

Research Brief ■ No. 1 ■ April 2023

Sudden Death in the Young

Delaware Profile 2017-2021

The research brief provides an overview of sudden death in the young (SDY) case registry, in Delaware. It uses the SDY case registry dataset from 2017 to 2021 from Delaware's Maternal and Child Death Review Commission (MCDRC) whose purpose is to improve the identification, review, and categorization of sudden unexplained child deaths under Delaware's legislative authority 31 Del. C. § § 320 – 324. As per the statute, a child death is defined as, *death of children under the age of 18 and stillbirth occurring after at least 20 weeks gestation*. The SDY registry was created under the auspices of the Centers for Disease for Control and Prevention (CDC) to investigate etiologies and risk factors for sudden death in the young including: Sudden Unexpected Infant Death (SUID), Sudden Cardiac Death (SCD), and Sudden Unexplained Death in Epilepsy (SUDEP) whose cause is not immediately known before investigation [1]. The details of SDY processes in Delaware are described elsewhere [1]; however, they are consistent with CDC guidelines [2, 3]. The National Center for Fatality Review and Prevention's (NCFRP) Child Death Review (CDR) funded by the Health Resources and Services Administration (HRSA), Maternal and Child Health Bureau, is the resource center for state and local child death review programs [2, 3].

Overview

The National Institutes of Health, the CDC, and the Michigan Public Health Institute collaborated to create a SDY registry, as historically, SDY ascertainment was hindered due to a lack of standardized, systematic collection of epidemiological data [2, 3]. The goals of the SDY registry are to: (1) describe the incidence of SDY in the United States using population based surveillance; (2) compile data from SDY cases to create a resource of information and DNA samples for research; (3) facilitate standardized approaches to investigation, autopsy, and categorization of SDY cases; (4) develop partnerships between local, state, and federal stakeholders toward a common goal of understanding and preventing SDY; and (5) support families who have lost loved ones to SDY by providing resources on bereavement and medical evaluation of surviving family members [2, 3]. Cases are identified through state/local offices of the Medical Examiner/Coroner and where applicable detailed phenotyping is performed for cases of SCD, unexplained infant and child death, and



Importance

In the U.S., about 1 in 800 infants (120/100,000 live births) and 1.9/100,000 children die unexpectedly. In Delaware, a total of 97 children died unexpectedly during 2017-2021.

Key findings

- Of the 97 deaths, 45 (46%) deaths were in the explained and 52 (54%) were unexplained causes of death category.
- The 2017-2021 SDY rate for infants in Delaware was 104.6 (95%CI: 78.8-136.1) per 100,00 live births as compared to the 2015-2016 U.S. SDY infant rate of 119.5 (95%CI: 111.8-127.6) per 100,000 live births. Between 2017 and 2021, Delaware saw a 45% decrease in SDY infant rates from 138.4 (95%CI: 77.5-228.2) per 100,000 live births in 2017 to 76.3 (95%CI: 33.0-150.3) per 100,000 live births in 2021.
- The 2017-2021 SDY rate for children in Delaware was 4.3 (95%CI: 3.1-5.8) per 100,000 children and the rate was about 2.2 times that of the 2015-2016 U.S. SDY rate of 1.9 (95%CI: 1.6-2.1) per 100,000 children.
- Delaware's Black non-Hispanic SDY infant rate of 231.5 (95%CI: 159.4-325.0) was about three times that of White non-Hispanic SDY infant rate of 75.3 (95%CI: 45.3-117.5) per 100,000 live births.



SUDEP [2, 3]. Currently, 10 states including Delaware participate in the SDY registry with data collection beginning in 2015 [2, 3], consistent with applicable federal and CDC policy and requirements of public health surveillance as defined in 45 CFR 46.102(l)(2). When a death occurs within 24 hours of the first symptom in the hospital after a resuscitated cardiac arrest, it is “sudden.” A death is “unexpected”, if it happens to someone who was in stable health or had an acute illness and the illness would not be the expected of cause death [2, 3]. In children, both witnessed and unwitnessed deaths are included in the registry as the events are rare [2, 3]. As per the SDY case registry, cause of death is categorized as “explained” (e.g., infant suffocation, cardiac, neurological, and other) or “unexplained” (i.e., possible cardiac, SUDEP, possible cardiac or SUDEP, or unexplained infant/child death) for cases with complete case information (i.e., contains autopsy, toxicology, or death scene investigation data). Cases with incomplete case information are excluded. Further, during case review, if cases are found to be due to intentional overdose, or due to, drowning, or motor vehicle accidents and determined to be truly accidental (i.e., without concern for underlying arrhythmia or seizure) then the cases are also excluded [3].

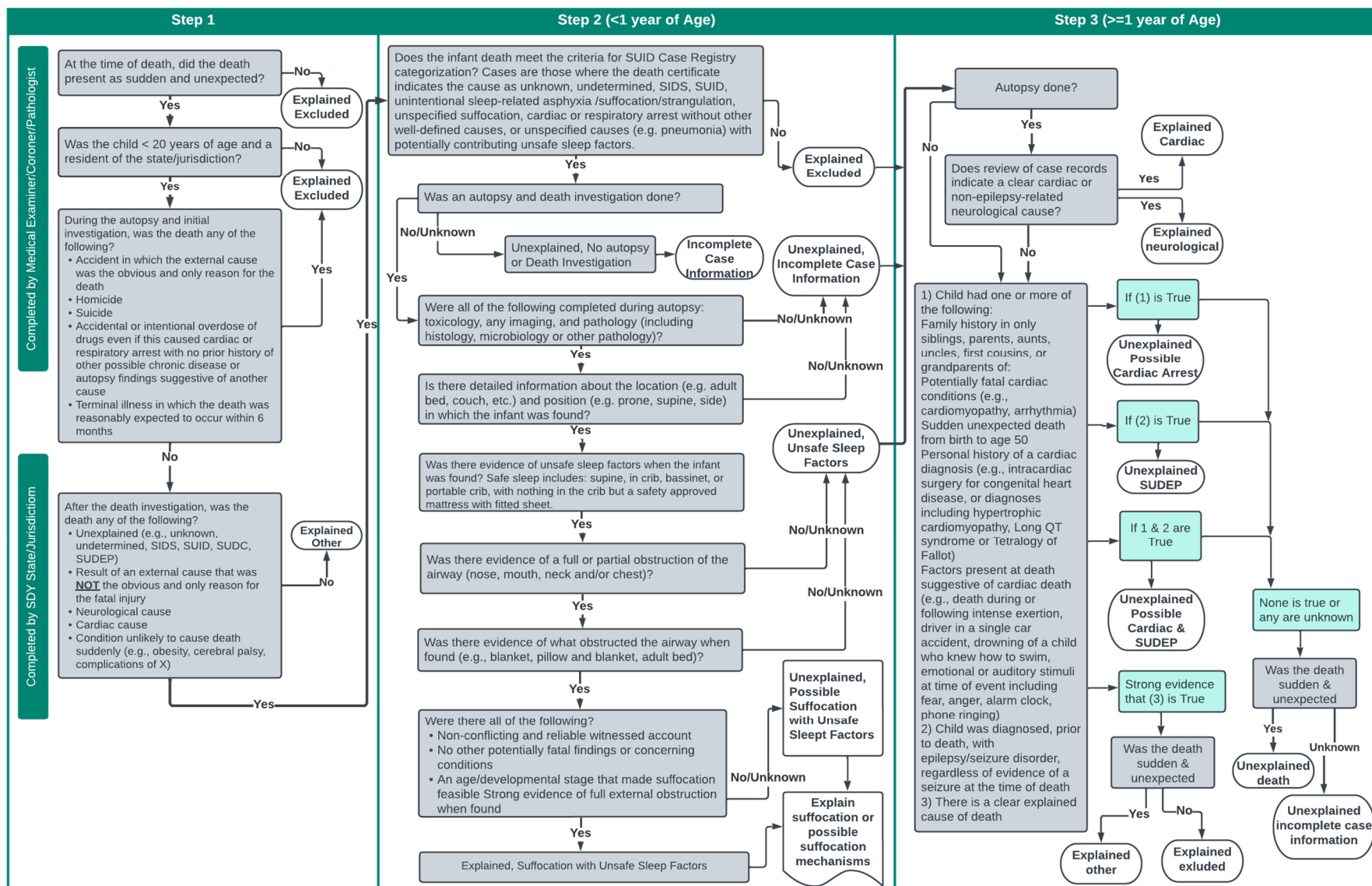
The most recent analysis of U.S. SDY registry data from 2015-2016 included six states (Delaware, Georgia, Minnesota, New Hampshire, Nevada, and Tennessee) and three jurisdictions (Hampton, Newport News, Norfolk, and Virginia Beach cities in Virginia; Fond du Lac, Forest, Kenosha, Milwaukee, Oneida, Racine, Vilas Waukesha, and Winnebago counties in Wisconsin; and San Francisco County in California). Of the 1,319 SDY cases identified from these states and jurisdictions, 187 cases were excluded (i.e., 122 cases had incomplete case information and 65 cases were determined to be accidental drownings and motor vehicle accidents after death case investigation), leaving 1,132 SDY cases for analysis. Of the 1,132 SDY cases in the U.S., 889 were infants (less than one year of age) with an overall SDY rate for infants of 120 per 100,000 live births, and 243 were children (one to 17 years of age) with an overall rate of 1.9 per 100,000 children [3]. As such, in estimating SDY rates, live births serve as the denominator for infants, and postcensal population estimates for children one to 17 years of age serve as the denominator for children [3].

Sudden Death in the Young ascertainment in Delaware

The Delaware SDY registry was established in 2015, under the MCDRC legislative authority 31 Del. C. § § 320 – 324 of reviewing all child deaths [1], which is with the Delaware Judicial Branch. Similar to fetal and infant mortality reviews, abstractors review medical records on every child who is born in Delaware to a Delaware resident, and whose death was “sudden” and “unexpected” consistent with CDC guidelines [1]. The ascertainment process begins when the MCDRC receives a notification of a child death from any of the sources: 1) the Division of Forensic Sciences-Medical Examiner (DFS-ME); 2) Investigation Coordinator (IC) from the Office of the Child Advocate; 3) Death Certificate from the Office of Vital Statistics contingent on toxicology results from the DFS-ME; and 4) media article [1]. Although age range may vary by jurisdictions, most of the SDY cases are restricted to <20 years of age [2]. In Delaware, deaths occurring to children less than 18 years of age are reviewed in accordance with the statute [1]. The ascertainment of SDY cases is consistent with U.S. SDY case registry [3]. Figure 1 displays a modified algorithm of SDY case registry, and a detailed algorithm of SDY registry can be found elsewhere [4].



Figure 1. Sudden Death in the Young Case Registry Algorithm



Source: SDY Algorithm. Available at: https://sdyregistry.org/wp-content/uploads/SDY-Categorization-Algorithm_V8.3.pdf



Sudden Death in the Young cases in Delaware

During 2017-2021, there were 102 SDY cases in Delaware, including: 45 explained cases, 52 unexplained cases, and five cases that were excluded either due to either incomplete case information or ineligibility (Table 1). Of the 97 SDY cases analyzed, 55 (56.7%) were infants less than one year of age and 42 (43.3%) were children one to 17 years of age.

Table 1. Sudden Death in the Young case characteristics, Delaware, 2017-2021

Characteristics	Sudden Death in the Young, Number (%)		
	Total	Infants (<1 year)	Children (1-17 years)
Overall	102 (100%)	57 (55.9%)	45 (44.1%)
SDY Cases			
Explained	45 (44.1%)	22 (38.6%)	23 (51.1%)
Unexplained	52 (51.0%)	33 (57.9%)	19 (42.2%)
Excluded	5 (4.9%)	2 (3.5%)	3 (6.7%)
SDY Cases Analyzed	97 (100%)	55 (56.7%)	42 (43.3%)
Explained categories			
Cardiac	5 (5.2%)		5 (11.9%)
Neurologic	2 (2.1%)		2 (4.8%)
Infant suffocation	15 (15.5%)	14 (25.5%)	1 (2.4%)
Other	23 (23.7%)	8 (14.5%)	15 (35.7%)
Unexplained categories			
Possible cardiac	3 (3.1%)		3 (7.1%)
Sudden Unexplained Death in Epilepsy (SUDEP)	3 (3.1%)		3 (7.1%)
Possible cardiac/SUDEP	1 (1.0%)		1 (2.4%)
Unexplained death	45 (46.4%)	33 (60.0%)	12 (28.6%)
Age			
Less than one year	55 (56.7%)	55 (100%)	N/A
1-2 years	16 (16.5%)	N/A	16 (38.1%)
3-5 years	2 (2.1%)	N/A	2 (4.8%)
6-8 years	3 (3.1%)	N/A	3 (7.1%)
9-11 years	7 (7.2%)	N/A	7 (16.7%)
12-14 years	5 (5.2%)	N/A	5 (11.9%)
15-17 years	9 (9.3%)	N/A	9 (21.4%)
Sex			
Female	46 (47.4%)	29 (52.7%)	17 (40.5%)
Male	51 (52.6%)	26 (47.3%)	25 (59.5%)
Race and Ethnicity			
White (non-Hispanic)	40 (41.2%)	19 (34.5%)	21 (50.0%)
Black (non-Hispanic)	51 (52.6%)	33 (60.0%)	18 (42.9%)
Hispanic	6 (6.2%)	3 (5.5%)	3 (7.1%)
Other race includes two or more races	N/A	N/A	N/A
County of residence			
Kent	22 (22.7%)	12 (21.8%)	10 (23.8%)
New Castle	53 (54.6%)	28 (50.9%)	25 (59.5%)
Sussex	22 (22.7%)	15 (27.3%)	7 (16.7%)



Table 1 (continued)

Characteristics	Sudden Death in the Young, Number (%)		
	Total	Infants (<1 year)	Children (1-17 years)
Death investigation			
No	12 (12.4%)	2 (3.6%)	10 (23.8%)
Yes	85 (87.6%)	53 (96.4%)	32 (76.2%)
Autopsy			
No	11 (11.3%)	1 (1.8%)	10 (23.8%)
Yes	86 (88.7%)	54 (98.2%)	32 (76.2%)

Source: Delaware Courts, Child and Maternal Death Review Commission, Sudden Death in the Young Case Registry, 2017-2021.

Notes: Column percentages unless noted otherwise.

As noted in Table 1, 45 deaths were in the explained and 52 were in the unexplained SDY category for a total of 97 SDY deaths. Of the 55 SDY infant deaths, the majority of the deaths (33/55 or 60%) were unexplained deaths, one in four (14/55; 25.5%) deaths were due to infant suffocation, and about one in seven (8/55 or 14.5%) were explained deaths in the “other causes” category. Of the 42 SDY deaths among children, 35.7% (15/42) were explained deaths in the “other causes” category, and, more than one in four (12/45 or 28.6%) were in the unexplained death category.

Overall, there were more males (51 or 52.6%) than females (46 or 47.4%) in the SDY cases analyzed. However, among infants less than one year of age, there were more females (29 or 52.7%) as compared to males (26 or 47.3%). Among children one to 17 years of age, there were more males (25 or 59.5%) as compared to females (17 or 40.5%). Black non-Hispanic infants and children (51 or 52.6%) were disproportionately represented in the total number of SDY cases in Delaware, although among children one to 17 years of age the percentage of White non-Hispanic children was higher (21 or 50.0%) as compared to Black non-Hispanic children (18 or 42.2%) and Hispanic children (3 or 7.1%). In most SDY cases, a death investigation (87.6%), and autopsy (88.7%) was conducted.

Although in a majority of the SDY cases (78.3% or 76/97) there was no documented disability, about one in five had a disability (21.7%; 21/97). Of the 21 cases with documented disability, 13 (13.4%) had a physical disability, three (3.1%) had a cognitive or intellectual disability, three (3.1%) had two or more disabilities, one had attention deficit hyperactivity disorder (ADHD), and one had sensory disability. Children one to 17 years of age shared a disproportionate burden among those with a disability (76.2%; 16/21). Similarly, of the 97 SDY cases analyzed, about one in 11 had a special health care need (9.3%; 9/97). The majority of SDY cases documented the parental home as the residence (83.5%; 81/97), followed by a relative’s home (12.4%; 12/97). Among infants less than one year of age, 16.4% (9/55) lived in a relative’s home as compared to 7.1% (3/42) children aged one to 17 years.

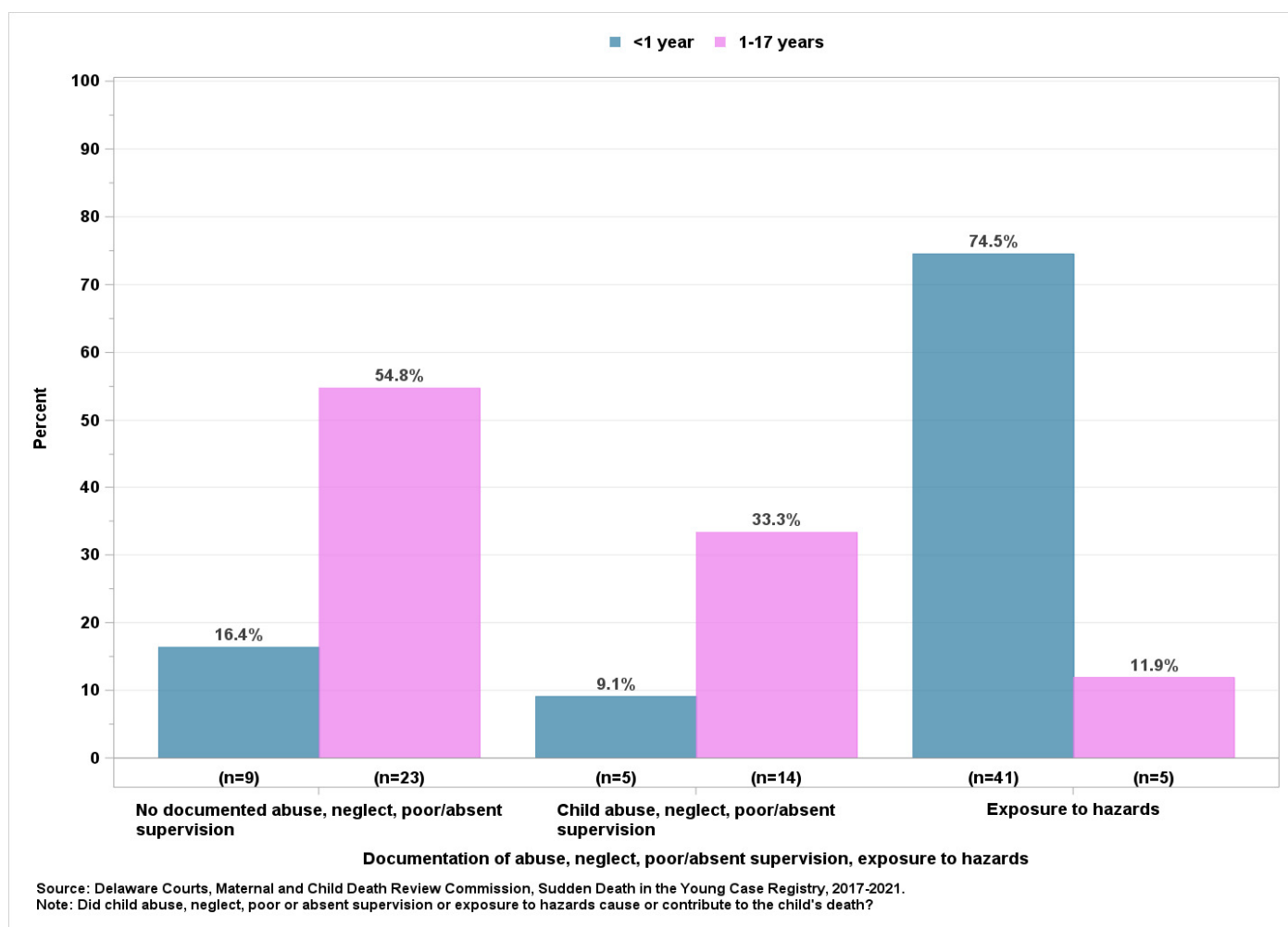
The SDY registry captures child maltreatment history. Of the 97 SDY cases analyzed during 2017 to 2021, in a majority (71.1% 69/97) of the SDY cases, there was no documented history of child maltreatment. However, in about one in three (28.9%; 28/97) SDY cases, a history of child maltreatment was documented. Of all SDY cases analyzed during 2017-2021, only 16 cases (16.5%) had an “open status” (i.e., the case was either pending investigation or investigation was ongoing and or not completed) and 81 (83.5%) did not have an “open status.” Of the 16 cases with “open-status,” a disproportionate percentage (23.6%; 13/55) of the open cases were among infants less than one year of age as compared to children one to 17 years of age



(7.1%; 3/42). However, in only four SDY cases (4.1%; 4/97) child maltreatment was substantiated as per Delaware code [5] and all cases related to neglect.

The SDY registry documents whether child abuse, neglect, poor or absent supervision, and exposure to hazards could have caused or contributed to death in infants and children. In a majority (67%; 65/97) of the SDY cases analyzed, there was documentation that child abuse, neglect, poor or absent supervision, and exposure to hazards could be a possible cause or contributor to death. For instance, in 47 cases (47.4%) exposure to hazards was documented; in one in 10 cases (10.3%; 10/97) child neglect was documented; and in one in 11 cases (9.3%; 10/97) poor or absent supervision was documented as a possible cause or contributor to death. Figure 2 displays the SDY cases by documented child abuse, neglect, poor or absent supervision, and exposure to hazards by age-group of the child. Of all SDY cases among infants less than one year of age, 74.5% of cases (41/55), documented exposure to hazards as a cause or contributor to death compared to 11.9% (5/42) among children one to 17 years of age. In contrast, in one in three cases (33.3% or 14/42) among children one to 17 years of age, child neglect or poor/absent supervision was documented as a possible contributor to death compared to about one in 10 (9.1% or 5/55) among infants less than one year of age.

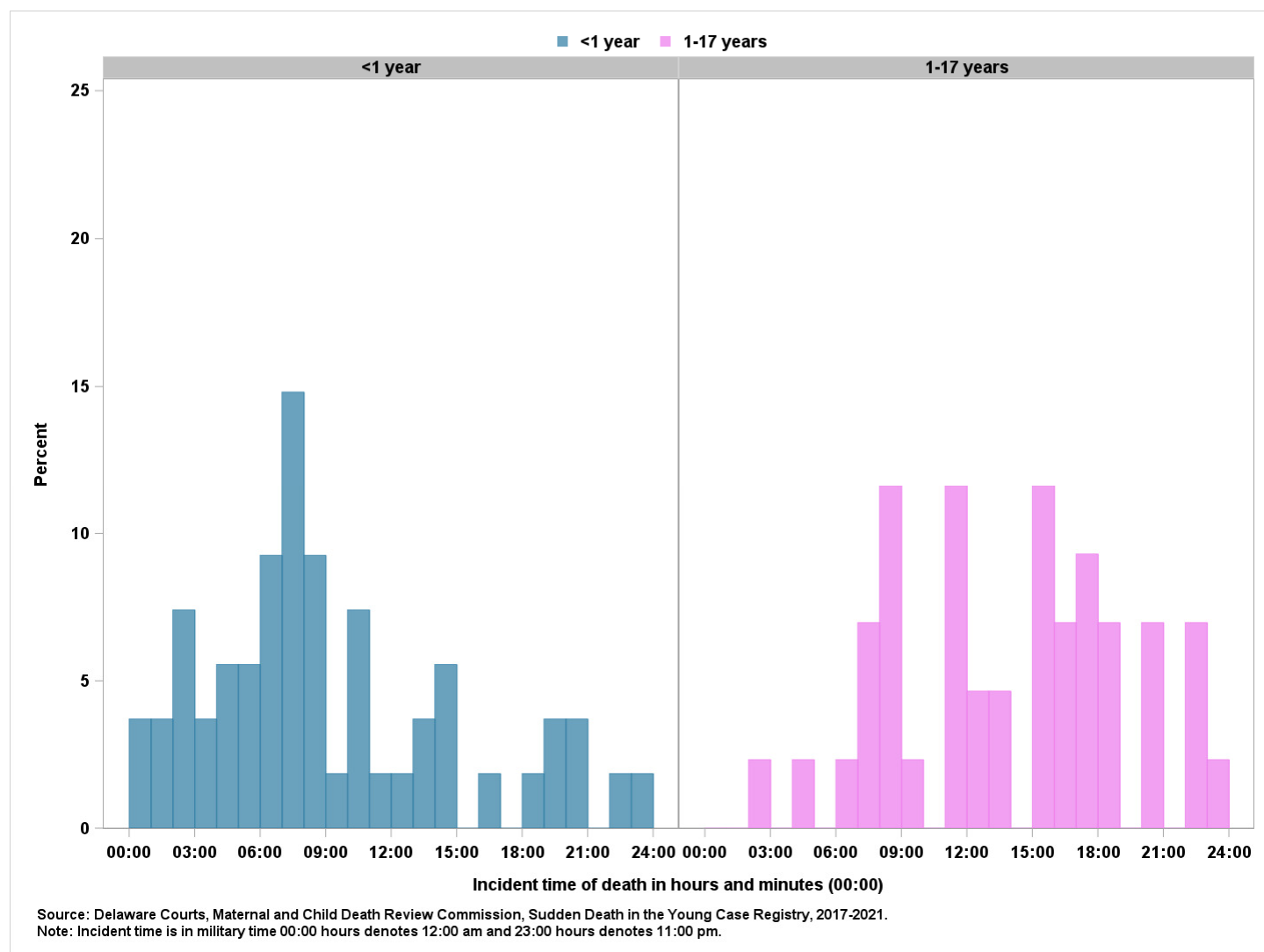
Figure 2. Documentation of child abuse, neglect, poor or absent supervision, and exposure to hazards among Sudden Death in the Young infants and children in Delaware, 2017-2021



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The SDY registry captures the approximate time of death for infants and children (Figure 3). More than one in three SDY deaths (37.2%) among infants and children occurred between 12:00 am (0:00 hours) and 7:00 am. There were significant differences in age and time of death. Among infants, about one in two deaths (53.7%) occurred between 12:00 am (0:00 hours) and 7:00 am as compared to 15% of deaths among children one to 17 years of age during this timeframe. In contrast, among children one to 17 years of age, 42.5% of deaths occurred between 8:00 am and 3:00 pm (15:00 hours) as compared to 31.5% in infants less than one year during this timeframe. Further, among children one to 17 years of age, 42.5% of deaths occurred between 4:00 pm and 11:00 pm as compared to 14.8% in infants less than one year during this timeframe. In summary, while most of the deaths among infants less than one year occurred between 12:00 am to 3:00 pm, most of the deaths among children one to 17 years of age occurred between 3:00 pm and 11:00 pm. Although there are no studies specifically examining the time of death among SDY infants and children, it may be helpful to examine opportunities for intervention during critical time-periods, such as the “golden hour” in trauma and emergency medicine [6].

Figure 3. Incident time of death among SDY infants and children in Delaware, 2017-2021



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Figure 4 displays the SDY rates for infants (less than one year of age) expressed per 100,000 live births and children one to 17 years of age expressed as per 100,000 children using mid-year census data from Delaware Population Consortium estimates [7]. The 2017-2021 SDY rate for infants in Delaware was 104.6 (95%CI: 78.8-136.1) as compared to the 2015-2016 U.S rate of 119.5 (95%CI: 111.8-127.6). Similarly, the 2017-2021 SDY rate for children was 4.3 (95%CI: 3.1-5.8) as compared to the 2015-2016 U.S. rate of 1.9 (95%CI: 1.6-2.1).

While there was no statistically significant difference in the overall SDY infant rates between Delaware and the U.S., the overall SDY rate for children in Delaware was higher as compared to the U.S. The Delaware SDY rate for children was about 2.2 times that of the U.S. SDY rate for children. Between 2017 and 2021, Delaware saw a 45% decrease in SDY infant rates from 138.4 (95%CI: 77.5-228.2) per 100,000 live births in 2017 to 76.3 (95%CI: 33.0-150.3) per 100,000 live births in 2021.

Figure 4. Sudden Death in the Young rates* in infants and children, Delaware, 2017-2021

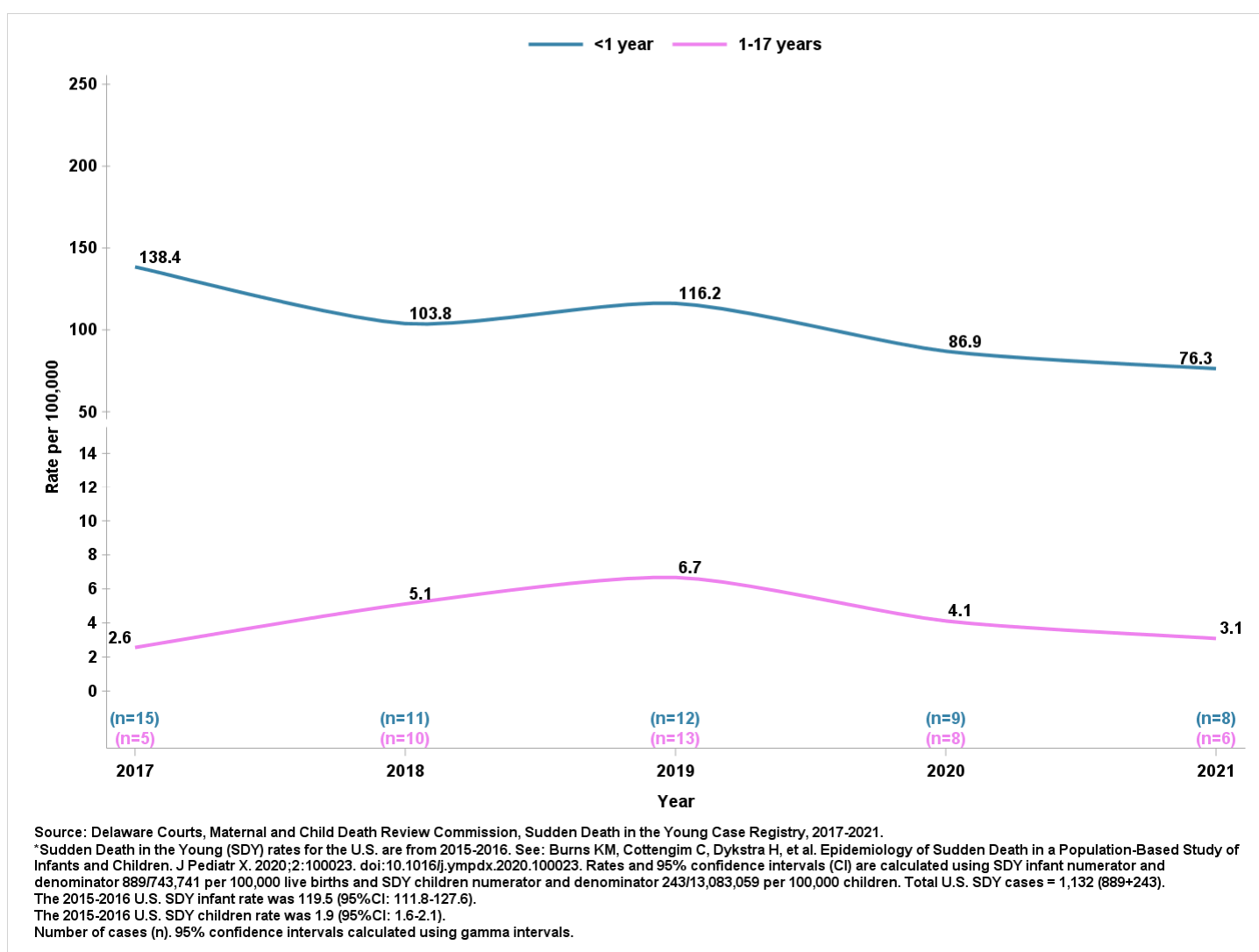


Figure 5 displays the overall Delaware SDY rates for infants (less than one year of age) and children one to 17 years of age by race and ethnicity and county of residence. The Black non-Hispanic SDY infant rate of



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231.5 (95%CI: 159.4-325.0) per 100,000 live births was significantly higher and about three times the SDY infant rate of White non-Hispanic of 75.3 (95%CI: 45.3-117.5) per 100,000 live births. The Black non-Hispanic SDY rate for children was higher (7.3; 95%CI: 4.3-11.5) than the White non-Hispanic SDY rate for children (4.3; 95%CI: 2.6-6.5) per 100,000 children; however, the difference was not significant. There were no significant differences in SDY rates for infants or children by county of residence.

Figure 5. Sudden Death in the Young rates for infants and children by race and ethnicity and county of residence in Delaware, 2017-2021

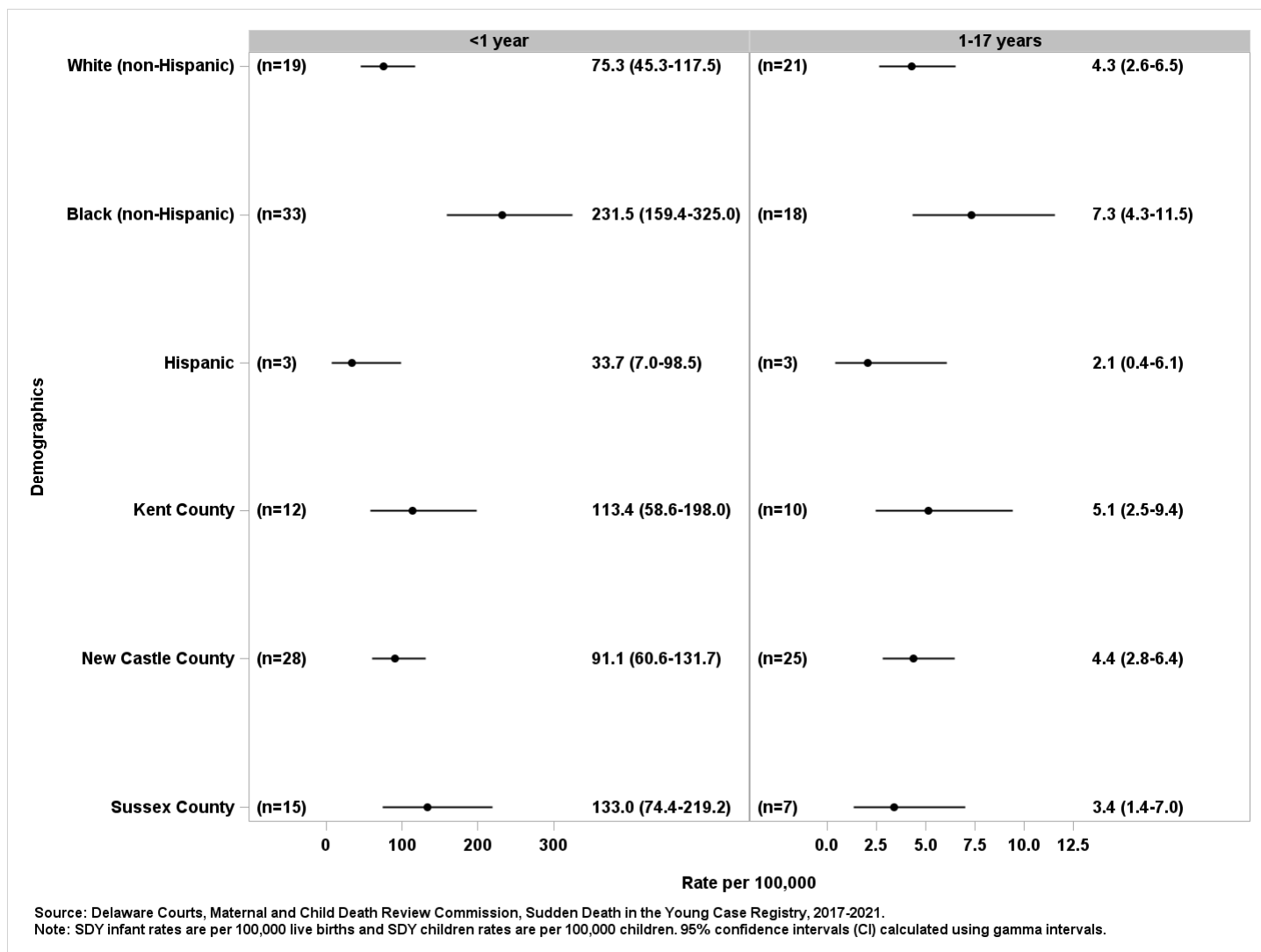


Figure 6 displays the U.S. and Delaware SDY rates for explained and unexplained causes of death for infants and children. The SDY rates for explained causes of death and unexplained causes of death among Delaware infants were not significantly different from the U.S. SDY rates. The explained SDY rate for Delaware infants was 41.8 (95%CI: 26.2-63.3) per 100,000 live births and higher than the U.S. rate of 36.0 (95%CI: 31.8-40.6) per 100,000 live births. The SDY rate for unexplained causes of death of Delaware infants was 62.7 (95%CI: 43.2-88.1) per 100,000 live births and lower than the U.S. rate of 83.5 (95%CI: 77.1-90.3) per 100,000 live births.



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In contrast, the SDY rates for both the explained and unexplained causes of death among Delaware children one to 17 years were significantly higher than the U.S. SDY rates for children. The SDY rate for explained causes of death of Delaware children was 2.4 (95%CI: 1.5-3.5) per 100,000 children and was significantly higher than the U.S. rate of 1.1 (95%CI: 0.9-1.3) per 100,000 children. Further, the SDY rate for unexplained causes of death of Delaware children was 2.0 (95%CI: 1.2-3.0) per 100,000 children and significantly higher than the U.S. rate of 0.8 (95%CI: 0.6-1.0) per 100,000 children.

Figure 6. Sudden Death in the Young rates for infants and children by explained and unexplained categories for the U.S., 2015-2016, and Delaware, 2017-2021

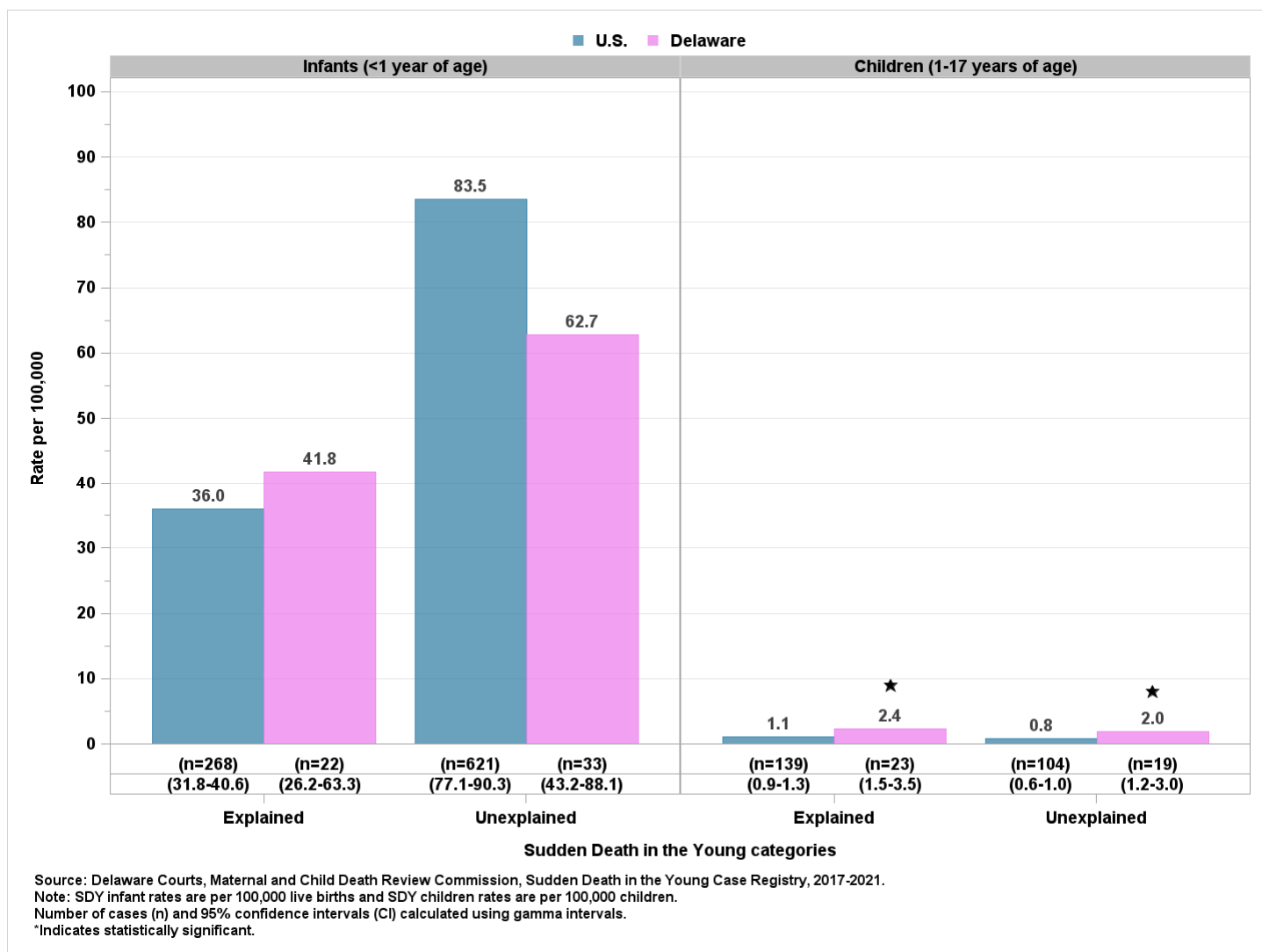


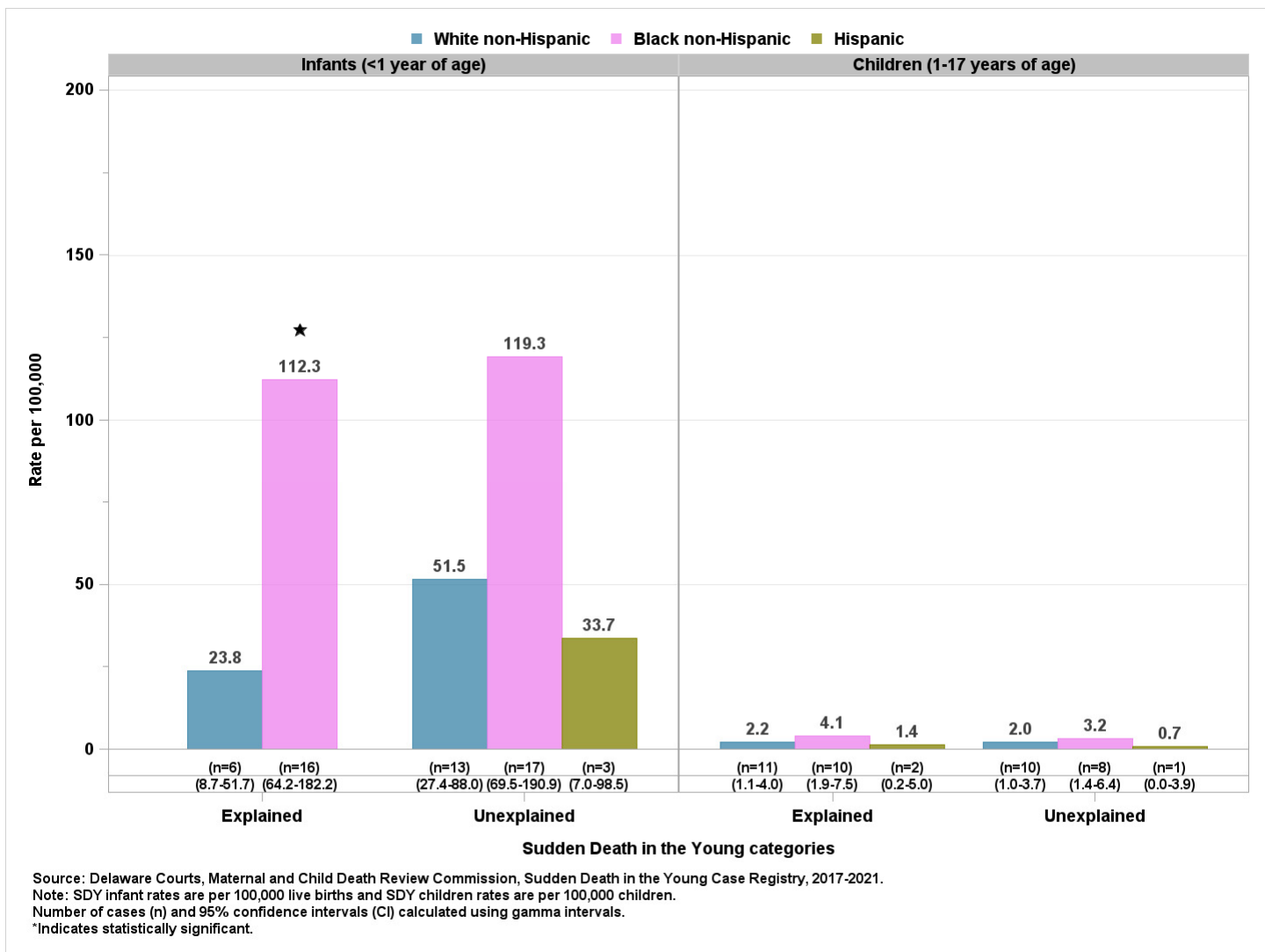
Figure 7 displays the SDY rates for explained and unexplained causes of death for Delaware infants and children by race and ethnicity. The SDY rate for explained causes of death was 112.3 (95%CI:64.2-182.2) for Black non-Hispanic infants and was five times and significantly higher than the SDY rate of 23.8 (95%CI:8.7-51.7) for White non-Hispanic infants. Although the SDY rate for unexplained causes of death among Black non-Hispanic infant was 119.3 (95%CI: 69.5-190.9) and about two times the SDY rate of 51.5 (95%CI: 27.4-88.0) for White non-Hispanic infants, the rate was not statistically different. Similarly, the SDY



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rate for unexplained causes of death among Hispanic infants was 33.7 (95%CI: 7.0-98.5) was not significantly different than the SDY rates for White non-Hispanic rate or Black non-Hispanic infants.

Figure 7. Sudden Death in the Young rates for infants and children by explained and unexplained categories by race and ethnicity in Delaware, 2017-2021



The SDY registry records the “official manner,” “immediate cause of death,” and up to three causes that lead to the death (i.e., final disease or condition resulting in death). From Figure 6 above and as noted previously (Table 1) there were a total of 45 explained and 52 unexplained SDY deaths among Delaware infants and children from 2017 to 2021. Of the 45 deaths in the explained category, 22 deaths (14 infant suffocation, and eight other) were among infants, and 23 (15 other, five cardiac, two neurological/seizures, and one suffocation) were among children. Of the 52 deaths in the unexplained category, 33 were among infants, and 19 deaths (12 unexplained, three possible cardiac, three SUDEP, and one was possible SUDEP/cardiac) were among children one to 17 years of age.

Table 2 shows the detailed causes of death for the 45 explained SDY cases for infants and children. Of the 22 SDY cases in the explained category among Delaware infants, 14 cases (63.6%) related to infant



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suffocation with an overall rate of 26.6 (95%CI: 14.6-44.7) per 100,000 live births and the most recent available U.S. rate for 2015-2016 was 25.8 (95%CI: 22.3-29.7) or 26 per 100,000 live births [4]. The remaining eight of the 22 SDY infant cases in the explained category include “other causes” with an overall rate of 15.2 (95%CI: 6.6-30.0) per 100,000 live births and the 2015-2016 U.S. rate was 6.9 (95%CI: 5.1-9.0) per 100,000 births [4]. Of the eight cases in the “other causes” category, three cases (18.2%) related to infection, two cases (9.1%) related to pneumonia, one case (4.5%) related to influenza, and two cases (9.1%) were related unknown etiology.

Of the 23 SDY cases in the explained category among Delaware children, five cases (21.7%) related to cardiovascular diseases, two cases (8.7%) related to neurological conditions, one case (4.3%) related to infant suffocation. Of the 23 SDY cases in the explained category, most (15; 65.2%) related to “other causes” with an overall rate of 1.5 (95%CI: 0.9-2.5) per 100,000 children as compared to the 2015-2016 U.S. rate of 0.7 (95%CI: 0.6-0.8) per 100,000 children. Of the 15 cases, five cases (21.7%) related to drowning, four cases related to asthma (17.4%), two cases were related to pulmonary embolism (8.7%), and one case each related to infection (4.3%), a motor vehicle accident (4.3%), diabetes (4.3%), and sickle cell disease (4.3%).

Table 2. Number, percentage, and rates of explained Sudden Death in the Young among infants and children, Delaware, 2017-2021

Categories	Explained Sudden Death in the Young, Number (%)			
	Infants (<1 year of age)		Children (1-17 years)	
	Total	Rate (95%CI)	Total	Rate (95%CI)
Overall	22 (100%)	41.8 (26.2-63.3)	23 (100%)	2.4 (1.4-3.5)
Explained	14 (63.6%)	26.6 (14.6-44.7)	8 (34.8%)	0.8 (0.4-1.6)
Infant suffocation	14 (63.6%)	26.6 (14.6-44.7)	1 (4.3%)	0.1 (0.0-0.6)
Cardiovascular diseases [†]	N/A	N/A	5 (21.7%)	0.5 (0.2-1.2)
Neurological	N/A	N/A	2 (8.7%)	0.2 (0.0-0.7)
Explained Other	8 (36.4%)	15.2 (6.6-30.0)	15 (65.2%)	1.5 (0.9-2.5)
Infection	3 (13.6%)	5.6 (2.1-19.5)	1 (4.3%)	0.1 (0.0-0.6)
Pneumonia	2 (9.1%)	3.8 (0.5-13.7)	N/A	N/A
Influenza	1 (4.5%)	1.9 (0.0-10.6)	N/A	N/A
Drowning	N/A	N/A	5 (21.7%)	0.5 (0.2-1.2)
Asthma	N/A	N/A	4 (17.4%)	0.4 (0.1-1.1)
Pulmonary embolism	N/A	N/A	2 (8.7%)	0.2 (0.0-0.7)
Motor vehicle accident	N/A	N/A	1 (4.3%)	0.1 (0.0-0.6)
Diabetes	N/A	N/A	1 (4.3%)	0.1 (0.0-0.6)
Sickle cell disease	N/A	N/A	1 (4.3%)	0.1 (0.0-0.6)
Unknown etiology [‡]	2 (9.1%)	3.8 (0.5-13.7)	N/A	N/A

Source: Delaware Courts, Child and Maternal Death Review Commission, Sudden Death in the Young Case Registry, 2017-2021.

Notes: Number (No.) and column percentages unless noted otherwise may not sum to 100 due to rounding. SDY rates for infants (less than one year of age) expressed per 100,000 live births and children one to 17 years of age expressed as per 100,000 children using mid-year census data. 95% confidence intervals (CI) are based on gamma intervals.

[†]Cardiovascular diseases among infant includes one case of Tetralogy of the Fallot, which is a congenital anomaly.

[‡] Unknown etiology cases among infant includes one interstitial pneumonia as plausible of cause of death with other conditions including congenital anomalies and Klinefelter's syndrome. Another case suggests sudden unexpected infant death with advance review notes suggesting laryngomalacia or possible respiratory syncytial virus (RSV) playing a role.

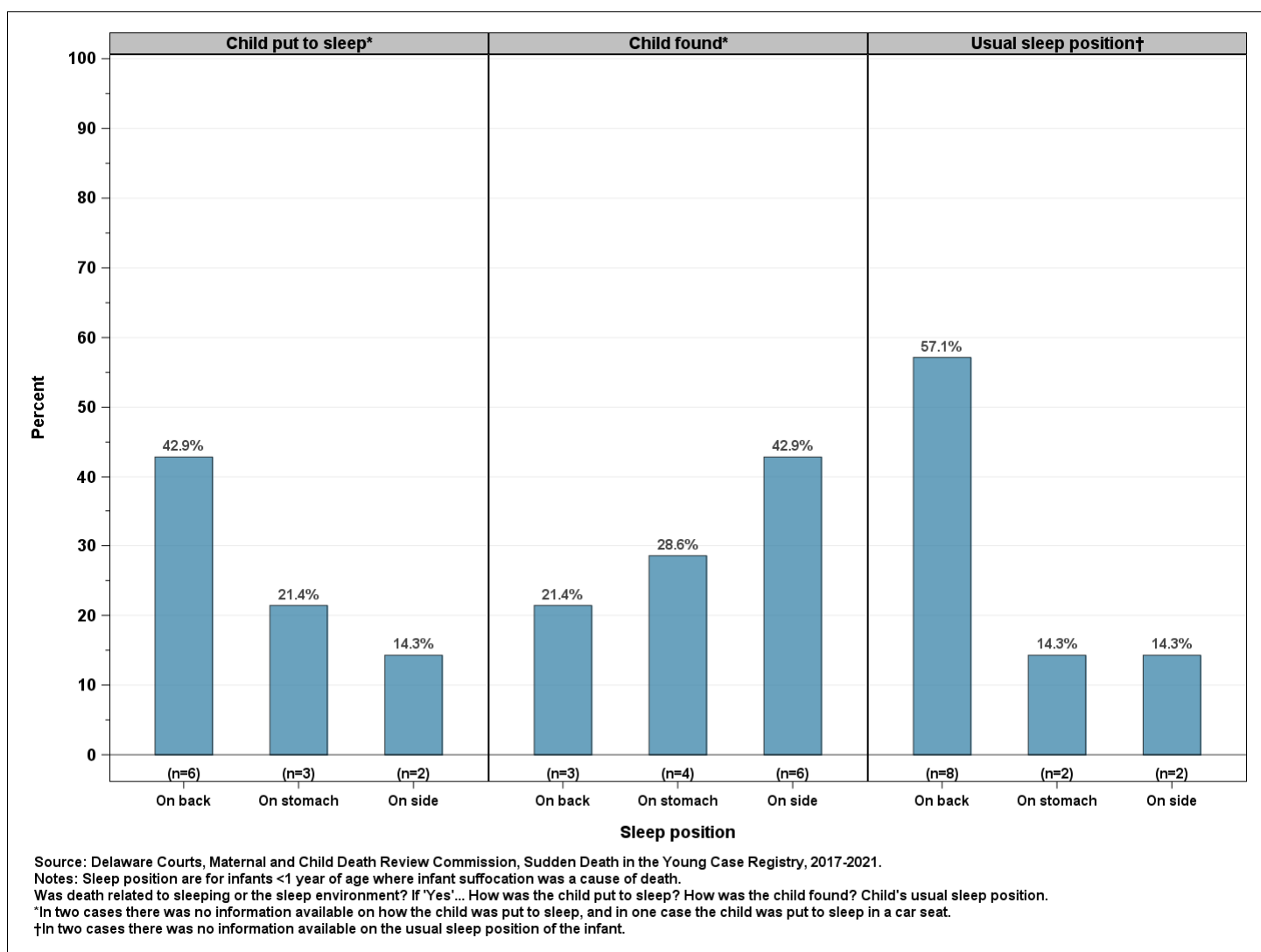
The SDY case registry captures infant's sleep environment at the time of the incident among infants who had suffocation as a cause of death. In six (43%) of the 14 infants with infant suffocation as cause of death, the infant was in a new or different environment than usual; and eight (57%) of the infants were not in a new

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environment. In most cases the infant did not have a pacifier, was not wrapped, or swaddled in a blanket that could have led to blocking of airways or overheating. However, in a majority of the SDY cases (8; 57%) the infant was exposed to second-hand smoke and in most cases (6/8; 75%), the exposure to second-hand smoke was described as “frequently.” Of the 14 infants with infant suffocation as a cause of death, in six cases (43%), the infant was found to be on an adult bed; in four cases (29%) the infant was found on the couch; and in one case each the infant was found in the bassinet; on a chair, in a car seat, and in one case there was no information available.

Figure 7 displays the sleep position of infants, which includes how the child was put to sleep before the incident, how the child was found at the time of incident, and the usual sleep position of the infant. The American Academy of Pediatrics (AAP) recommends placing infants in a supine position (on the back) to reduce the risk of sudden infant death syndrome [8].

Figure 7. Sleep position among infants with infant suffocation as a cause of death, Delaware, 2017-2021



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In a majority of the SDY cases (8; 57%) where infant suffocation was a cause of death, the infant's usual sleep position was on the back in accordance with AAP's recommendation [8]. In most cases (6; 43%) the child was put to sleep on their back before the incident (Figure 7). However, in six (43%) cases, the infant was found on their side.

The SDY registry captures information on the facial position at the time of the incident. Overall, of the 14 infants with infant suffocation as the cause of death, 43% (6/14) were found "face down," five infants were found "face-up," and three were found to be on the left or right side. Of the six infants who were found in a side (Figure 7) position, two were found "face down," one was found "face-up", and three were found either on their left or right side. All infants (4/4 or 100%) who were found on the stomach were found "face-down." Further, in 13 (93%) cases the child's airway (including nose, mouth, neck and/or chest) was "fully obstructed." Except for one infant death, all infants where infant suffocation was a cause of death were among Black non-Hispanic infants (13/14; 93%). In most cases, (11; 85%) the infants were born at term (>37 weeks of gestation). Most women (12/14; 86%) whose infants died of infant suffocation had received prenatal care and there was no documentation of postpartum depression among these women.

Conclusion

Using SDY case registry data, this brief describes the explained and unexplained causes of death among Delaware infants younger than one year and children one to 17 years of age. A total of 97 SDY cases were identified from SDY case registry data spanning five years (2017-2021) in Delaware. The results show that the Delaware 2017-2021 SDY rate for infants was similar to the most recent U.S. 2015-2016 SDY rate for infants. However, Delaware's SDY rate for children was about two times that of the U.S. SDY rate for children. Between 2017 and 2021, Delaware saw a 45% decrease in SDY infant rates. Like the U.S., Delaware's Black non-Hispanic infants shared a disproportionate burden of SDY cases. Further, like the U.S., unexplained deaths accounted for over 50% of the SDY cases in Delaware.

Among Delaware infants, infant suffocation accounted for 63% of all explained infant deaths with an overall rate comparable to the U.S.; however, Delaware's SDY rate for explained "other causes" in infants was over two times that of the U.S. rate. Black non-Hispanic infants were disproportionately represented among infant suffocation deaths, making up 93% of the 14 cases. In Delaware, where infant suffocation was a cause of death, there were three conditions or characteristics observed in majority the cases: 1) the infant's sleep position at the time of the death was not on the back; 2) the infant had been placed to sleep on an adult bed or couch; and 3) the infant was exposed to second-hand smoke.

These findings present opportunities to ensure that all Delaware infants are placed by their caregivers in a supine position all the time, everywhere on "a firm, flat, non-inclined sleep surface to reduce the risk of suffocation or wedging/entrapment" as per AAP recommendation [8]. In addition, although Delaware's law restricts or prohibits smoking in both government and private housing common areas [9], concerted efforts to provide support and outreach for quitting smoking can be made. Caregivers can be counseled on how to quit smoking to reduce second-hand smoke, especially near infants and young children. It is also important to explore alternative strategies for those unwilling to quit smoking, such as behavioral and pharmacological support and air quality feedback [10].



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