



Impact of Sudden
Cardiac Death of the Young
in Michigan
2007-2016
Surveillance Update



Michigan Department of Health & Human Services

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Background:

In 2004, Michigan identified sudden cardiac death (SCD) as a potentially preventable condition. To better understand the burden of SCD in Michigan, in 2009 the Michigan Department of Health and Human Services (MDHHS) published a report titled *Too Young to Die*¹ which analyzed SCD occurrence, specifically among the young population (1-39 years). The original report was updated in 2012.² These reports included background information about SCD, mortality statistics, case reviews, and potential prevention practices.

The goal of this report is to update the statistics from the two previous reports. Sudden cardiac death of the young (SCDY) numbers and rates as well as updated figures, tables, and maps using death certificate data from 2007-2016 are included in this report supplement.

Who is affected by SCDY?

Where do most SCDs occur?

Why do SCDs happen?

Case Definition:

- Aged 1-39 years,
- Specific underlying causes of death, and
- Did not die in an inpatient setting

Methods:

Surveillance and analysis methods followed protocol and case definitions similar to the previous reports, only underlying ICD-10 codes used changed slightly. Cases were identified from death certificate data between 2007 and 2016 from the MDHHS Division for Vital Records and Health Statistics. Cases were included if they were between 1 and 39 years of age, did not die in an inpatient setting and had an underlying cause of death in one of the three following categories: cardiac (I00-I51 except I12-I13 and I26-I28, I71), congenital cardiac malformation (Q20-Q25, Q87.4), and ill-defined or unknown (R96-R99) etiologies.

Results:

Between 2007 and 2016, there were a total of 2,702 SCDY cases identified. The statewide age-adjusted SCDY mortality rate for individuals aged 1-39 years was 5.9 deaths per 100,000 residents. Differences between counties were observed, as depicted in Figure 1. Twenty-one counties had age-adjusted mortality rates higher than the statewide rate. The highest SCDY rates were reported in Iosco, Ogemaw, Montcalm, and Wayne counties. Wayne County had the largest total number of SCDY cases (851), followed by Oakland (220), Genesee (169), Kent (141), and Macomb (140) counties. The rates for all Michigan counties, with five or more cases, are included in Appendix A.

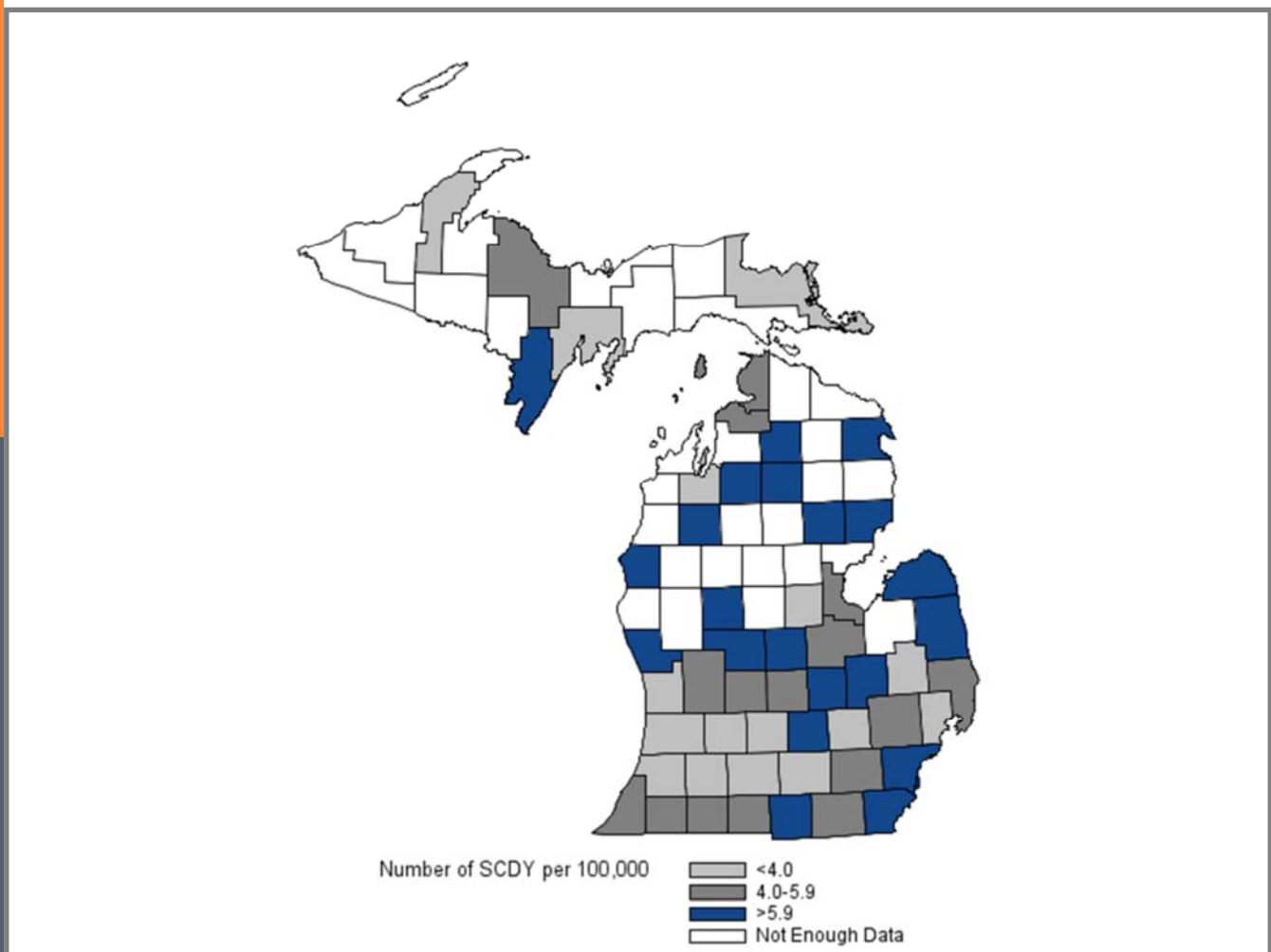


Figure 1: Age-Adjusted Mortality Rates of SCDY in Michigan Counties of Residents Aged 1-39 Years, 2007-2016

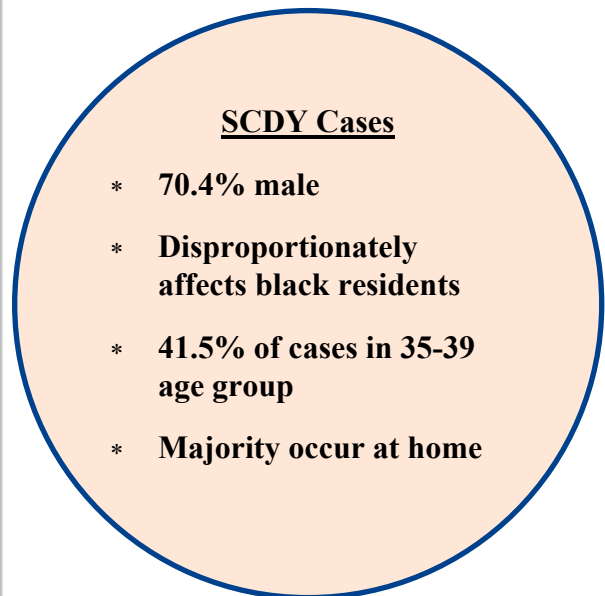
Table 1: Demographics of SCDY Cases of Michigan Residents Aged 1-39 Years, 2007-2016

	Number	Percent
Total	2,702	
Sex⁺		
Male	1,901	70.4
Female	801	29.6
Race⁺		
White	1,673	61.9
Black	913	33.8
Other	116	4.3
Age⁺⁺		
1-4 Years	83	3.1
5-9 Years	26	1.0
10-14 Years	53	2.0
15-19 Years	124	4.6
20-24 Years	255	9.4
25-29 Years	386	14.3
30-34 Years	654	24.2
35-39 Years	1,121	41.5
Place of Death⁺		
Hospital: ER/Outpatient	1,132	41.9
Nursing Home	46	1.7
Extended Care	6	0.2
Home	1,168	43.3
Other Institution	51	1.9
Ambulance	4	0.1
Other	186	6.9
Unknown	106	3.9
Autopsy⁺		
Yes	2,048	75.8
No	82	3.0
Unknown	572	21.2

⁺ Significant difference (p<0.05) between groups

⁺⁺ p = 0.08

Data were analyzed by sex, race, age, place of death, autopsy status, and cause of death (Table 1). Most individuals died at home (43.3%) followed by the hospital emergency room/outpatient setting or were dead on arrival (41.9%). Autopsies were performed in just over three-quarters of these SCDY cases (75.8%).



Significant disparities were observed for sex and race; 70.4% of SCDY occurred in males and 33.8% occurred in blacks (Table 1). The age-adjusted SCDY mortality rate for blacks was 12.2 deaths per 100,000, more than 2.5 times higher than the age-adjusted mortality rate for whites (4.6 deaths per 100,000 residents).

The highest age-adjusted SCDY mortality rate was among black males, 17.4 deaths per 100,000, nearly triple that of the age-adjusted mortality rate among white males (6.6 deaths per 100,000). The SCDY rate for black females was 7.5 deaths per 100,000, which is also almost triple that of white females (2.6 deaths per 100,000) [data not shown].

Disparities were also observed for age and sex (Figure 2). For all groups analyzed, males were more commonly affected with SCDY than females. The largest disparity between sexes was observed in the 35-39 age group, with males making up more than 72% of the cases [data not shown].

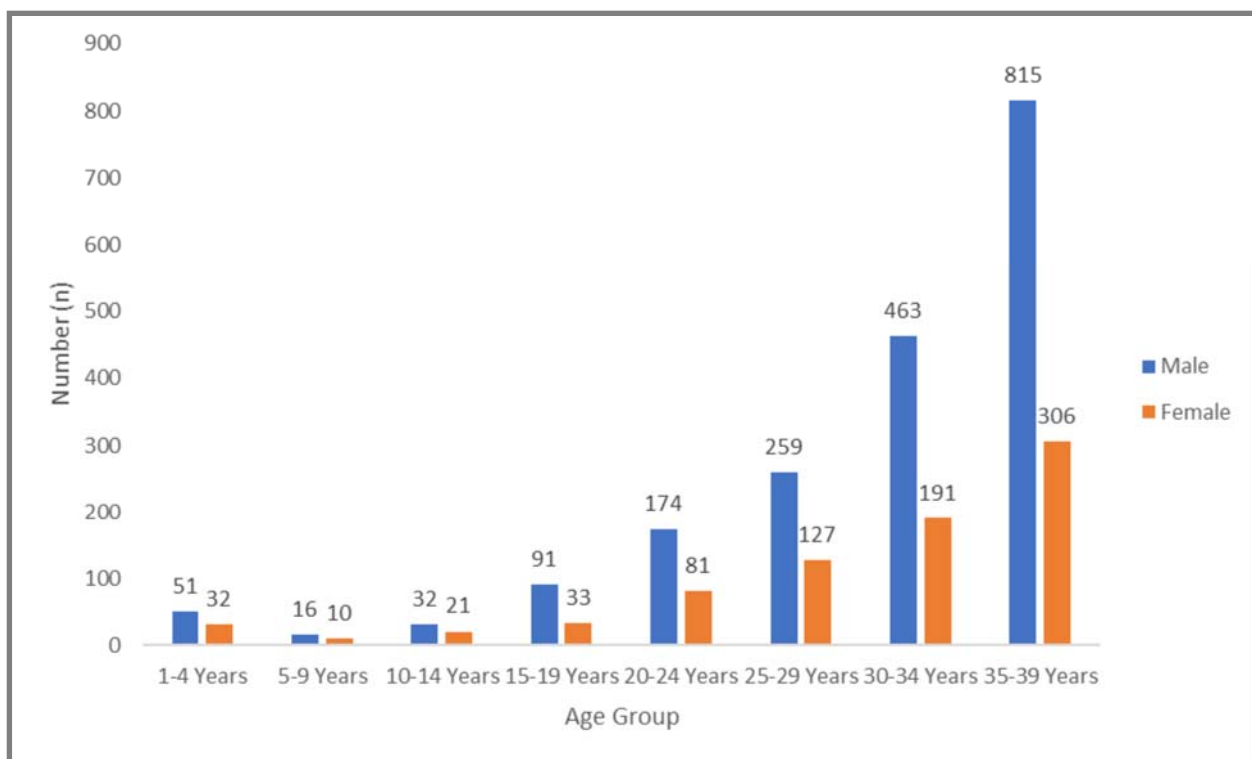


Figure 2: Number of SCDY Cases in Michigan Residents Aged 1-39 Years, by Age and Sex, 2007-2016

Overall, the number of SCDY cases increased with age. The greatest number of SCDY cases were reported in adults aged 35-39 years. The lowest age-adjusted SCDY mortality rate was in the 5-9 year age group at 0.4 per 100,000 residents. There was a dramatic increase between cases in their 20s and cases in their 30s, with continued increases later in the 30s. The highest SCDY mortality rate was for the 35-39 year age group at 18.7 deaths per 100,000 residents.

Table 2: Ten Most Frequent Underlying Causes of Death of Michigan SCDY, 2007-2016

ICD-10 Code	Cause of Death	Number	Percent
I11.9	Hypertensive Heart Disease	394	14.6
I25.0	Chronic Ischemic Heart Disease	387	14.3
R99	Ill-defined and Unknown Cause of Mortality	334	12.4
I42.0	Dilated Cardiomyopathy	286	10.6
I25.1	Atherosclerotic Heart Disease	213	7.9
I21.9	Acute Myocardial Infarction	182	6.7
I49.9	Cardiac Arrhythmia	90	3.3
I42.9	Cardiomyopathy, unspecified	89	3.3
I42.2	Other Hypertrophic Cardiomyopathy	80	3.0
Q24.9	Congenital Malformation of the Heart	56	2.1

The single most frequently reported cause of death was hypertensive heart disease (14.6%), followed by chronic ischemic heart disease (14.3%) and ill-defined cause (12.4%), as noted in Table 2. The top ten causes of SCDY consisted of eight cardiac causes, one congenital cardiac malformation and one ill-defined etiology.

The overall age-adjusted SCDY mortality rate was 5.7 deaths per 100,000 residents. The mortality rate related to cardiac ICD codes was 4.7 deaths per 100,000 residents, significantly higher than the mortality rates for ill-defined causes (0.3 deaths per 100,000 residents) and for congenital cardiac malformations (0.9 deaths per 100,000 residents) [data not shown].

**Age-Adjusted
SCDY
Mortality Rate:
5.7 Deaths per
100,000 residents**

For the top ten causes of death, there were notable differences by race, with blacks disproportionately represented among deaths related to all ten top causes. Blacks made up 53.5% of all SCDY cases caused by dilated cardiomyopathy and 52% all SCDY cases caused by hypertensive heart disease, as shown in Figure 3. The most commonly reported underlying cause of death among blacks was hypertensive heart disease (n=205) while among whites it was chronic ischemic heart disease (n=237).

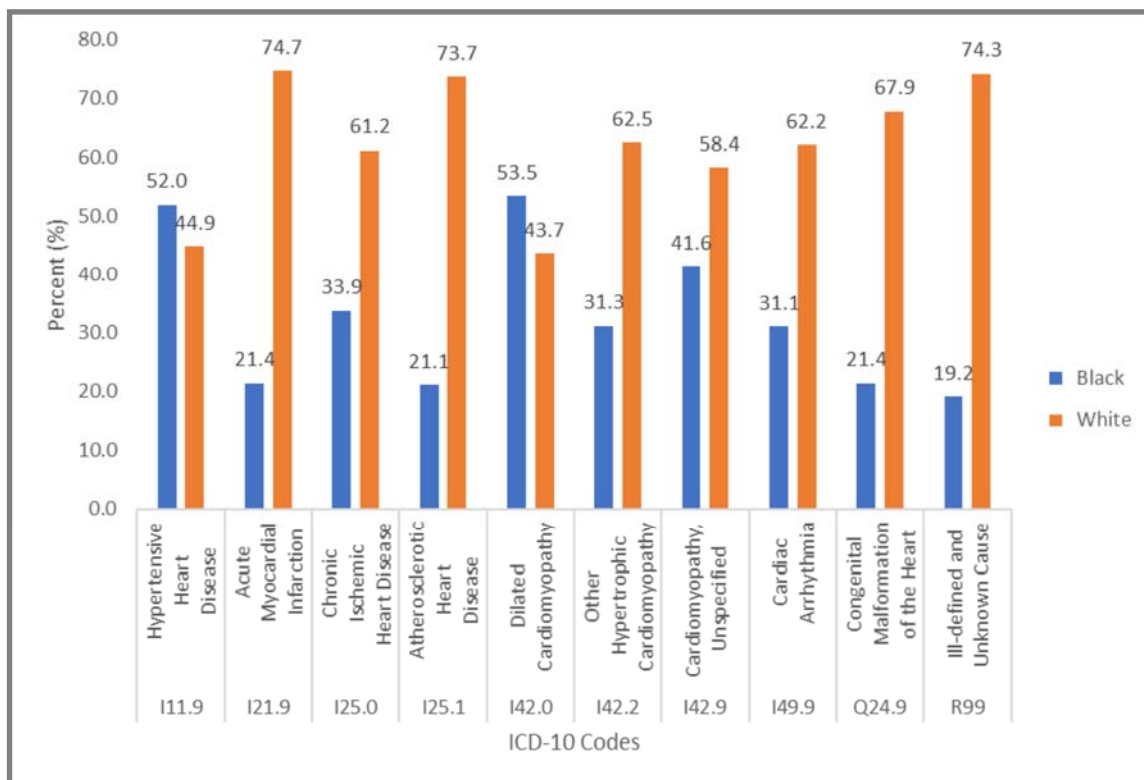


Figure 3: Racial Distribution of the Top Ten Causes of SCDY, Michigan Residents Aged 1-39 Years, 2007-2016

There were also notable differences between males and females. Males were more likely than females to die from each of the top ten causes of death. The greatest difference between the genders was in the other hypertrophic cardiomyopathy category where males represented 80.0% of all deaths and females comprised 20.0% of all deaths (Figure 4).

Males were more likely than females to die from each of the top ten causes of SCDY.

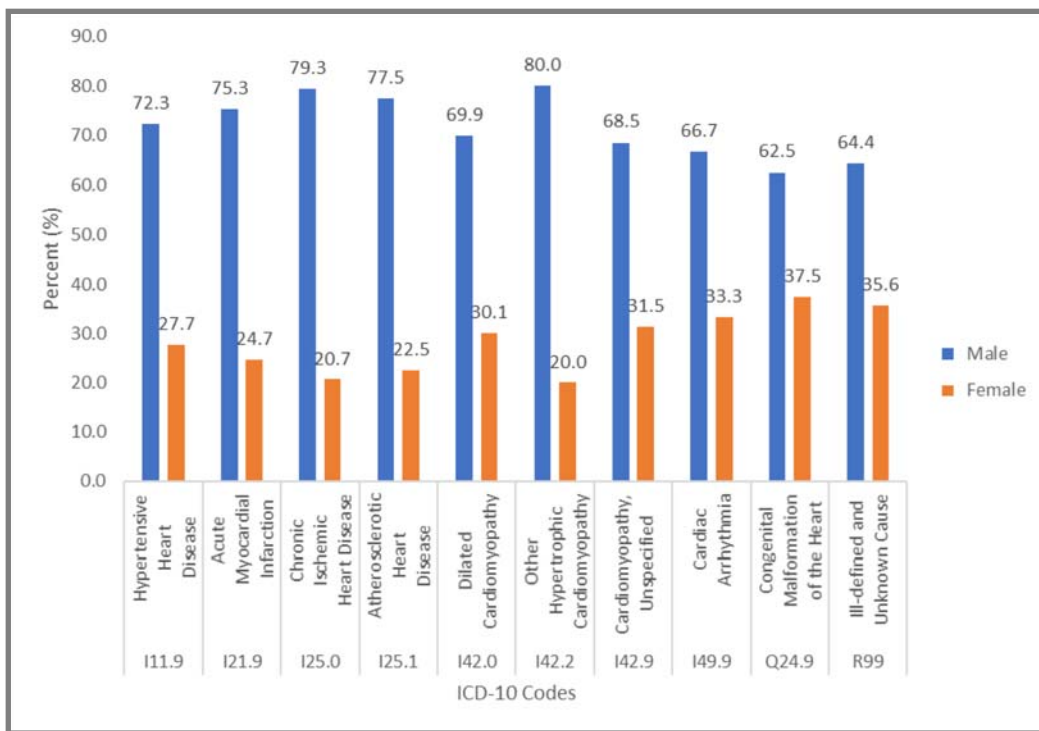


Figure 4: Gender Distribution of the Top Ten Causes of SCDY, Michigan Residents Aged 1-39 Years, 2007-2016

When analyzed by year, there was little fluctuation in the number of SCDY cases due to congenital and ill-defined causes. However in 2012, an increase was seen in ill-defined cases (Figure 6).

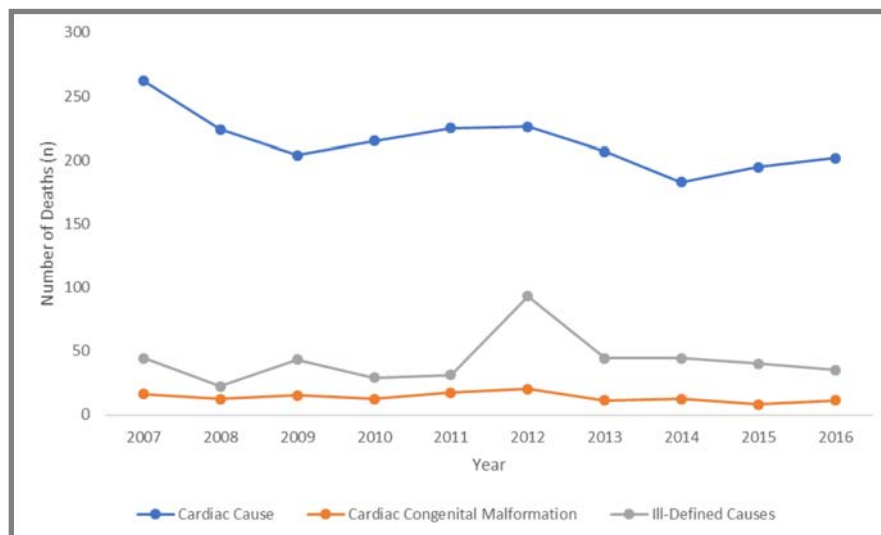


Figure 6: Number of SCDY, among Michigan Residents Aged 1-39 Years, by Underlying Cause of Death, 2007-2016

Conclusions:

Reducing early mortality due to heart disease is an important priority for public health. Although SCDY is a relatively rare occurrence when compared to SCD in older adults, it has a devastating impact not only on the family but on the larger community as well. Using death files to monitor and examine the trends of SCDY in Michigan is an important step to help reduce the burden. The data informs the education and policy activities occurring to help reduce SCDY.

Case identification using death certificate records has some limitations though and has previously been reported to result in an overestimation of true SCDY cases. In addition, analysis of death certificate data alone does not allow investigation of potential modifier effects that might provide additional insight or explanation relative to these causes of death—for instance, the impact of environmental or behavioral factors such as smoking, drug or alcohol use, excessive weight or level of physical activity, etc. Further assessments of SCDY using multiple sources of case ascertainment (i.e. death certificates, emergency medical response, medical examiner, hospital) enhance the accuracy of data.

Since the last report, there has been limited reduction in the total number of SCDY cases and significant barriers remain with race, sex, and age. MDHHS will continue to monitor SCDY across the state and work with partners to implement prevention practices and policy activities that will help reduce SCDY.

Suggested Citation: Impact of Sudden Cardiac Death of the Young in Michigan 2007-2016 Surveillance Update, Michigan Department of Health and Human Services, Lifecourse Epidemiology and Genomics Division, 2019.

Appendix A

Age-Adjusted Rates of SCDY per 100,000 Michigan Residents, by County, 2007-2016

County	Number of SCDY	Age Adjusted Rate	95% Confidence Interval
Alcona	-	-	-
Alger	-	-	-
Allegan	18	3.7	(2 - 5.5)
Alpena	9	7.8	(2.7 - 12.9)
Antrim	-	-	-
Arenac	-	-	-
Baraga	-	-	-
Barry	8	3.4	(1 - 5.8)
Bay	21	4.7	(2.7 - 6.8)
Benzie	-	-	-
Berrien	28	4.0	(2.5 - 5.5)
Branch	8	4.1	(1.2 - 7)
Calhoun	24	3.8	(2.3 - 5.4)
Cass	10	4.9	(1.8 - 7.9)
Charlevoix	5	5.6	(0.7 - 10.5)
Cheboygan	-	-	-
Chippewa	6	3.3	(0.6 - 6)
Clare	-	-	-
Clinton	15	4.6	(2.2 - 6.9)
Crawford	5	9.7	(1 - 18.3)
Delta	5	3.3	(0.4 - 6.3)
Dickinson	-	-	-
Eaton	14	3.0	(1.4 - 4.7)
Emmet	7	5.1	(1.3 - 8.8)
Genesee	169	8.4	(7.1 - 9.7)
Gladwin	-	-	-
Gogebic	-	-	-
Grand Traverse	14	3.4	(1.6 - 5.2)
Gratiot	19	9.2	(5 - 13.4)
Hillsdale	12	6.3	(2.7 - 9.9)
Houghton	5	3.4	(0.2 - 6.6)
Huron	8	7.4	(2.3 - 12.6)
Ingham	80	6.0	(4.6 - 7.4)
Ionia	13	4.0	(1.8 - 6.2)
Iosco	13	17.0	(7.7 - 26.3)
Iron	-	-	-
Isabella	16	5.4	(2.6 - 8.2)
Jackson	27	3.8	(2.4 - 5.3)
Kalamazoo	42	3.4	(2.4 - 4.5)
Kalkaska	6	8.3	(1.6 - 14.9)
Kent	141	4.7	(3.9 - 5.5)
Keweenaw	-	-	-

County	Number of SCDY	Age Adjusted Rate	95% Confidence Interval
Lake	-	-	-
Lapeer	11	3.2	(1.3 - 5.1)
Leelanau	-	-	-
Lenawee	18	4.2	(2.2 - 6.1)
Livingston	28	3.8	(2.4 - 5.2)
Luce	-	-	-
Mackinac	-	-	-
Macomb	140	3.6	(3 - 4.2)
Manistee	-	-	-
Marquette	12	4.0	(1.6 - 6.3)
Mason	8	7.1	(2.1 - 12)
Mecosta	14	8.7	(3.9 - 13.5)
Menominee	6	7.1	(1.4 - 12.8)
Midland	14	3.8	(1.8 - 5.8)
Missaukee	-	-	-
Monroe	33	6.8	(4.8 - 8.8)
Montcalm	27	10.7	(6.9 - 14.5)
Montmorency	-	-	-
Muskegon	49	6.5	(4.7 - 8.3)
Newaygo	-	-	-
Oakland	220	4.0	(3.4 - 4.5)
Oceana	-	-	-
Ogemaw	9	11.8	(4.1 - 19.5)
Ontonagon	-	-	-
Osceola	-	-	-
Oscoda	-	-	-
Otsego	8	8.1	(2.4 - 13.8)
Ottawa	27	2.1	(1.3 - 2.9)
Presque Isle	-	-	-
Roscommon	-	-	-
Saginaw	45	5.2	(3.7 - 6.8)
Sanilac	13	7.4	(3.3 - 11.4)
Schoolcraft	-	-	-
Shiawassee	20	6.7	(3.8 - 9.7)
St. Clair	34	5.2	(3.4 - 6.9)
St. Joseph	16	5.9	(3 - 8.8)
Tuscola	-	-	-
Van Buren	10	3.0	(1.1 - 4.9)
Washtenaw	79	4.5	(3.5 - 5.5)
Wayne	851	10.0	(9.3 - 10.6)
Wexford	11	7.0	(2.8 - 11.1)

- Data was suppressed for counties with fewer than five SCDY.

References

1. *Too Young to Die — Impact of Sudden Cardiac Death of the Young in Michigan 1999-2008*, Michigan Department of Community Health, Cardiovascular Health, Nutrition and Physical Activity Section, Genomics and Genetic Disorders Section, 2008.
2. *Too Young to Die — An Update on the Impact of Sudden Cardiac Death of the Young in Michigan 1999-2011*, Michigan Department of Community Health, Genomic and Genetic Disorders Section, 2012.