



Data Brief: Sudden Unexpected Infant Death (SUID)

Massachusetts Department of Public Health

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What is sudden unexpected infant death (SUID)?

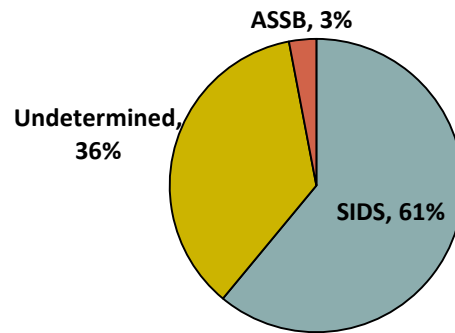
Sudden unexpected infant death (SUID) is the sudden and unexpected death of an infant under the age of 1 year where a cause is not immediately known before investigation. Nationally, there are about 3,500 sudden unexpected infant deaths annually.¹ Often these deaths occur during sleep. The following causes of death are classified as SUID:

- Accidental suffocation and strangulation in bed (ASSB)
- Sudden infant death syndrome (SIDS)
- Undetermined cause

All three of these types of deaths are associated with similar risk factors and are grouped together to better understand the magnitude of the problem and the circumstances of these deaths. A sudden unexpected infant death may be classified as accidental suffocation and strangulation in bed if the circumstances surrounding the death provide enough evidence to determine that the death was caused by suffocation and if no other contributing illnesses or congenital factors were present. An infant may suffocate or be strangled due to being covered with bedding, another person or animal, becoming wedged in a couch or alongside a bed or crib, or becoming entangled in bedding or cords around the sleep area.

Because SUID typically occurs during sleep, in many cases there is not enough known about the circumstances of the death to determine the cause. When all other natural and accidental causes are ruled out, the death is classified as SIDS or undetermined cause; the final determination of the cause and manner of death may vary based on the diagnostic preferences of the pathologist conducting the autopsy. In Massachusetts, the majority of SUID cases are classified as SIDS (Figure 1).

Figure 1: SUID by Cause, MA Residents <1 year, 2011-2015 (n=163)



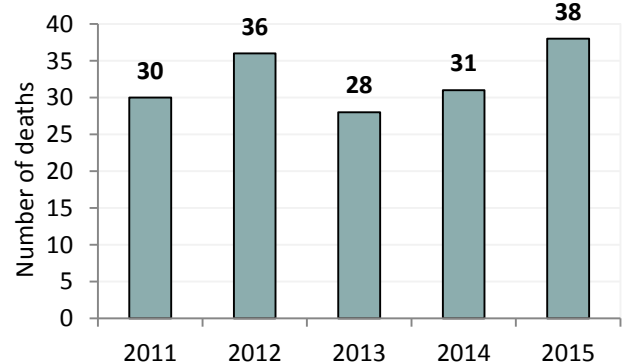
Source: MA Registry of Vital Records & Statistics, 2011-2015

Sudden Unexpected Infant Death in Massachusetts

Magnitude of SUID in Massachusetts

In Massachusetts, SUID is the leading cause of death among infants between the ages of 1-11 months and the 3rd leading cause of death among all infants under one year of age.¹ During the 5-year period of 2011-2015, there were a total of 163 SUID cases in Massachusetts – an average of 33 cases per year (Figure 2).

Figure 2: Sudden Unexpected Infant Deaths, MA Residents <1 year, 2011-2015 (n=163)



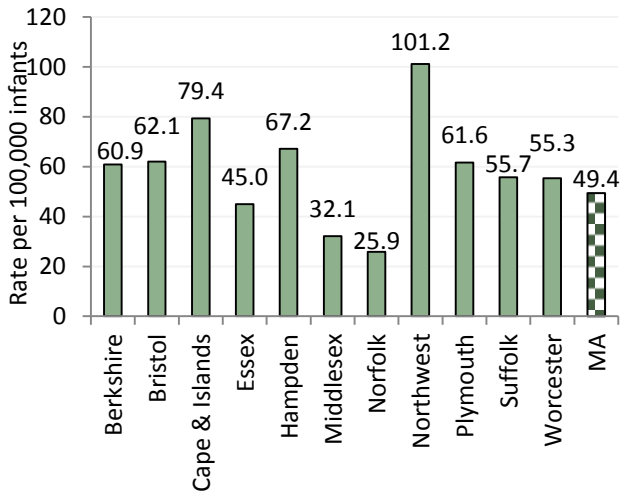
Source: MA Registry of Vital Records & Statistics, 2011-2015

¹ The leading causes of death among infants less than one month of age are perinatal causes and congenital malformations

SUID by Massachusetts District of Residence

During the 10-year period of 2006-2015, the average annual Massachusetts SUID rate was 49.4 per 100,000 (95% CI [44.3, 54.5]) infants less than one year of age. The SUID rate in the Northwest district, which includes Franklin and Hampshire counties, was significantly higher than the state rate (Figure 3). While other districts had rates that differed from the state rate, those differences were not statistically significant.

Figure 3: Average Annual Rate of SUID by District of Residence, MA Residents <1 Year, 2006-2015 (n=366)

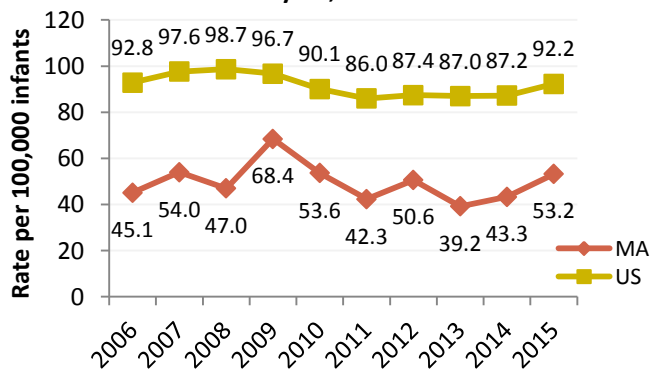


Source: MA Registry of Vital Records & Statistics, 2006-2015

Trends in SUID in Massachusetts and the US

The rate of SUID in Massachusetts is significantly lower than the national rate: in 2015, the Massachusetts SUID rate was 53.2 deaths per 100,000 infants compared to 92.2 per 100,000 infants nationally (Figure 4). During the 10-year period of 2006-2015, there were no statistically significant trends in the Massachusetts or the national SUID rate.

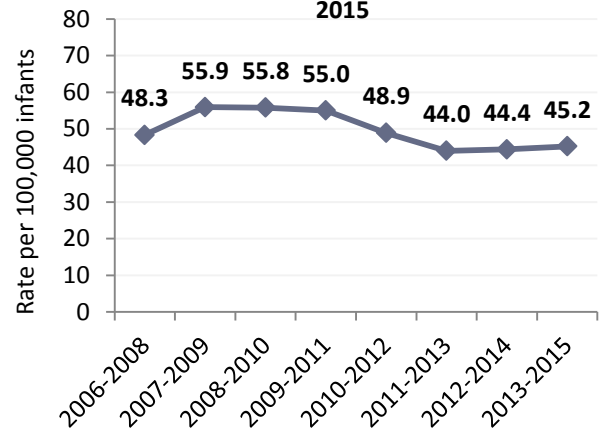
Figure 4: SUID Rate, MA and US Residents <1 year, 2006-2015



Source: MA Registry of Vital Records & Statistics and National Center for Health Statistics, 2006-2015

Due to the small number of SUID cases in Massachusetts, the rate can fluctuate from year to year. A three-year rolling average annual rate is also presented to minimize the annual fluctuations and better visualize any trends in the rate (Figure 5). While the 3-year rolling average annual SUID rate indicates a potential downward trend since 2007-2009, the changes in the rate are not statistically significant.

Figure 5: 3-Year Rolling Average SUID Rate, MA Residents <1 Year, 2006-2008 to 2013-2015



Source: MA Registry of Vital Records & Statistics, 2006-2015

Risk and Protective Factors Associated with SUID

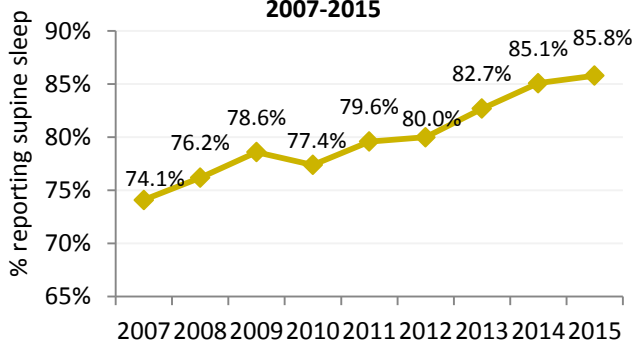
Risk factors associated with SUID include socio-economic factors, genetic factors and health at the time of birth and death, and caregiver behaviors. Caregiver behaviors associated with SUID include placing an infant to sleep in a non-supine position (placing an infant to sleep on their stomach or side); exposure to secondhand smoke; placing an infant to sleep on a soft surface such as a couch or adult bed; soft bedding such as pillows or blankets; and bed sharing, especially where an infant is sleeping with another child or an adult who is fatigued or impaired.ⁱⁱ There is evidence that maternal stress during pregnancy, which may be due to socio-economic factors such as poverty, exposure to racism, violence, and/or other trauma, may affect fetal development and result in vulnerabilities – such as preterm birth or low birth weight – that may increase the risk of SUID.^{iii,iv} Unstable, unsafe, or crowded living situations may make it difficult for families to adopt safe infant sleep practices. A lack of or inadequate prenatal care may also be a risk factor for SUID.^v Breastfeeding is protective against SUID.^{vi}

Risk and Protective Factors in the Sleep Environment

The Massachusetts Pregnancy Risk Assessment Monitoring System (PRAMS) is a survey completed by mothers with infants between the ages of 2-6 months. In 2015, 85.8% (95% CI [83.5%, 87.9%]) of mothers responding to the survey reported the most common sleep position for their infants was the supine (back) position (Figure 6).

The percent of mothers in Massachusetts reporting the supine position as the most common infant sleep position increased from 74.1% (95% CI [71.1%, 77.0%]) in 2007 to 85.8% in 2015 – an average annual increase of 1.8% (Figure 6).

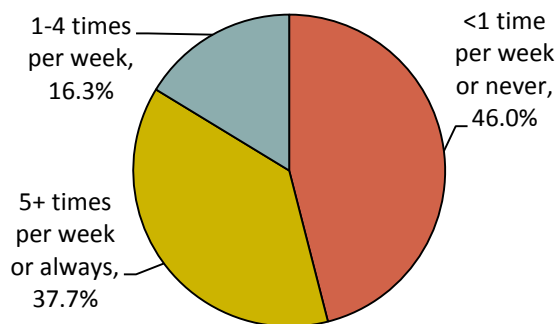
Figure 6: Trend of Supine Sleep, MA PRAMS, 2007-2015



Source: MA Pregnancy Risk Assessment Monitoring System, 2007-2015

In 2015, 46.0% (95% CI [42.6%, 49.4%]) of mothers reported bed sharing less than one time per week or never; 37.7% (95% CI [34.6%, 41.0%]) reported bed sharing 5 or more times per week or always (Figure 7).

Figure 7: MA PRAMS: "How often does your new baby sleep or nap on the same sleep surface with you and/or anyone else?", 2015 (Sample n=1,258)



Source: MA Pregnancy Risk Assessment Monitoring System, 2015

Risk and Protective Factors at Birth

As described above, factors present at birth, such as being preterm or low birthweight and prenatal smoking exposure, may also increase the risk of SUID. Breastfeeding and access to adequate prenatal care may protect against SUID. Selected SUID risk and protective factors among Massachusetts infants at the time of birth are presented in Figure 8.

Figure 8: Risk & Protective Factors Associated with SUID at the Time of Birth, MA Infants, 2015 (n=71,484)

Risk Factor	% reporting
Low birthweight	7.5%
Preterm	8.4%
Prenatal smoking	5.9%
Protective Factor	% reporting
Adequate prenatal care	81.8%
Breastfeeding	87.0%

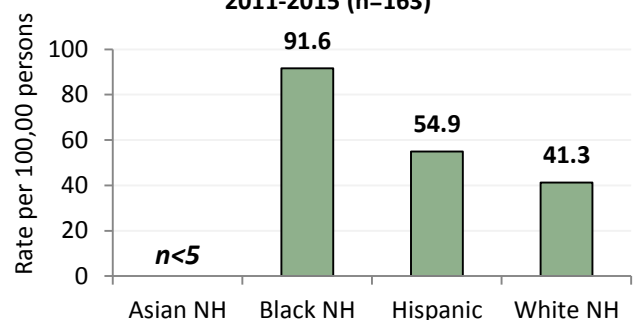
Source: MA Registry of Vital Records & Statistics, 2015

Inequities in SUID in Massachusetts

SUID Rates by Race/Ethnicity

The average annual rate of SUID among Black non-Hispanic infants in Massachusetts was more than twice the rate among White non-Hispanic infants and 1.7 times the rate among Hispanic infants during the 5-year period of 2011-2015 (Figure 9). Due to the low number of cases among Asian infants, a rate cannot be calculated for that group. While the SUID rate among Black non-Hispanic infants is disproportionately high, the majority of SUID cases in the state occur among White non-Hispanic infants (62% of all SUIDs).

Figure 9: Average Annual SUID Rate by Race/Ethnicity, MA Residents <1 year, 2011-2015 (n=163)



Source: MA Registry of Vital Records & Statistics, 2011-2015

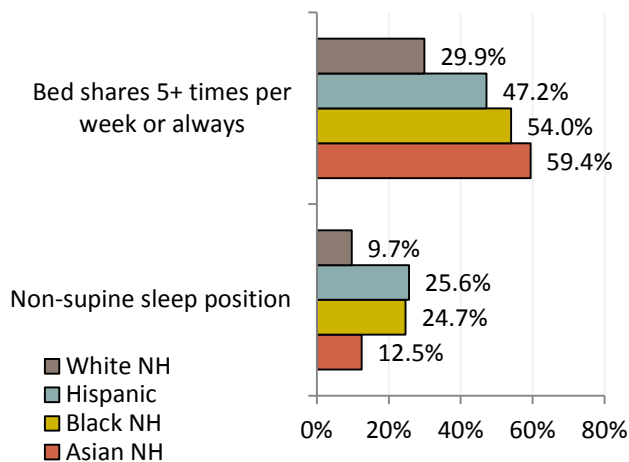
Risk and Protective Factors Associated with SUID by Race/Ethnicity

Because risk and protective factors associated with SUID vary widely across racial/ethnic groups and because socio-economic inequities such as poverty and lack of access to resources such as health care are concentrated in groups that have historically experienced discrimination, it is not possible to link one specific health behavior or risk factor to the racial/ethnic inequities in SUID.

Risk and Protective Factors in the Sleep Environment by Race/Ethnicity

Parenting practices and behaviors are shaped by a broad range of social, environmental, and economic conditions, which occur in the context of larger societal structures. While infant sleep positioning and sleep location may play a role in the inequities in SUID, following recommended infant sleep practices is determined by more than just personal choice; circumstances such as housing and access to care, among others, also play a role. Black non-Hispanic and Hispanic mothers are more likely to report placing their infants to sleep in a non-supine position such as on the infant’s stomach or side compared to White non-Hispanic and Asian non-Hispanic mothers (Figure 10). Fifty-nine percent (59.4%; 95% CI [52.9%, 65.5%]) of Asian non-Hispanic and 54.0% (95% CI [46.6%, 61.3%]) of Black non-Hispanic mothers in Massachusetts report bed sharing with their infants 5 or more times per week or always; this is significantly higher than White non-Hispanic mothers (Figure 10).

Figure 10: Infant Sleep Practices by Race/Ethnicity, MA PRAMS, 2015 (Sample n=1,245)



Source: MA Pregnancy Risk Assessment Monitoring System, 2015

Risk and Protective Factors at Birth by Race/Ethnicity

White non-Hispanic mothers report higher percentages of prenatal smoking compared to other groups. The percent of low birthweight and preterm infants also differs by racial/ethnic group (Figure 11). Breastfeeding at time of discharge from the hospital is similar among all racial/ethnic groups. White non-Hispanic and Asian mothers are more likely to receive adequate prenatal care compared to Hispanic and Black non-Hispanic mothers (Figure 11).

Figure 11: Risk & Protective Factors associated with SUID at the time of birth by Race/Ethnicity, MA Infants, 2015 (n=71,484)

Risk Factor	Race/Ethnicity			
	White NH	Hispanic	Black NH	Asian NH
Low birthweight	6.5%	8.3%	10.6%	8.6%
Preterm	7.8%	9.2%	10.4%	8.1%
Prenatal	7.5%	3.9%	3.9%	1.1%
Protective Factor	White NH	Hispanic	Black NH	Asian NH
Adequate prenatal care	85.1%	77.6%	69.3%	82.8%
Breastfeeding	86.2%	86.7%	87.9%	91.7%

Source: MA Registry of Vital Records & Statistics, 2015

Preventing SUID and More Information

Programs that: promote prenatal and maternal health; encourage the adoption of infant safe sleep practices among new parents via parent education and overcoming barriers to safe sleep, such as unstable housing; and work toward decreasing inequities in access to health care may reduce the incidence of SUID.

For more information on infant safe sleep and prevention of sudden unexpected infant death, visit MDPH’s infant safe sleep website at:

www.mass.gov/safesleep

Method Notes

The definition of SUID in this data brief includes deaths of infants less than 12 months of age who were residents of Massachusetts at the time of birth and at the time of death due to the following causes:

- accidental suffocation and strangulation in bed (ASSB) – ICD-10 code W75
- sudden infant death syndrome (SIDS) – ICD-10 code R95
- undetermined causes – ICD-10 code R99

SUID counts and rates for all years include accidental, natural, undetermined, and pending manners of death. The inclusion of cases with a pending manner of death at the time of data release means that counts may be inflated for more recent years where not all cases have a final determination of cause and manner. The percent of pending cases by year ranges from 0% in 2006 and 2007 to 19% and 21% in 2014 and 2015 respectively. Data for recent years will be revised to reflect final determinations of cause and manner of death until the percent of pending cases is below at least 12%. Data on SUID counts and rates of Massachusetts infants is from the Massachusetts linked infant birth-death file. The data presented in this data brief may differ from previous SUID data released by MDPH. SUID data previously released was from the Massachusetts death file; was restricted to residents at the time of death but not at the time of birth and death; excluded any cases with a pending manner of death; and included unspecified threat to breathing (ICD-10 code W84) in addition to the three causes of death listed above. The Massachusetts SUID definition was revised in 2018 to more closely align with the SUID definition used by the Centers for Disease Control and Prevention (CDC). For more information on classification and reporting of SUID cases, please see:

- Shapiro-Mendoza CK, Tomashek KM, Anderson RN, & Wingo J. (2006) Recent National Trends in Sudden, Unexpected Infant Deaths: More Evidence Supporting a Change in Classification or Reporting, *American Journal of Epidemiology*, 163 (8), pp 762–769, <https://doi.org/10.1093/aje/kwj117>

Figures 1-5 & 9: Data for Massachusetts infants is from the Massachusetts linked infant birth-death files, Registry of Vital Records & Statistics, MDPH. File dates are: 2006-2011: 7/12/2018; 2012: 7/3/2018; 2013-2015: 6/29/2018. All linked infant birth-death files use the open Massachusetts birth and death files at the time of file linkage.

Figure 3: Data is presented by district rather than county. District groupings correspond to Massachusetts local child fatality review (CFR) team districts. Local CFR teams are based in the district attorney’s offices. Barnstable, Dukes and Nantucket counties are included in the Cape & Islands district. Franklin and Hampshire counties are included in the Northwest district. 95% confidence intervals were calculated for all death rates to determine statistical significance. The methodology used is the same as the methodology described in National Vital Statistics Reports, Vol. 52, No. 10, December 17, 2003.

Figures 3-5 & 9: Rates presented are crude rates calculated based on the number SUID cases per live births. Data on Massachusetts live births is from the Massachusetts birth file, Massachusetts Registry of Vital Records & Statistics, MDPH.

Figure 4: Data for US infants is from the National Center for Health Statistics linked birth/infant death records accessed via the CDC Wonder online query system: United States Department of Health and Human Services (US DHHS), Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS), Division of Vital Statistics (DVS), Linked Birth / Infant Death Records 2003-2006 and 2007-2015 on CDC WONDER Online Database. Accessed at <http://wonder.cdc.gov/lbd-v2006.html> and <http://wonder.cdc.gov/lbd-current.html> on September 4, 2018 3:49:31 PM.

Figures 4-5: Statistical significance for trends in SUID was calculated using Joinpoint Regression Program, Version 4.5.0.1. June 2017; Statistical Research and Applications Branch, National Cancer Institute.

Figures 6, 7, & 10: Data is from Massachusetts Pregnancy Risk Assessment Monitoring System, 2015. For more information: <https://www.mass.gov/service-details/pregnancy-risk-assessment-monitoring-system-prams>.

Figure 6: Average annual percent changes were calculated using Joinpoint Regression Program, Version 4.5.0.1. June 2017; Statistical Research and Applications Branch, National Cancer Institute.

Figures 8 & 11: Data is from: *Massachusetts Births 2015*, Boston, MA: Registry of Vital Records and Statistics, Massachusetts Department of Public Health. December 2016. <https://www.mass.gov/files/documents/2017/04/zx/birth-report-2015.pdf>.

References

ⁱ Centers for Disease Control and Prevention. Sudden Unexpected Infant Death and Sudden Infant Death Syndrome. (2018). Retrieved from: <https://www.cdc.gov/sids/AboutSUIDandSIDS.htm>.

ⁱⁱ Moon RY and AAP TASK FORCE ON SUDDEN INFANT DEATH SYNDROME. (2016) SIDS and Other Sleep-Related Infant Deaths: Evidence Base for 2016 Updated Recommendations for a Safe Infant Sleeping Environment. *Pediatrics*, 138(5). doi: e20162940. Retrieved from: <http://pediatrics.aappublications.org/content/138/5/e20162940.long>.

ⁱⁱⁱ Kramer MR and Hogue CR. (2009) What Causes Racial Disparities in Very Preterm Birth? A Biosocial Perspective. *Epidemiological Reviews*, 2009;31(1):84-98. Retrieved from: <https://doi.org/10.1093/ajerev/mxp003>.

^{iv} Geronimus AT, Hicken M, Keene D, Bound J. (2006) “Weathering” and Age Patterns of Allostatic Load Scores Among Blacks and Whites in the United States. *American Journal of Public Health*, 96(5): pp 826–833. Doi: [10.2105/AJPH.2004.060749](https://doi.org/10.2105/AJPH.2004.060749)

^v Moon RY and AAP TASK FORCE ON SUDDEN INFANT DEATH SYNDROME. (2016) SIDS and Other Sleep-Related Infant Deaths: Evidence Base for 2016 Updated Recommendations for a Safe Infant Sleeping Environment. *Pediatrics*, 138(5). doi: e20162940. Retrieved from: <http://pediatrics.aappublications.org/content/138/5/e20162940.long>.

^{vi} Ibid.