	Percent (%)	Prosperity Region	Percent (%)
1 – Upper Peninsula	11.2	7 – South Central	9.8
2 – Northwest	7.7	8 – Southwest	6.7
3 – Northeast	9.8	9 – Southeast Michigan	7.9
4 – West Michigan	8.4	10 – Detroit Metro	10.2
5 – East Central Michigan	8.1		
6 – East Michigan	6.4	State of Michigan	8.9

Data Notes: ^a Prevalence data taken from the 2012-2016 Michigan Behavioral Risk Factor Survey (MiBRFS). ^b Prosperity region rate suppressed if sample size < 50 or if the relative standard error > 30.

Adult Current Asthma by Household Income

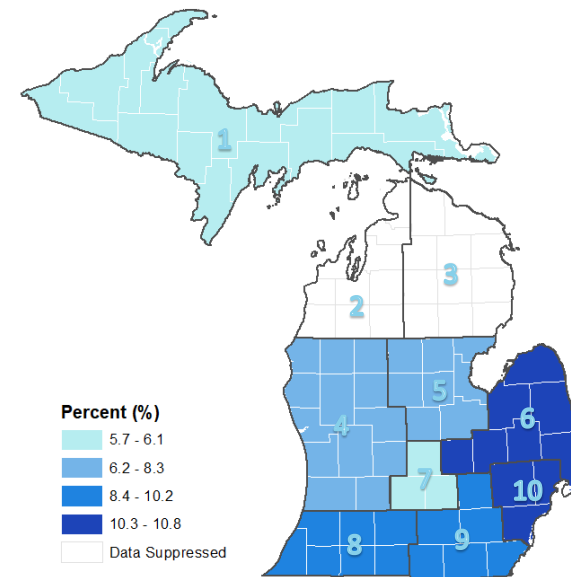
< \$35,000



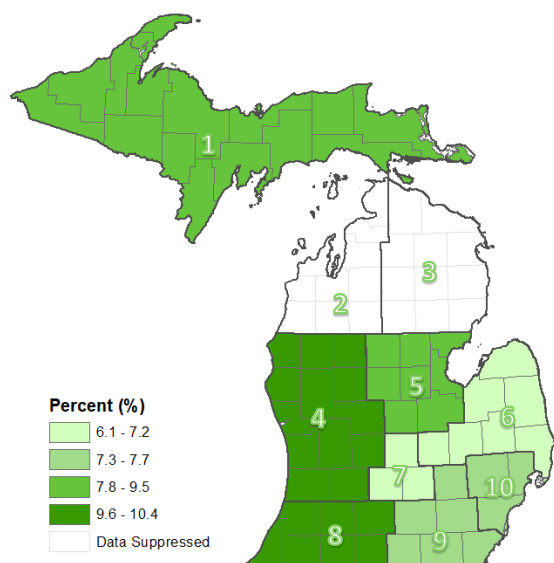
Prevalence of Current Asthma Among Adults With a Household Income of < \$35,000 ^{a, b}			
Prosperity Region	Percent (%)	Prosperity Region	Percent (%)
1 – Upper Peninsula	13.5	7 – South Central	14.9
2 – Northwest	12.2	8 – Southwest	11.3
3 – Northeast	12.9	9 – Southeast Michigan	14.9
4 – West Michigan	12.7	10 – Detroit Metro	17
5 – East Central Michigan	11.0		
6 – East Michigan	13.4	State of Michigan	14.4

Prevalence of Current Asthma Among Adults With a Household Income of \$35,000 - \$49,999 ^{a, b}			
Prosperity Region	Percent (%)	Prosperity Region	Percent (%)
1 – Upper Peninsula	5.7	7 – South Central	6.0
2 – Northwest	-	8 – Southwest	9.1
3 – Northeast	-	9 – Southeast Michigan	9.3
4 – West Michigan	8.2	10 – Detroit Metro	10.6
5 – East Central Michigan	7.2		
6 – East Michigan	10.8	State of Michigan	9.3

\$35,000 - \$49,999



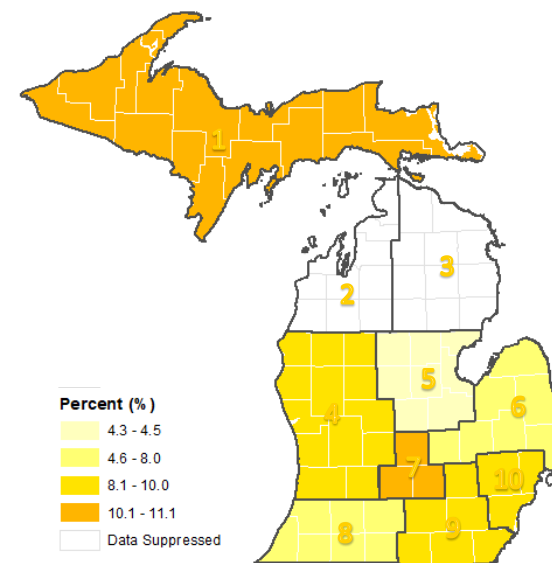
\$50,000 - \$74,999



Prevalence of Current Asthma Among Adults With a Household Income of \$50,000 - \$74,999 ^{a, b}			
Prosperity Region	Percent (%)	Prosperity Region	Percent (%)
1 – Upper Peninsula	9.5	7 – South Central	6.1
2 – Northwest	-	8 – Southwest	9.9
3 – Northeast	-	9 – Southeast Michigan	7.3
4 – West Michigan	10.4	10 – Detroit Metro	7.7
5 – East Central Michigan	9.2		
6 – East Michigan	7.2	State of Michigan	8.3

Prevalence of Current Asthma Among Adults With a Household Income of \$75,000 + ^{a, b}			
Prosperity Region	Percent (%)	Prosperity Region	Percent (%)
1 – Upper Peninsula	10.4	7 – South Central	11.1
2 – Northwest	-	8 – Southwest	7.4
3 – Northeast	-	9 – Southeast Michigan	9.9
4 – West Michigan	8.5	10 – Detroit Metro	8.8
5 – East Central Michigan	4.3		
6 – East Michigan	7.9	State of Michigan	8.5

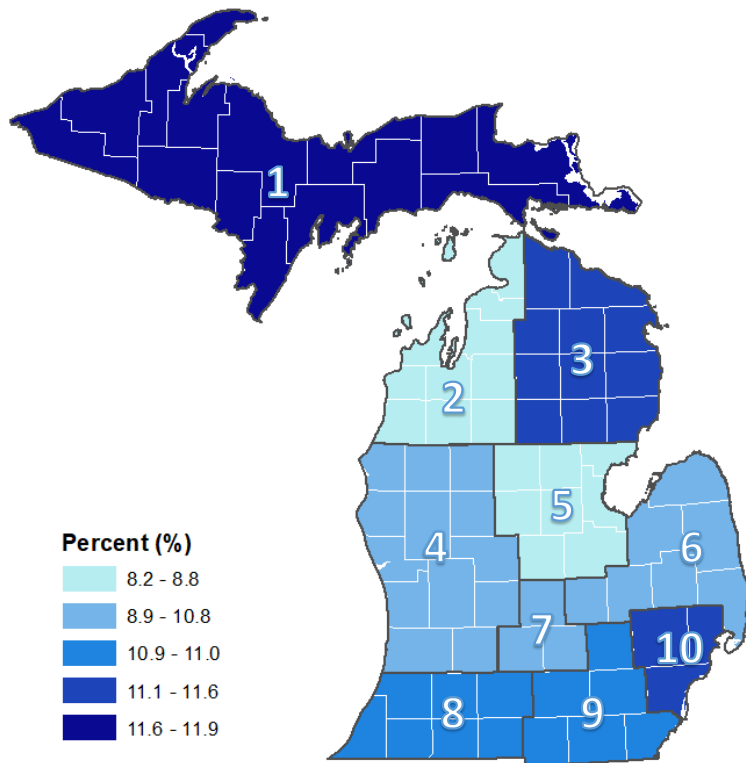
\$75,000+



Data Notes: ^a Prevalence data taken from the 2012-2016 Michigan Behavioral Risk Factor Survey (MiBRFS). ^b Prosperity region rate suppressed if sample size < 50 or if the relative standard error > 30.

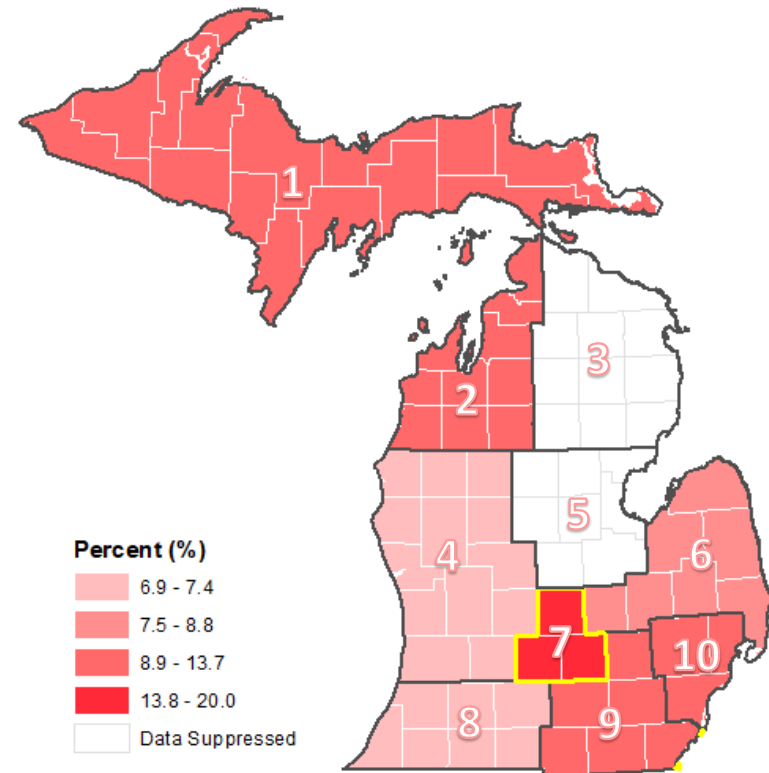
Adult Current Asthma by Insurance Coverage Status *

Health Insurance



Prosperity Region	Percent (%)	Prosperity Region	Percent (%)
1 – Upper Peninsula	11.9	7 – South Central	10.6
2 – Northwest	8.2	8 – Southwest	11.0
3 – Northeast	11.3	9 – Southeast Michigan	10.9
4 – West Michigan	10.8	10 – Detroit Metro	11.6
5 – East Central Michigan	8.8		
6 – East Michigan	10.8	State of Michigan	11.0

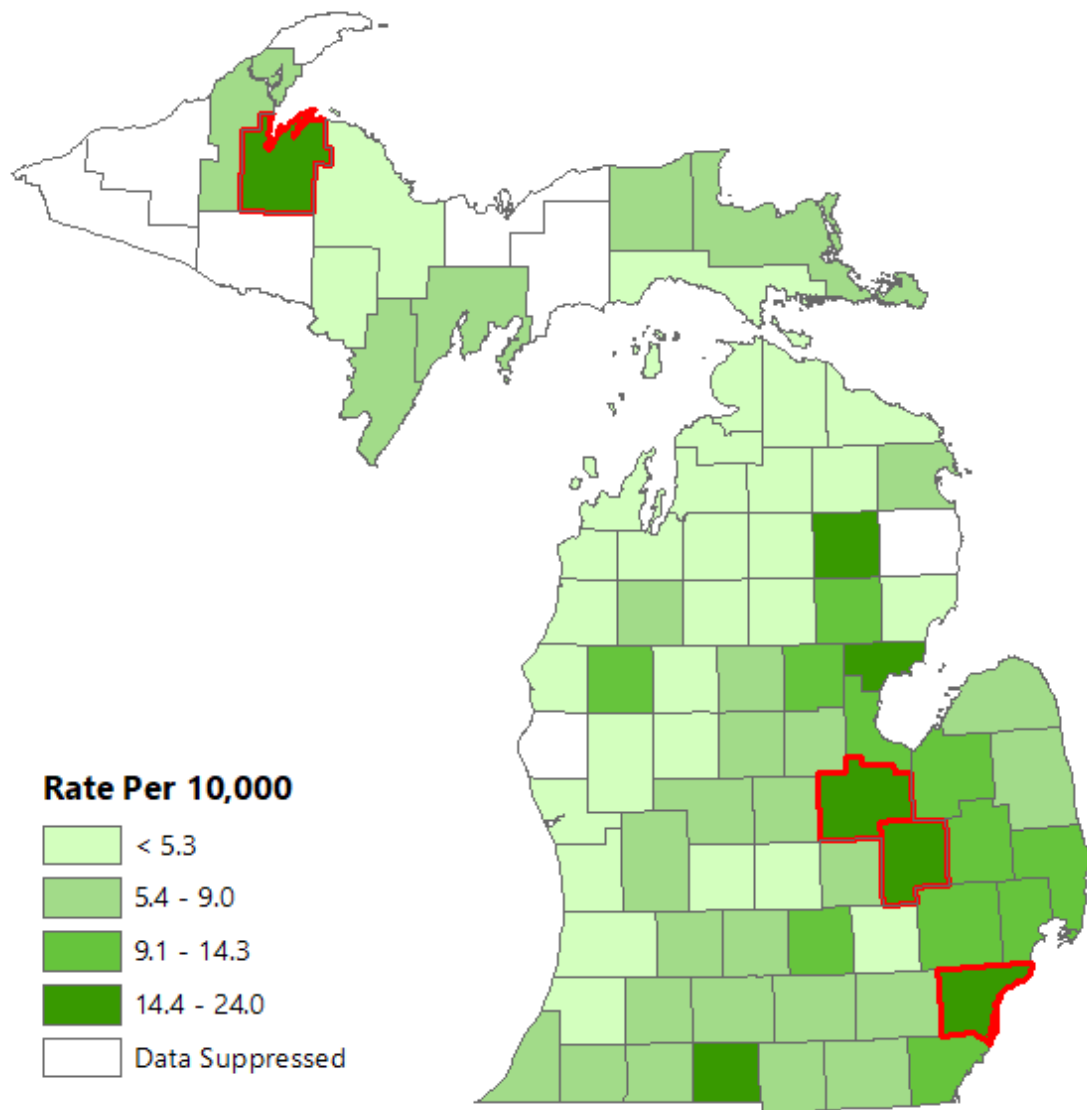
No Health Insurance



Prosperity Region	Percent (%)	Prosperity Region	Percent (%)
1 – Upper Peninsula	12.3	7 – South Central	20.0 *
2 – Northwest	12.6	8 – Southwest	6.9
3 – Northeast	-	9 – Southeast Michigan	11.5
4 – West Michigan	7.4	10 – Detroit Metro	13.7
5 – East Central Michigan	-		
6 – East Michigan	8.8	State of Michigan	11.1

Data Notes: Individuals with health insurance include those indicating they have any kind of health care coverage, including health insurance, prepaid plans, such as HMOs, or government plans such as Medicare, or Indian Health Service. ^a Prevalence data taken from the 2012-2016 Michigan Behavioral Risk Factor Survey (MiBRFS). ^b Prosperity region rate suppressed if sample size < 50 or if the relative standard error > 30. ^c Prosperity regions defined as outliers (see page 2) are outlined in yellow on the map and indicated by an asterisk in the table.

Adult Asthma Hospitalizations



Age-Adjusted Rates ^{a,b} (per 10,000) of Asthma Hospitalizations Among Adults (Aged 18+) ^{c, d}

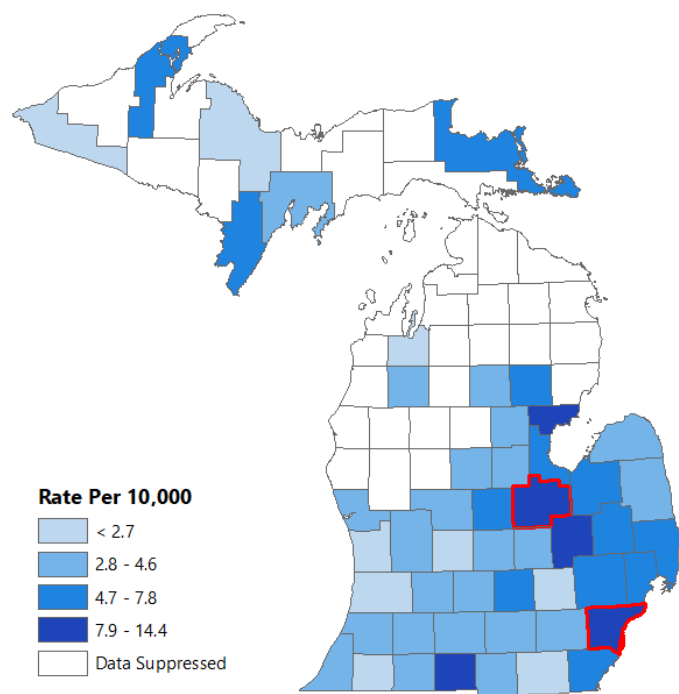
County ^d	Rate	County ^d	Rate
Alcona	-	Lake	9.7
Alger	-	Lapeer	9.5
Allegan	4.0	Leelanau	4.3
Alpena	6.4	Lenawee	5.4
Antrim	3.3	Livingston	3.7
Arenac	14.9	Luce	7.7
Baraga	16.4 *	Mackinac	4.7
Barry	6.9	Macomb	11.5
Bay	13.3	Manistee	3.9
Benzie	5.1	Marquette	3.5
Berrien	6.4	Mason	2.3
Branch	14.3	Mecosta	2.9
Calhoun	6.7	Menominee	8.3
Cass	5.4	Midland	6.7
Charlevoix	2.7	Missaukee	4.2
Cheboygan	4.1	Monroe	12.9
Chippewa	8.1	Montcalm	5.9
Clare	6.4	Montmorency	4.7
Clinton	5.0	Muskegon	3.9
Crawford	2.7	Newaygo	3.3
Delta	5.4	Oakland	11.0
Dickinson	4.2	Oceana	-
Eaton	7.1	Ogemaw	10.0
Emmet	5.0	Ontonagon	-
Genesee	15.7 *	Osceola	4.3
Gladwin	10.2	Oscoda	15.2
Gogebic	-	Otsego	2.4
Grand Traverse	4.5	Ottawa	2.7
Gratiot	8.9	Presque Isle	5.0
Hillsdale	8.6	Roscommon	5.3
Houghton	8.2	Saginaw	21.8 *
Huron	8.0	St Clair	12.7
Ingham	12.6	St Joseph	6.5
Ionia	3.1	Sanilac	8.0
Iosco	4.0	Schoolcraft	-
Iron	-	Shiawassee	5.7
Isabella	6.0	Tuscola	9.7
Jackson	6.5	Van Buren	4.8
Kalamazoo	5.7	Washtenaw	5.7
Kalkaska	3.6	Wayne	23.0 *
Kent	5.8	Wexford	7.4
Keweenaw	-	State of Michigan	11.1

Data Notes:

^a Hospitalization data taken from the 2010–2014 Michigan Inpatient Database. ^b Rates are age-adjusted to the 2000 US Standard Population. ^c County rate suppressed if hospitalization count < 20. ^d Counties defined as outliers (see page 2) are outlined in red on the map and indicated by an asterisk in the table.

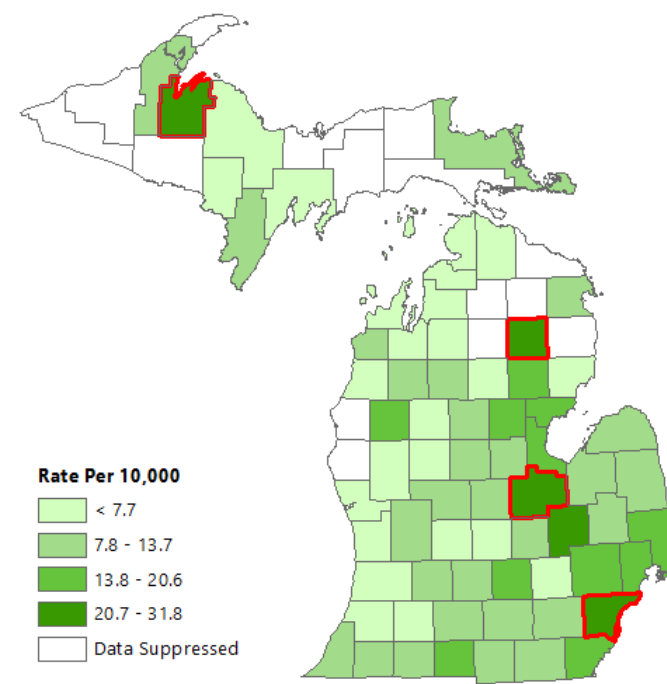
Adult Asthma Hospitalizations by Sex

Male



Age-Adjusted Rates ^{a,b} (per 10,000) of Asthma Hospitalizations Among Adults by Sex (Aged 18+) ^{c,d}					
County ^d	Male	Female	County ^d	Male	Female
Alcona	-	-	Lake	-	17.5
Alger	-	-	Lapeer	5.9	13.1
Allegan	2.2	5.7	Leelanau	-	7.4
Alpena	-	9.8	Lenawee	2.1	8.7
Antrim	-	4.8	Livingston	1.9	5.3
Arenac	9.8	20.2	Luce	-	-
Baraga	-	31.7 *	Mackinac	-	-
Barry	3.6	10.1	Macomb	7.6	15.1
Bay	7.8	18.3	Manistee	-	4.8
Benzie	-	8.3	Marquette	1.7	5.4
Berrien	3.1	9.5	Mason	-	-
Branch	9.7	19.7	Mecosta	-	4.5
Calhoun	4.3	8.9	Menominee	6.0	11.0
Cass	2.1	8.5	Midland	4.5	8.6
Charlevoix	-	4.5	Missaukee	-	8.1
Cheboygan	-	5.5	Monroe	7.5	17.9
Chippewa	6.8	9.8	Montcalm	3.0	9.2
Clare	-	10.5	Montmorency	-	-
Clinton	3.4	6.6	Muskegon	2.7	5.1
Crawford	-	-	Newaygo	-	4.8
Delta	4.2	6.4	Oakland	6.8	14.7
Dickinson	-	5.8	Oceana	-	-
Eaton	3.7	10.2	Ogemaw	4.6	15.4
Emmet	-	7.7	Ontonagon	-	-
Genesee	10.2	20.6	Osceola	-	4.5
Gladwin	4.5	15.8	Oscoda	-	28.9 *
Gogebic	0.0	-	Otsego	-	-
Grand Traverse	2.4	6.4	Ottawa	1.6	3.7
Gratiot	6.2	12.4	Presque Isle	-	-
Hillsdale	3.7	13.4	Roscommon	3.0	7.6
Houghton	5.2	11.1	Saginaw	13.8 *	29.2 *
Huron	3.7	12.3	St Clair	6.0	19.1
Ingham	7.3	17.4	St Joseph	3.9	8.9
Ionia	2.0	4.3	Sanilac	4.0	11.9
Iosco	-	6.2	Schoolcraft	-	-
Iron	-	-	Shiawassee	2.9	8.4
Isabella	3.9	8.0	Tuscola	5.6	13.7
Jackson	3.7	9.5	Van Buren	3.7	5.9
Kalamazoo	4.1	7.2	Washtenaw	3.0	8.2
Kalkaska	-	6.0	Wayne	14.4 *	30.8 *
Kent	3.6	7.7	Wexford	3.7	11.1
Keweenaw	-	-	State of Michigan	6.7	15.2

Female



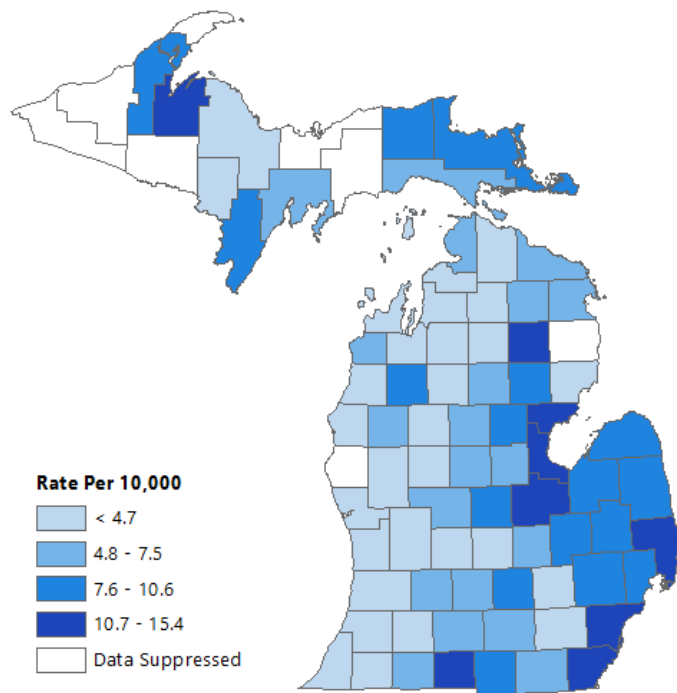
Data Notes:

^a Hospitalization data taken from the 2010-2014 Michigan Inpatient Database. ^b Rates are age-adjusted to the 2000 US Standard Population. ^c County rate suppressed if hospitalization count < 20.

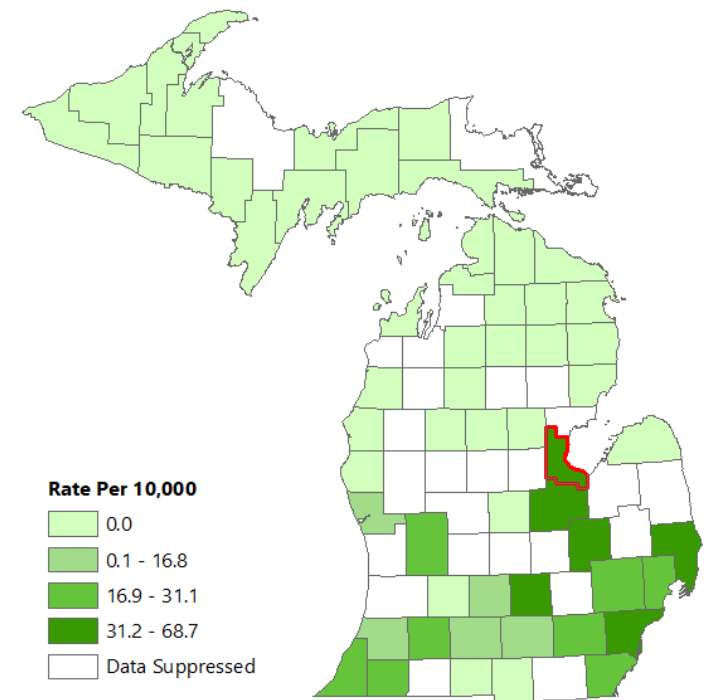
^d Counties defined as outliers (see page 2) are outlined in red on the map and indicated by an asterisk in the table.

Adult Asthma Hospitalizations by Race

White



Black



Age-Adjusted Rates ^{a, b} (per 10,000) of Asthma Hospitalizations Among Adults by Race (Aged 18+) ^{c, d}					
County ^d	White	Black	County ^d	White	Black
Alcona	-	0.0	Lake	7.4	-
Alger	-	0.0	Lapeer	9.4	-
Allegan	3.8	-	Leelanau	4.3	0.0
Alpena	6.5	0.0	Lenawee	5.3	-
Antrim	3.3	-	Livingston	3.7	-
Arenac	14.2	-	Luce	9.0	0.0
Baraga	12.9	0.0	Mackinac	5.8	0.0
Barry	6.9	0.0	Macomb	10.1	25.6
Bay	12.3	68.7 [*]	Manistee	4.0	0.0
Benzie	5.2	-	Marquette	3.5	-
Berrien	4.4	19.4	Mason	2.3	0.0
Branch	14.9	0.0	Mecosta	2.8	-
Calhoun	6.4	10.6	Menominee	8.7	0.0
Cass	4.4	20.0	Midland	6.8	-
Charlevoix	2.8	0.0	Missaukee	4.2	0.0
Cheboygan	4.2	0.0	Monroe	12.6	27.2
Chippewa	8.5	-	Montcalm	5.8	-
Clare	6.3	0.0	Montmorency	4.7	0.0
Clinton	4.6	-	Muskegon	2.4	12.6
Crawford	2.8	0.0	Newaygo	3.3	-
Delta	5.1	0.0	Oakland	8.6	27.6
Dickinson	4.3	0.0	Oceana	-	0.0
Eaton	6.7	13.4	Ogemaw	9.9	-
Emmet	5.0	0.0	Ontonagon	-	0.0
Genesee	10.3	38.6	Osceola	4.2	0.0
Gladwin	10.3	0.0	Oscoda	15.3	0.0
Gogebic	-	0.0	Otsego	2.5	0.0
Grand Traverse	4.2	-	Ottawa	2.6	-
Gratiot	9.3	0.0	Presque Isle	5.1	0.0
Hillsdale	8.7	0.0	Roscommon	5.2	-
Houghton	8.4	0.0	Saginaw	14.2	52.0
Huron	8.0	0.0	St Clair	11.7	48.5
Ingham	10.6	31.1	St Joseph	6.2	-
Ionia	3.2	-	Sanilac	8.0	-
Iosco	4.1	0.0	Schoolcraft	-	0.0
Iron	-	0.0	Shiawassee	5.6	-
Isabella	5.7	-	Tuscola	9.7	-
Jackson	6.1	12.6	Van Buren	4.3	14.2
Kalamazoo	4.3	19.5	Washtenaw	4.0	20.3
Kalkaska	3.7	0.0	Wayne	12.0	40.8
Kent	4.2	16.8	Wexford	7.5	-
Keweenaw	-	0.0	State of Michigan	7.7	33.6

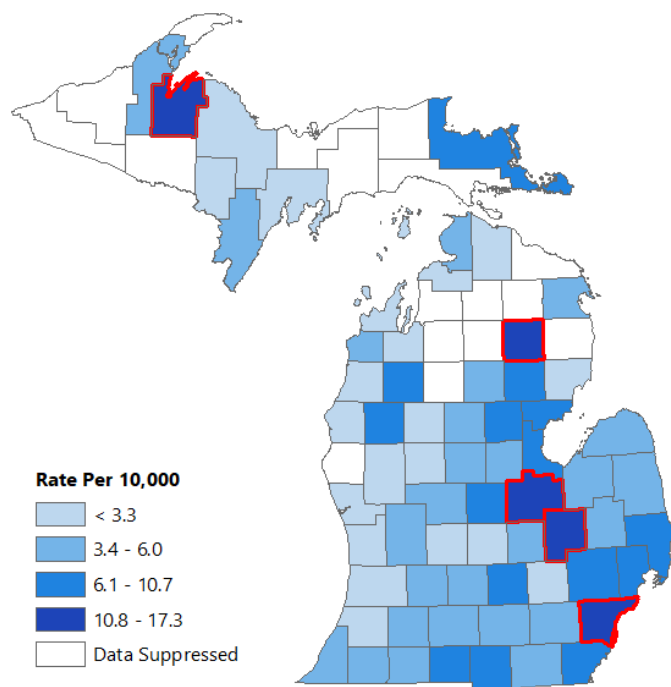
Data Notes:

^a Hospitalization data taken from the 2010–2014 Michigan Inpatient Database. ^b Rates are age-adjusted to the 2000 US Standard Population. ^c County rate suppressed if hospitalization count < 20.

^d Counties defined as outliers (see page 2) are outlined in red on the map and indicated by an asterisk in the table.

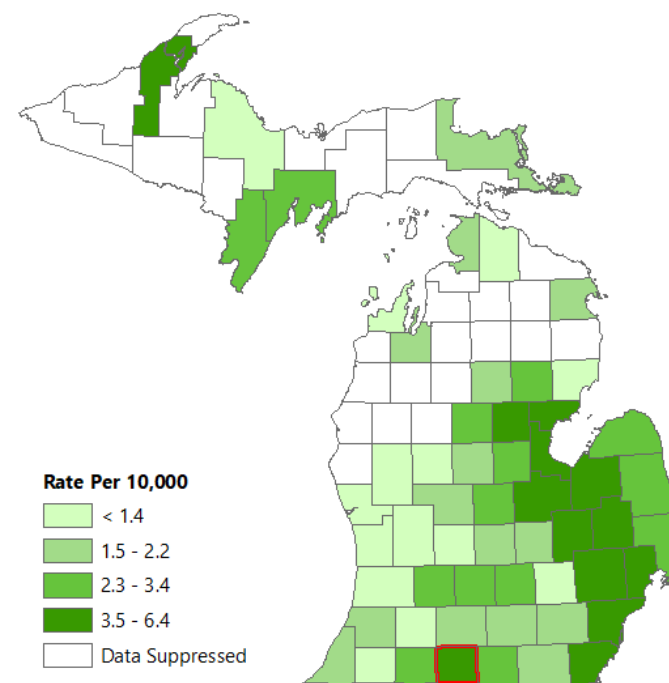
Adult Asthma Hospitalizations by Age

Aged 18 - 64



Age-Adjusted Rates ^{a,b} (per 10,000) of Asthma Hospitalizations Among Adults by Age Group ^{c, d}					
County ^d	Age Group		County ^d	Age Group	
	18 - 64	65+		18 - 64	65+
Alcona	-	-	Lake	9.3	-
Alger	-	-	Lapeer	5.5	4.0
Allegan	2.8	1.2	Leelanau	3.1	1.3
Alpena	4.5	1.9	Lenawee	3.8	1.6
Antrim	-	-	Livingston	2.3	1.4
Arenac	10.7	4.2	Luce	-	-
Baraga	12.3 *	-	Mackinac	-	-
Barry	4.1	2.9	Macomb	7.3	4.2
Bay	9.1	4.2	Manistee	2.9	-
Benzie	3.7	-	Marquette	2.2	1.3
Berrien	4.8	1.6	Mason	1.7	-
Branch	7.9	6.4 *	Mecosta	1.7	1.2
Calhoun	5.0	1.7	Menominee	5.6	2.8
Cass	4.2	1.2	Midland	4.2	2.4
Charlevoix	2.0	-	Missaukee	-	-
Cheboygan	2.8	1.3	Monroe	9.0	3.9
Chippewa	6.3	1.8	Montcalm	4.2	1.7
Clare	3.9	2.4	Montmorency	-	-
Clinton	3.2	1.9	Muskegon	3.2	0.6
Crawford	-	-	Nawaygo	1.9	1.3
Delta	3.0	2.4	Oakland	6.8	4.2
Dickinson	3.1	-	Oceana	-	-
Eaton	4.4	2.8	Ogemaw	6.7	3.3
Emmet	3.5	1.5	Ontonagon	-	-
Genesee	11.8 *	3.8	Osceola	3.1	-
Gladwin	6.5	3.7	Oscoda	13.0 *	-
Gogebic	-	-	Otsego	-	-
Grand Traverse	2.9	1.6	Ottawa	1.8	0.9
Gratiot	6.2	2.7	Presque Isle	-	-
Hillsdale	6.2	2.4	Roscommon	3.5	1.8
Houghton	4.1	4.0	Saginaw	16.1 *	5.7
Huron	5.2	2.8	St Clair	9.3	3.3
Ingham	9.4	3.2	St Joseph	4.2	2.3
Ionia	2.2	0.9	Sanilac	5.4	2.6
Iosco	2.7	1.2	Schoolcraft	-	-
Iron	-	-	Shiawassee	3.8	1.8
Isabella	3.9	2.2	Tuscola	5.9	3.8
Jackson	4.8	1.8	Van Buren	3.0	1.8
Kalamazoo	4.4	1.3	Washtenaw	4.1	1.6
Kalkaska	-	-	Wayne	17.2 *	5.8
Kent	4.4	1.4	Wexford	6.4	-
Keweenaw	-	-	State of Michigan	7.9	3.2

Aged 65+

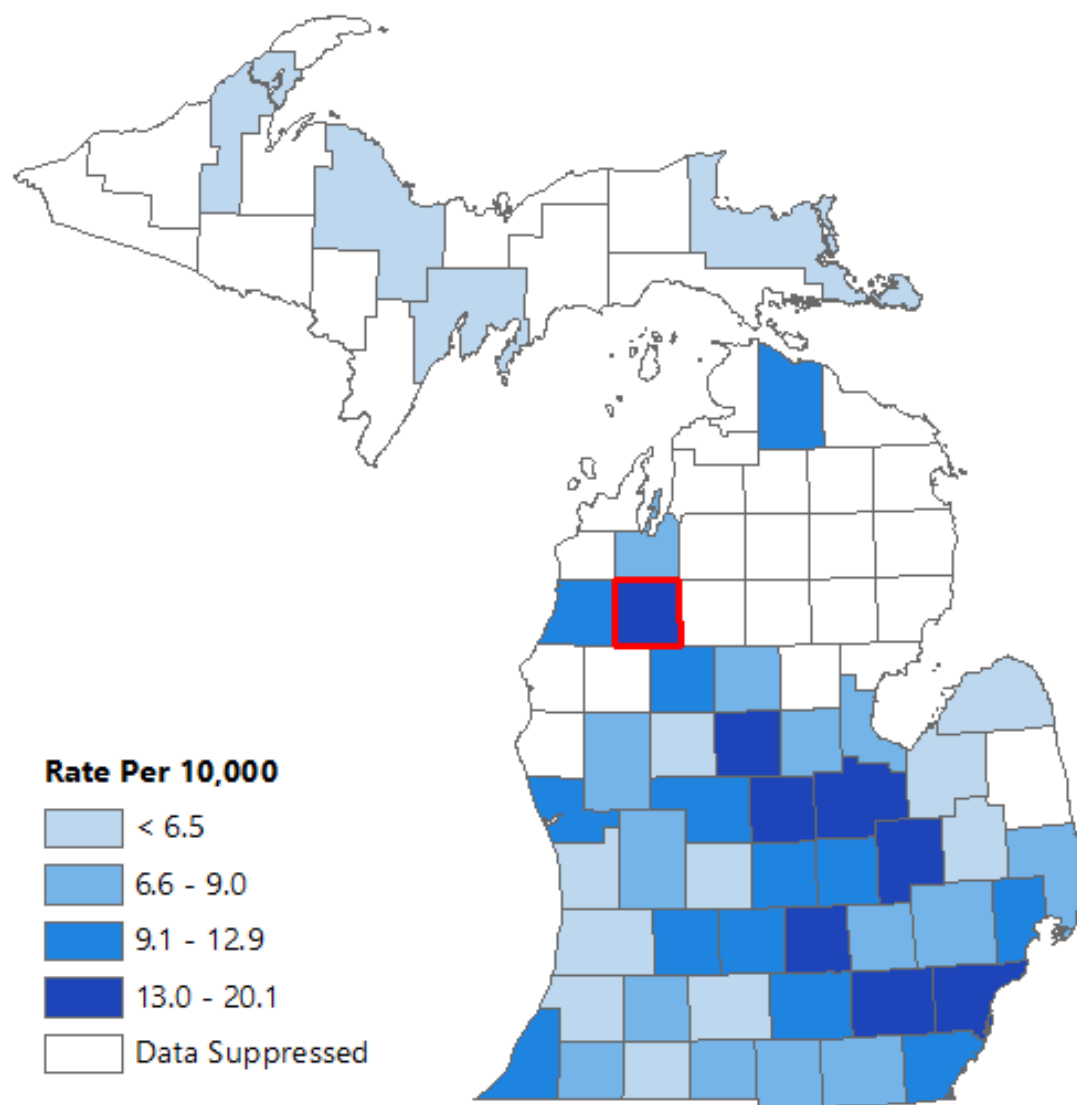


Data Notes:

^a Hospitalization data taken from the 2010-2014 Michigan Inpatient Database. ^b Rates are age-adjusted to the 2000 US Standard Population. ^c County rate suppressed if hospitalization count < 20.

^d Counties defined as outliers (see page 2) are outlined in red on the map and indicated by an asterisk in the table.

Child Asthma Hospitalizations



Data Notes:

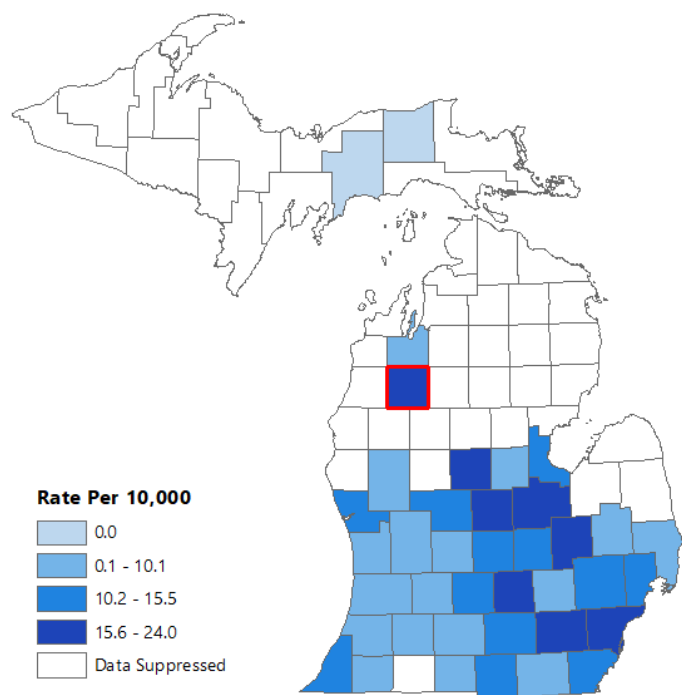
^a Hospitalization data taken from the 2010-2014 Michigan Inpatient Database. ^b Rates are age-adjusted to the 2000 US Standard Population. ^c County rate suppressed if hospitalization count < 20. ^d Counties defined as outliers (see page 2) are outlined in red on the map and indicated by an asterisk in the table.

Age-Adjusted Rates ^{a,b} (per 10,000) of Asthma Hospitalizations Among Children (Aged <18) ^{c, d}

County ^d	Rate	County ^d	Rate
Alcona	-	Lake	-
Alger	-	Lapeer	5.8
Allegan	4.8	Leelanau	-
Alpena	-	Lenawee	7.2
Antrim	-	Livingston	7.8
Arenac	-	Luce	-
Baraga	-	Mackinac	-
Barry	9.1	Macomb	9.3
Bay	8.6	Manistee	9.4
Benzie	-	Marquette	5.5
Berrien	10.2	Mason	-
Branch	7.7	Mecosta	4.9
Calhoun	6.0	Menominee	-
Cass	7.0	Midland	7.6
Charlevoix	-	Missaukee	-
Cheboygan	11.0	Monroe	9.3
Chippewa	6.0	Montcalm	11.0
Clare	7.9	Montmorency	-
Clinton	10.9	Muskegon	11.1
Crawford	-	Newaygo	7.7
Delta	5.4	Oakland	8.9
Dickinson	-	Oceana	-
Eaton	12.9	Ogemaw	-
Emmet	-	Ontonagon	-
Genesee	14.2	Osceola	10.4
Gladwin	-	Oscoda	-
Gogebic	-	Otsego	-
Grand Traverse	7.4	Ottawa	3.9
Gratiot	17.3	Presque Isle	-
Hillsdale	6.7	Roscommon	-
Houghton	6.0	Saginaw	14.3
Huron	6.4	St Clair	7.7
Ingham	16.7	St Joseph	3.9
Ionia	5.2	Sanilac	-
Iosco	-	Schoolcraft	-
Iron	-	Shiawassee	9.8
Isabella	17.5	Tuscola	4.4
Jackson	11.4	Van Buren	6.0
Kalamazoo	7.9	Washtenaw	17.3
Kalkaska	-	Wayne	17.7
Kent	8.0	Wexford	20.1 *
Keweenaw	-	State of Michigan	10.9

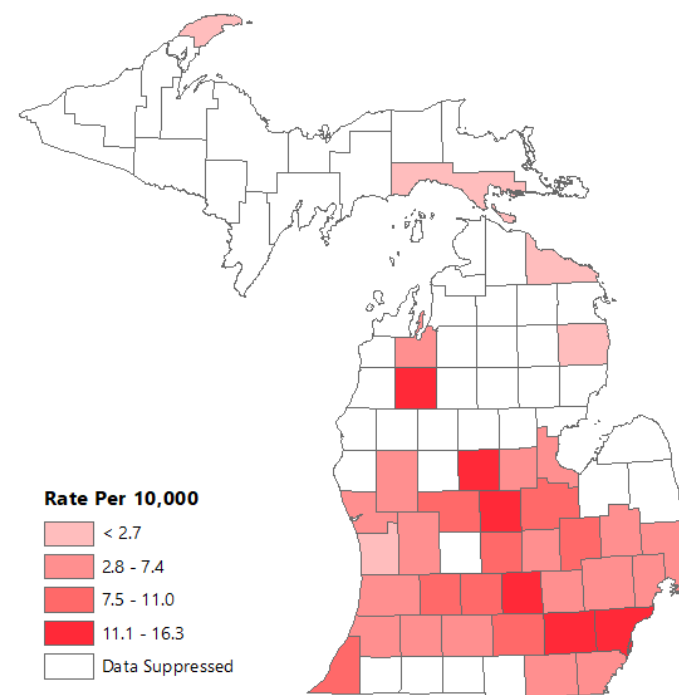
Child Asthma Hospitalizations by Sex

Male



Age-Adjusted Rates ^{a,b} (per 10,000) of Asthma Hospitalizations Among Children by Sex (Aged <18) ^{c,d}					
County ^d	Male	Female	County ^d	Male	Female
Alcona	-	0.0	Lake	-	-
Alger	-	-	Lapeer	6.8	4.7
Allegan	6.1	3.4	Leelanau	-	-
Alpena	-	-	Lenawee	8.1	6.3
Antrim	-	-	Livingston	9.8	5.8
Arenac	-	-	Luce	0.0	-
Baraga	-	-	Mackinac	-	0.0
Barry	10.1	8.1	Macomb	11.5	7.1
Bay	11.9	5.0	Manistee	-	-
Benzie	-	-	Marquette	-	-
Berrien	11.2	9.3	Mason	-	-
Branch	9.0	-	Mecosta	-	-
Calhoun	7.7	4.3	Menominee	-	-
Cass	9.0	-	Midland	9.3	5.9
Charlevoix	-	-	Missaukee	-	-
Cheboygan	-	-	Monroe	12.1	6.5
Chippewa	-	-	Montcalm	13.2	8.7
Clare	-	-	Montmorency	-	-
Clinton	12.2	9.4	Muskegon	15.5	6.6
Crawford	-	-	Newaygo	8.1	7.3
Delta	-	-	Oakland	11.0	6.8
Dickinson	-	-	Oceana	-	-
Eaton	14.7	11.0	Ogemaw	-	-
Emmet	-	-	Ontonagon	-	-
Genesee	18.0	10.1	Osceola	-	-
Gladwin	-	-	Oscoda	-	-
Gogebic	-	-	Otsego	-	-
Grand Traverse	9.3	5.4	Ottawa	5.0	2.7
Gratiot	20.6	13.8	Presque Isle	-	0.0
Hillsdale	11.3	-	Roscommon	-	-
Houghton	-	-	Saginaw	18.2	10.1
Huron	-	-	St Clair	10.0	5.2
Ingham	21.6	11.8	St Joseph	-	-
Ionia	6.7	-	Sanilac	-	-
Iosco	-	-	Schoolcraft	0.0	-
Iron	-	-	Shiawassee	12.4	7.0
Isabella	21.8	13.0	Tuscola	-	-
Jackson	13.5	9.1	Van Buren	6.4	5.6
Kalamazoo	8.5	7.3	Washtenaw	21.1	13.3
Kalkaska	-	-	Wayne	21.6	13.5
Kent	9.5	6.4	Wexford	23.9 *	16.3
Keweenaw	-	0.0	State of Michigan	13.4	8.4

Female



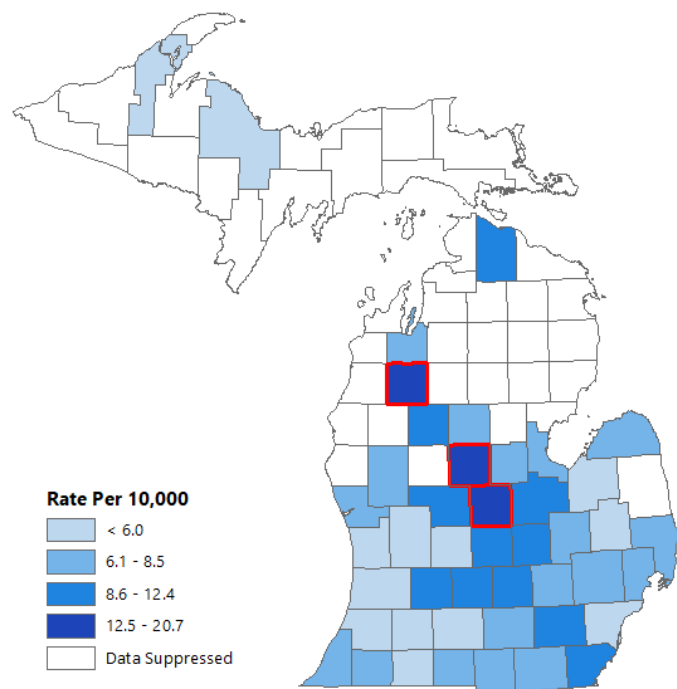
Data Notes:

^a Hospitalization data taken from the 2010-2014 Michigan Inpatient Database. ^b Rates are age-adjusted to the 2000 US Standard Population. ^c County rate suppressed if hospitalization count < 20.

^d Counties defined as outliers (see page 2) are outlined in red on the map and indicated by an asterisk in the table.

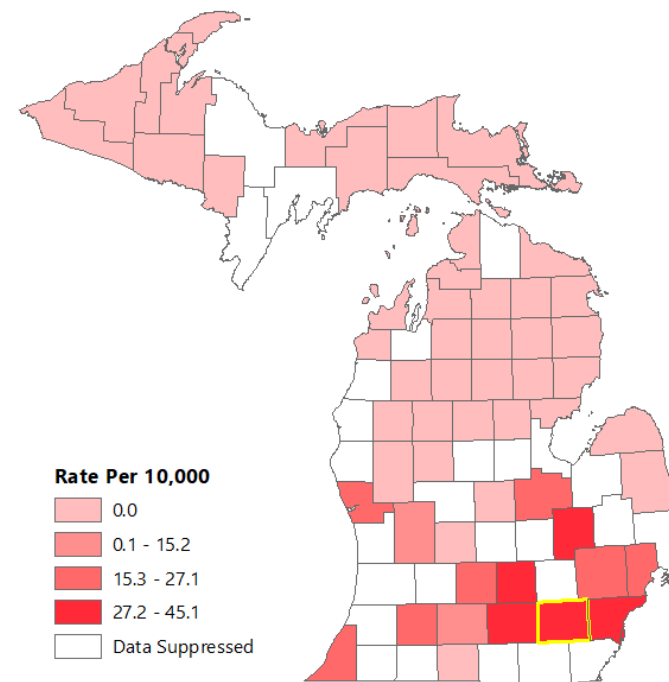
Child Asthma Hospitalizations by Race

White



Age-Adjusted Rates ^{a, b} (per 10,000) of Asthma Hospitalizations Among Children by Race (Aged <18) ^{c, d}					
County ^d	White	Black	County ^d	White	Black
Alcona	-	0.0	Lake	-	0.0
Alger	-	0.0	Lapeer	5.6	-
Allegan	4.5	-	Leelanau	-	0.0
Alpena	-	0.0	Lenawee	6.7	-
Antrim	-	0.0	Livingston	8.0	-
Arenac	-	0.0	Luce	-	0.0
Baraga	-	0.0	Mackinac	-	0.0
Barry	8.8	-	Macomb	6.7	23.5
Bay	8.5	-	Manistee	-	-
Benzie	-	0.0	Marquette	5.4	-
Berrien	6.3	22.4	Mason	-	-
Branch	7.6	0.0	Mecosta	-	0.0
Calhoun	5.2	9.2	Menominee	-	-
Cass	6.6	-	Midland	7.8	-
Charlevoix	-	0.0	Missaukee	-	0.0
Cheboygan	11.0	-	Monroe	9.0	-
Chippewa	-	0.0	Montcalm	10.3	-
Clare	7.7	0.0	Montmorency	-	0.0
Clinton	9.3	-	Muskegon	7.0	25.6
Crawford	-	0.0	Newaygo	7.8	0.0
Delta	-	-	Oakland	6.2	22.8
Dickinson	-	0.0	Oceana	-	-
Eaton	12.0	18.5	Ogemaw	-	0.0
Emmet	-	0.0	Ontonagon	-	0.0
Genesee	7.8	30.7	Osceola	9.0	0.0
Gladwin	-	0.0	Oscoda	-	0.0
Gogebic	-	0.0	Otsego	-	0.0
Grand Traverse	7.3	-	Ottawa	3.7	-
Gratiot	16.6 *	0.0	Presque Isle	-	0.0
Hillsdale	6.4	-	Roscommon	-	0.0
Houghton	5.7	0.0	Saginaw	8.7	27.0
Huron	6.7	0.0	St Clair	7.4	-
Ingham	12.4	29.3	St Joseph	3.1	-
Ionia	5.0	0.0	Sanilac	-	0.0
Iosco	-	0.0	Schoolcraft	-	0.0
Iron	-	0.0	Shiawassee	8.7	-
Isabella	18.5 *	-	Tuscola	4.2	-
Jackson	8.2	31.3	Van Buren	4.8	-
Kalamazoo	4.7	20.6	Washtenaw	11.4	45.1 *
Kalkaska	-	0.0	Wayne	5.8	31.9
Kent	6.0	15.2	Wexford	20.6 *	0.0
Keweenaw	-	0.0	State of Michigan	6.9	27.1

Black

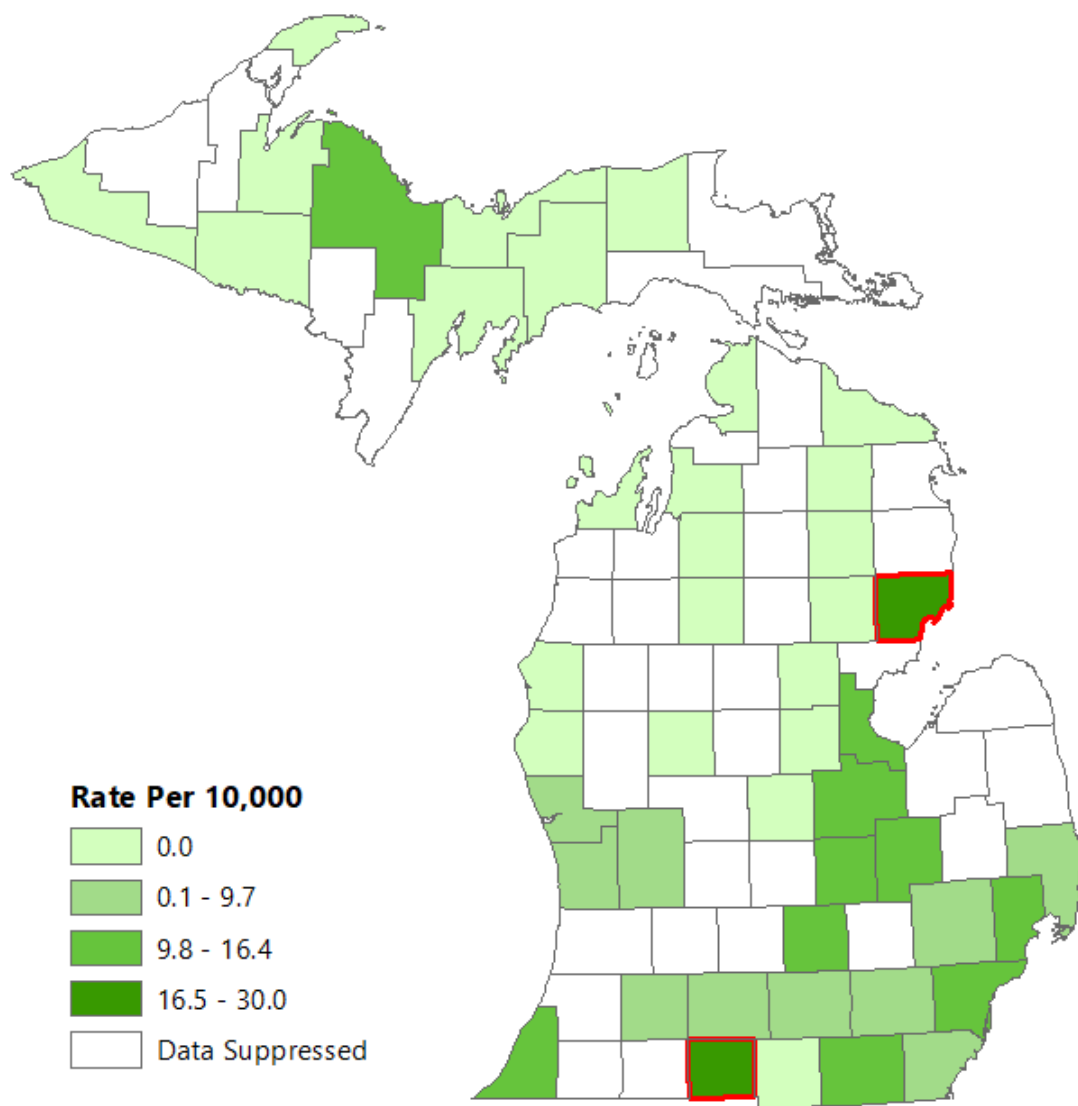


Data Notes:

^a Hospitalization data taken from the 2010-2014 Michigan Inpatient Database. ^b Rates are age-adjusted to the 2000 US Standard Population. ^c County rate suppressed if hospitalization count < 20.

^d Counties defined as outliers (see page 2) are outlined in red on the map of White individuals, outlined in yellow on the map of Black individuals, and indicated by an asterisk in the table.

Asthma Mortality



Data Notes:

^a Hospitalization data taken from the 2010-2014 Michigan Inpatient Database and includes both adult and children asthma mortality combined. ^b Rates are age-adjusted to the 2000 US Standard Population. ^c County rate suppressed if mortality count < 5. ^d Counties defined as outliers (see page 2) are outlined in red on the map and indicated by an asterisk in the table.

Age-Adjusted Rates ^{a,b} (per 10,000) of Asthma Mortality ^{c, d}			
County ^e	Rate	County ^e	Rate
Alcona	-	Lake	-
Alger	0.0	Lapeer	-
Allegan	-	Leelanau	0.0
Alpena	-	Lenawee	10.9
Antrim	0.0	Livingston	-
Arenac	-	Luce	0.0
Baraga	0.0	Mackinac	-
Barry	-	Macomb	11.7
Bay	11.2	Manistee	-
Benzie	-	Marquette	13.1
Berrien	12.7	Mason	0.0
Branch	24.1 *	Mecosta	0.0
Calhoun	5.8	Menominee	-
Cass	-	Midland	0.0
Charlevoix	-	Missaukee	0.0
Cheboygan	-	Monroe	9.2
Chippewa	-	Montcalm	-
Clare	-	Montmorency	0.0
Clinton	-	Muskegon	5.0
Crawford	-	Newaygo	-
Delta	0.0	Oakland	9.6
Dickinson	-	Oceana	0.0
Eaton	-	Ogemaw	0.0
Emmet	0.0	Ontonagon	-
Genesee	11.7	Osceola	-
Gladwin	0.0	Oscoda	0.0
Gogebic	0.0	Otsego	-
Grand Traverse	-	Ottawa	6.7
Gratiot	0.0	Presque Isle	0.0
Hillsdale	0.0	Roscommon	-
Houghton	-	Saginaw	11.9
Huron	-	St Clair	-
Ingham	11.7	St Joseph	0.0
Ionia	-	Sanilac	16.3
Iosco	29.5 *	Schoolcraft	7.5
Iron	0.0	Shiawassee	-
Isabella	-	Tuscola	-
Jackson	6.3	Van Buren	-
Kalamazoo	7.9	Washtenaw	6.6
Kalkaska	0.0	Wayne	16.0
Kent	6.2	Wexford	-
Keweenaw	0.0	State of Michigan	9.8