

Cardiovascular-Related Hospitalization among Michigan Adults (2017)

Major cardiovascular disease listed as primary diagnosis per 100,000 Michigan adults (18 years and older)

Characteristics	Major CVD listed as primary diagnosis	
	Hospital discharges per 100,000 MI adults	95% CI
Michigan (Rate Unadjusted)	2,181.9	(2,171.7-2,192.2)
Michigan (Rate Age-adjusted)	1,821.0	(1,812.3- 1,829.7)
Characteristics (Rate Unadjusted)		
Age Group (Years)		
18-44	256.9	(251.5-262.3)
45-64	1,837.9	(1,822.0-1,853.9)
65 and older	6,664.5	(6,626.7-6,702.4)
Gender		
Male	2,419.1	(2,403.7-2,434.6)
Female	1,956.7	(1,943.2-1,970.3)
Race		
non-Hispanic White	2,206.6	(2,194.9-2,218.3)
non-Hispanic Black	3,024.1	(2,991.5-3,056.7)

95% CI – 95% Confidence Interval

The following ICD-10 CM diagnosis codes were used to define major cardiovascular disease (Major CVD): diseases of the heart (I00-I09, I11, I13, I20-I51), cerebrovascular disease (I60-I69), and diseases of the arteries, arterioles and capillaries (I70-I78).

Length of Stay - Major cardiovascular disease listed as primary diagnosis

Length of stay	Major CVD	
	Days	Std
Average length of stay	5.2	+/- 5.0
Median length of stay	4	
Most frequent length of stay	2	

Std – Standard deviation (applies only to average)

The following ICD-10 CM diagnosis codes were used to define Major CVD: diseases of the heart (I00-I09, I11, I13, I20-I51), cerebrovascular disease (I60-I69), and diseases of the arteries, arterioles and capillaries (I70-I78).

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Heart attack listed as primary diagnosis per 100,000 Michigan adults (18 years and older)

	Heart attack listed as primary diagnosis	
Characteristics	Hospital discharges per 100,000 MI adults	95% CI
Michigan (Rate Unadjusted)	325.9	(321.9-329.9)
Michigan (Rate Age-adjusted)	272.8	(269.4- 276.1)
Characteristics (Rate Unadjusted)		
Age Group (Years)		
18-44	35.9	(33.9-37.9)
45-64	332.4	(325.6-339.3)
65 and older	906.0	(891.6-920.4)
Gender		
Male	396.5	(390.2-402.8)
Female	258.9	(253.9-263.9)
Race		
non-Hispanic White	343.3	(338.7-348.0)
non-Hispanic Black	368.9	(357.4-380.4)

95% CI – 95% Confidence Interval

ICD-10 CM diagnosis codes I21 and I22 were used to define heart attack.

Length of Stay - Heart attack listed as primary diagnosis

Length of stay	Heart attack	
	Days	Std
Average length of stay	4.7	+/- 4.9
Median length of stay	4	
Most frequent length of stay	2	

Std – Standard deviation (applies only to average)

ICD-10 CM diagnosis codes I21 and I22 were used to define heart attack.

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Heart failure listed as primary diagnosis per 100,000 Michigan adults (18 years and older)

Characteristics	Heart failure listed as primary diagnosis	
	Hospital discharges per 100,000 MI adults	95% CI
Michigan (Rate Unadjusted)	89.8	(87.7-91.9)
Michigan (Rate Age-adjusted)	74.6	(72.9- 76.4)
Characteristics (Rate Unadjusted)		
Age Group (Years)		
18-44	10.4	(9.3-11.5)
45-64	60.8	(57.9-63.7)
65 and older	299.1	(290.8-307.4)
Gender		
Male	95.1	(92.0-98.2)
Female	84.9	(82.0-87.7)
Race		
non-Hispanic White	95.3	(92.9-97.8)
non-Hispanic Black	101.2	(95.1-107.2)

95% CI – 95% Confidence Interval

ICD-10 CM diagnosis code I50 was used to define heart failure.

Length of Stay - Heart failure listed as primary diagnosis

Length of stay	Heart failure	
	Days	Std
Average length of stay	5.5	+/- 7.3
Median length of stay	4	
Most frequent length of stay	2	

Std – Standard deviation (applies only to average)

ICD-10 CM diagnosis code I50 was used to define heart failure.

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Coronary heart disease listed as primary diagnosis per 100,000 Michigan adults (18 years and older)

Coronary heart disease listed as primary diagnosis		
Characteristics	Hospital discharges per 100,000 MI adults	95% CI
Michigan (Rate Unadjusted)	513.4	(508.4-518.4)
Michigan (Rate Age-adjusted)	429.1	(424.9- 433.4)
Characteristics (Rate Unadjusted)		
Age Group (Years)		
18-44	51.5	(49.1-54.0)
45-64	542.4	(533.7-551.1)
65 and older	1,406.7	(1,388.9-1,424.6)
Gender		
Male	647.2	(639.1-655.3)
Female	386.4	(380.3-392.5)
Race		
non-Hispanic White	539.6	(533.7-545.4)
non-Hispanic Black	580.3	(565.9-594.7)

95% CI – 95% Confidence Interval

ICD-10 CM diagnosis codes I20-I25 were used to define coronary heart disease.

Length of Stay - Coronary heart disease listed as primary diagnosis

Length of stay	Coronary heart disease	
	Days	Std
Average length of stay	4.6	+/- 4.8
Median length of stay	4	
Most frequent length of stay	2	

Std – Standard deviation (applies only to average)

ICD-10 CM diagnosis codes I20-I25 were used to define coronary heart disease.

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Transient ischemic attack (TIA) listed as primary diagnosis per 100,000 Michigan adults (18 years and older)

TIA listed as primary diagnosis per 100,000 MI adults		
Characteristics	Hospital discharges per 100,000 MI adults	95% CI
Michigan (Rate Unadjusted)	61.1	(59.4-62.8)
Michigan (Rate Age-adjusted)	50.6	(49.2- 52.1)
Characteristics (Rate Unadjusted)		
Age Group (Years)		
18-44	6.0	(5.2-6.8)
45-64	44.6	(42.0-47.1)
65 and older	200.3	(193.5-207.1)
Gender		
Male	53.9	(51.6-56.3)
Female	67.9	(65.3-70.4)
Race		
non-Hispanic White	60.2	(58.3-62.2)
non-Hispanic Black	93.5	(87.7-99.4)

95% CI – 95% Confidence Interval

ICD-10 CM diagnosis code G45 was used to define TIA.

Length of Stay - TIA listed as primary diagnosis

Length of stay	TIA	
	Days	Std
Average length of stay	2.6	+/- 5.6
Median length of stay	2	
Most frequent length of stay	2	

TIA – Transient Ischemic Attack; Std – Standard deviation (applies only to average)

ICD-10 CM diagnosis code G45 was used to define TIA.

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Stroke (Ischemic and Hemorrhagic combined) listed as primary diagnosis per 100,000 Michigan adults (18 years and older)

Characteristics	Stroke listed as primary diagnosis	
	Hospital discharges per 100,000 MI adults	95% CI
Michigan (Rate Unadjusted)	413.7	(409.2-418.3)
Michigan (Rate Age-adjusted)	344.3	(340.6- 348.1)
Characteristics (Rate Unadjusted)		
Age Group (Years)		
18-44	43.3	(41.1-45.5)
45-64	350.1	(343.0-357.1)
65 and older	1,272.3	(1,255.3-1,289.3)
Gender		
Male	423.5	(417.0-430.1)
Female	404.5	(398.2-410.7)
Race		
non-Hispanic White	411.0	(405.9-416.1)
non-Hispanic Black	606.3	(591.5-621.0)

95% CI – 95% Confidence Interval

ICD-10 CM diagnosis codes I60-I69 were used to define stroke.

Length of Stay – Stroke (Ischemic and Hemorrhagic combined) listed as primary diagnosis

Length of stay	Stroke	
	Days	Std
Average length of stay	6.3	+/- 7.0
Median length of stay	4	
Most frequent length of stay	1	

Std – Standard deviation (applies only to average)

ICD-10 CM diagnosis codes I60-I69 were used to define stroke.

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Ischemic stroke listed as primary diagnosis per 100,000 Michigan adults (18 years and older)

Characteristics	Ischemic stroke listed as primary diagnosis	
	Hospital discharges per 100,000 MI adults	95% CI
Michigan (Rate Unadjusted)	275.3	(271.7-279.0)
Michigan (Rate Age-adjusted)	227.8	(224.7- 230.9)
Characteristics (Rate Unadjusted)		
Age Group (Years)		
18-44	22.9	(21.3-24.5)
45-64	221.2	(215.6-226.8)
65 and older	877.9	(863.8-892.1)
Gender		
Male	286.7	(281.3-292.1)
Female	264.5	(259.5-269.6)
Race		
non-Hispanic White	280.8	(276.6-285.0)
non-Hispanic Black	365.7	(354.2-377.2)

95% CI – 95% Confidence Interval

ICD-10 CM diagnosis codes I60-I62 were used to define ischemic stroke.

Length of Stay - Ischemic stroke listed as primary diagnosis

Length of stay	Ischemic stroke	
	Days	Std
Average length of stay	4.3	+/- 4.3
Median length of stay	3	
Most frequent length of stay	2	

Std – Standard deviation (applies only to average)

ICD-10 CM diagnosis codes I60-I62 were used to define ischemic stroke.

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Hemorrhagic stroke listed as primary diagnosis per 100,000 Michigan adults (18 years and older)

Characteristics	Hemorrhagic stroke listed as primary diagnosis	
	Hospital discharges per 100,000 MI adults	95% CI
Michigan (Rate Unadjusted)	51.1	(49.5-52.7)
Michigan (Rate Age-adjusted)	43.2	(42.3- 44.2)
Characteristics (Rate Unadjusted)		
Age Group (Years)		
18-44	8.7	(7.8-9.7)
45-64	46.4	(43.8-48.9)
65 and older	145.2	(139.4-151.0)
Gender		
Male	52.3	(50.0-54.6)
Female	50.0	(47.8-52.2)
Race		
non-Hispanic White	49.0	(47.2-50.8)
non-Hispanic Black	83.3	(77.8-88.8)

95% CI – 95% Confidence Interval

ICD-10 CM diagnosis codes I63, I65, and I66 were used to define hemorrhagic stroke.

Length of Stay - Hemorrhagic stroke listed as primary diagnosis

Length of stay	Hemorrhagic stroke	
	Days	Std
Average length of stay	8	+/- 8.3
Median length of stay	5	
Most frequent length of stay	1	

Std – Standard deviation (applies only to average)

ICD-10 CM diagnosis codes I63, I65, and I66 were used to define hemorrhagic stroke.

Data Sources and Reference

Michigan Resident Inpatient Files created using data from the Michigan Inpatient Database (MIDB) obtained with permission from the Michigan Health & Hospital Association Service Corporation, 2017.

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United States Department of Health and Human Services (US DHHS), Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS), Bridged-Race Population Estimates, United States July 1st resident population by state, county, age, sex, bridged-race, and Hispanic origin, on CDC WONDER On-line Database (2017).

Klein RJ, Schoenborn CA. Age adjustment using the 2000 projected U.S. population. Healthy People Statistical Notes, no. 20. Hyattsville, Maryland: National Center for Health Statistics. January 2001.

Definition

Confidence Interval (CI): A range about a measurement within which we would expect the “true” number of hospitalizations (hospital discharges) among the population. A 95% CI can be interpreted as the following: If we took 100 measurements and calculated 100 confident intervals, we would be 95% sure that the true hospital discharge rate among the adult Michigan population would fall within a certain range 95% of the time and outside the range 5% of the time. The wider the interval means the more imprecise the measurement, the narrower the interval the more precise the measurement.

Methods and Limitations

The hospitalizations per 100,000 Michigan adults (i.e., hospital discharge rates) were determined using hospital discharge counts among Michigan adults (18 years and older) as the numerator and the estimated number of Michigan adults (18 years and older) as the denominator. The Michigan Residence Inpatient Files provided data on hospital discharges. Discharges listed as primary ICD-10 CM diagnosis codes were used to define the following cardiovascular conditions:

- 1) major cardiovascular disease was diseases of the heart (I00-I09, I11, I13, I20-I51); cerebrovascular disease (I60-I69), and diseases of the arteries, arterioles and capillaries(I70-I78);
- 2) heart attack disease was defined as (I21 and I22);
- 3) heart failure was defined I50;
- 4) coronary heart disease was defined as I20-I25;
- 5) transient ischemic attack (TIA) was defined as G45;

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6) stroke was defined as I60-I69;

7) ischemic stroke was defined as I63, I65, and I66;

8) hemorrhagic stroke was defined as I60-I62.

Because hospital discharges are not individual persons, the hospital discharge rates may not necessarily reflect rates of disease per person with a cardiovascular condition; that is, persons who are hospitalized more than once in a year may be counted more than once.

The denominator was estimated from the 2017 adult Michigan bridged-race population estimate. Age-adjusted rates were rates adjusted to the 2000 U.S. Standard Population using three age groups (18–44, 45–64, 65+ years). Rates indicated as unadjusted were rates that were not age-adjusted.

Confidence intervals were 95%.