



## Sudden Infant Death Syndrome (SIDS)

SIDS is the sudden, unexplained death of an infant younger than 1 year old.

It is the leading cause of death in children between 1 month and 1 year of age. Although there is no sure way to prevent SIDS, parents and caregivers can reduce the risk for SIDS.

### About SIDS

SIDS is the sudden, unexplained death of an infant younger than 1 year of age that remains unexplained after a complete investigation. This investigation can include an autopsy, a review of the death scene, and complete family and medical histories.<sup>1</sup>

A diagnosis of SIDS is made by collecting information, conducting scientific or forensic tests, and talking with parents, other caregivers, and health care providers. If, after this process is complete, there is still no identifiable cause of death, the infant's death might be labeled as SIDS.

### Citations



1. Willinger, M., James, L. S., & Catz, C. (1991). Defining the sudden infant death syndrome (SIDS): Deliberations of an expert panel convened by the National Institute of Child Health and Human Development. *Pediatric Pathology*, 11, 677-684. [PMID: 1745639](#).

## How many infants die from SIDS or are at risk for SIDS?

Data from the Centers for Disease Control and Prevention (CDC) show that 1,545 infants died from sudden infant death syndrome (SIDS) in 2014 (the most recent year for which data are available).<sup>1</sup>

SIDS was the leading cause of death in children between 1 month and 1 year of age in 2013.<sup>2</sup>

The majority (90%) of SIDS deaths occur before a child is 6 months old, with most happening between 1 month and 4 months of age.<sup>3</sup>

## What factors increase the risk of SIDS?

Currently, there is no known way to prevent SIDS, but there are ways to reduce the risk. Several factors present during pregnancy, at birth, and throughout the first year after birth can impact SIDS risk. Many of these factors can be controlled or changed to reduce the risk, but some cannot be controlled or changed.

One of the most effective actions that parents and caregivers can take to lower SIDS risk is to place their baby to sleep on his or her back for all sleep times.

Research shows that:<sup>4</sup>

- Back sleeping carries the lowest risk for SIDS and is recommended.
- Stomach sleeping carries the highest risk for SIDS—between 1.7 and 12.9 times the risk of back sleeping. It is not recommended.
- The side-lying position also increases the risk. It is unstable and babies can easily roll to their stomach. It is not recommended.

To learn more about ways to reduce the risk for SIDS, visit the [How can I reduce the risk of SIDS? \(/health/topics/sids/conditioninfo/Pages/reduce.aspx\)](/health/topics/sids/conditioninfo/Pages/reduce.aspx) section of this topic.



Other known risk factors for SIDS include the following:

- **Preterm birth.** Infants born before 37 weeks in the womb are at higher risk for SIDS than are infants born at full term.<sup>3</sup>
- **Smoking.** Maternal smoking during pregnancy and smoke in the infant's environment increase the risk of SIDS.<sup>3</sup>

- **Race/ethnic origin.** African American and American Indian/Alaska Native infants are at higher risk for SIDS than are white, Hispanic American, or Asian/Pacific Islander American infants.<sup>1</sup>

## Citations



1. Mathews, T. J., MacDorman, M. F., & Thoma, M. E. (2015). Infant mortality statistics from the 2013 period linked birth/infant death data set. *National Vital Statistics Reports, 64*(9). Retrieved June 7, 2016, from [http://www.cdc.gov/nchs/data/nvsr/nvsr64/nvsr64\\_09.pdf](http://www.cdc.gov/nchs/data/nvsr/nvsr64/nvsr64_09.pdf) (PDF 1 MB)
2. Heron, M. (2016). Deaths: Leading causes for 2013. *National Vital Statistics Reports, 65*(2). Retrieved June 7, 2016, from [http://www.cdc.gov/nchs/data/nvsr/nvsr65/nvsr65\\_02.pdf](http://www.cdc.gov/nchs/data/nvsr/nvsr65/nvsr65_02.pdf) (PDF 4.8 MB)
3. American Academy of Pediatrics. (2011; reaffirmed 2014, October). SIDS and other sleep-related infant deaths: Expansion of recommendations for a safe infant sleeping environment. *Pediatrics, 128*, 1030–1039. Retrieved June 7, 2016, from <http://pediatrics.aappublications.org/content/128/5/e1341.full> 
4. American Academy of Pediatrics Task Force on Sudden Infant Death Syndrome. (2005; reaffirmed 2008, May). The changing concept of sudden infant death syndrome: Diagnostic coding shifts, controversies regarding the sleeping environment, and new variables to consider in reducing risk. *Pediatrics, 116*, 1245–1255. Retrieved June 7, 2016, from <http://pediatrics.aappublications.org/content/116/5/1245> 

## What causes SIDS?

Health care providers and researchers don't know the exact cause, but there are many theories.

More and more research evidence suggests that infants who die from sudden infant death syndrome (SIDS) are born with brain abnormalities or defects. These defects are typically found within a network of nerve cells that rely on a chemical called serotonin that allows one nerve cell to send a signal to another nerve cell. The cells are located in the part of the brain that probably controls breathing, heart rate, blood pressure, temperature, and waking from sleep.

But scientists believe that brain defects alone may not be enough to cause a SIDS death. Evidence suggests that other events must also occur for an infant to die from SIDS. Researchers use the Triple-Risk Model to explain this concept. In this model, all three factors have to occur for an infant to die from SIDS. Having only one of these factors may not be enough to cause death from SIDS, but when all three combine, the chances of SIDS are high.

These factors are:<sup>1</sup>


- **At-risk infant.** An infant has an unknown problem—such as a genetic change or a brain defect—that puts him or her at risk for SIDS. Health care providers, parents, and caregivers don't know about these problems, so they don't know the infant is at risk.
- **Important time in infant's development.** During the first 6 months after birth, infants go through many quick phases of growth that can change how well the body controls or regulates itself. Also, infant's bodies are learning how to respond to their environment.
- **Stressors in the environment.** All infants have stressors in their environments—sometimes called external stressors because they are outside the body. Being placed to sleep on the stomach, overheating during sleep, and exposure to cigarette smoke are all examples of external stressors. Infants who have no problems like those explained above can usually correct or overcome external stressors to survive and thrive. But an infant who has an unknown problem and whose body systems are immature and unstable might not be able to overcome these stressors.

According to the Triple-Risk Model, all three things have to be present for SIDS to occur.

Removing one of these factors—such as external stressors—may tip the balance in favor of the infant's survival. Because the first two situations can't be seen or pinpointed, the most effective way to reduce the risk of SIDS is to remove or reduce environmental stressors. Strategies to remove these stressors form the basis of the Safe to Sleep<sup>®</sup> campaign messages (</sids/Pages/sids.aspx>).

## Citations



1. American Academy of Pediatrics Task Force on Sudden Infant Death Syndrome. (2011; reaffirmed 2014, October). SIDS and other sleep-related infant deaths: Expansion of recommendations for a safe infant sleeping environment. *Pediatrics*, 128(5), e1341–e1367. Retrieved June 7, 2016, from <http://pediatrics.aappublications.org/content/128/5/e1341.long> .

## How can I reduce baby's risk of SIDS?

The American Academy of Pediatrics (AAP) Task Force on SIDS reviews all the latest scientific and clinical evidence about SIDS and other sleep-related infant deaths and makes recommendations about the most effective ways to reduce baby's risk of SIDS, and sleep-related deaths, such as suffocation (<https://safetosleep.nichd.nih.gov/safesleepbasics/SIDS/Common>).


The actions listed in the NICHD-led Safe to Sleep<sup>®</sup> campaign materials and publications are based on the AAP Task Force recommendations.<sup>1</sup>

It's important for **all caregivers**—parents, grandparents, aunts, uncles, babysitters, child care providers, and everyone who might care for baby—to learn about safe infant sleep to help reduce baby's risk.

Visit the Safe to Sleep<sup>®</sup> website to learn more about Ways to Reduce Baby's Risk (<https://safetosleep.nichd.nih.gov/safesleepbasics/risk/reduce>).

## Citations



1. American Academy of Pediatrics. (2022). Sleep-related infant deaths: Updated 2022 recommendations for reducing infant deaths in the sleep environment. *Pediatrics*, June;150(1): e2022057990 . Retrieved April 14, 2023.

## NICHD SIDS Research Goals

In 1974, landmark legislation—the Sudden Infant Death Syndrome Act (P.L. 93-270)—gave NICHD the statutory responsibility to oversee sudden infant death syndrome (SIDS) research. The Institute's ultimate goal is to eliminate SIDS.

To reach this aim, it is important to understand the underlying causes and mechanisms of the syndrome, to develop strategies to identify infants at high risk for sudden death, and to develop and implement preventive strategies that can effectively reduce the incidence of SIDS across diverse populations.<sup>1</sup>

NICHD outlined some of the progress made in understanding SIDS and its mechanisms in Targeting SIDS: A Strategic Plan ([https://www.nichd.nih.gov/publications/Pages/pubs\\_details.aspx?from=&pubs\\_id=129](https://www.nichd.nih.gov/publications/Pages/pubs_details.aspx?from=&pubs_id=129)). This Plan also identified and described several ongoing research efforts related to SIDS, including:

- **Etiology and pathogenesis.** NICHD seeks to understand how the neural abnormalities in SIDS infants develop and how they affect health and development before and after birth. Studies also examine how specific characteristics of the fetal and postnatal environment contribute to the pathologic process and whether genetic factors may predispose infants to SIDS.
- **Prognostics and diagnostics.** Research examines the efficacy of tools to assess the neurological and developmental maturation from fetal life through early infancy and of screening tools used in the neonatal period.
- **Preventive strategies.** NICHD leads studies and sponsors activities to support its goal of raising awareness of SIDS and how to reduce the risk. NICHD emphasizes the need for strong community partnerships to understand cultural variations in care and environmental risk factors, and to understand how multiple risk factors may interact.
- **Health disparities.** NICHD research focuses on the need for community resources and for the investigation of both protective and adverse forces that are at work within populations as a way of reducing the risk and incidence of SIDS.

## Citations



1. Eunice Kennedy Shriver National Institute of Child Health and Human Development. (2001). *Targeting sudden infant death syndrome (SIDS): A strategic plan*. Retrieved June 12, 2012, from [http://www.nichd.nih.gov/publications/pubs/Documents/SIDS\\_Syndrome.pdf](http://www.nichd.nih.gov/publications/pubs/Documents/SIDS_Syndrome.pdf) (PDF 855 KB)

# SIDS Research Activities and Advances

Understanding the science of sudden infant death syndrome (SIDS) is a primary goal of NICHD. Since its establishment, NICHD has led and supported research and activities aimed at understanding SIDS and reducing the risk for SIDS. Short descriptions of this research are included below.

## **Institute Activities and Advances**



Much of the Institute's research on SIDS is conducted through the [Pregnancy and Perinatology Branch \(PPB\)](#)

(</about/org/der/branches/ppb/Pages/overview.aspx>). Its efforts have included and still include studies on the causes and etiology of SIDS, ranging from basic research with animal models to more applied methods involving responses to environmental risk factors with the goal of developing tools to identify and protect high- risk infants; research on risk factors for SIDS, especially among certain portions of the U.S. population; and research to improve outreach designed to educate parents and caregivers about ways to reduce SIDS risk, especially among those populations with a higher incidence of SIDS.

Recent findings from Branch-supported research on SIDS include, but are not limited to, the following:

- **Brain abnormalities of SIDS infants within the continued investigation of the underlying processes that may lead to SIDS.** Almost 20 years of NICHD- and PPB-supported research have led to the important findings of a deficit in the neural network within the medullary raphe of the brainstem that is unique to SIDS infants. This network uses the neurotransmitter serotonin and controls heart rate, breathing, blood pressure, temperature, and arousal from sleep. Three-fourths of SIDS infants in one study had brainstem abnormalities. For more on this finding, visit [http://www.nichd.nih.gov/news/releases/Pages/sids\\_serotonin.aspx](http://www.nichd.nih.gov/news/releases/Pages/sids_serotonin.aspx) ([/news/releases/Pages/sids\\_serotonin.aspx](/news/releases/Pages/sids_serotonin.aspx)). Ongoing studies on the medullary deficiency seek to understand the underlying basis of the deficiency and how this affects infants' inability to resuscitate themselves following life-threatening challenges such as hypoxia. Visit <http://www.nichd.nih.gov/news/releases/Pages/020310-SIDS-linked-serotonin.aspx> (</news/releases/Pages/020310-SIDS-linked-serotonin.aspx>) for additional information on this line of research.



- **Infant sleep practices and how environmental factors impact SIDS risk.** Ongoing studies on sleep position focus on the decreased arousal response in stomach sleepers compared with infants who sleep on their backs. [NICHD researchers are studying sleep position decisions and other factors that influence SIDS risk \(/news/releases/Pages/120709-infant\\_sleep\\_position.aspx\)](#) that are common within certain racial or ethnic communities and lower-socioeconomic communities. The goal of these efforts is to improve the design, implementation, and effectiveness of risk reduction strategies for SIDS and causes of infant death associated with the sleep environment.
- **Infants who sleep in the same bed with their mother are at greater risk for SIDS and other kinds of sleep-related death.** However, infant care and public health experts have feared that sleeping separately might interfere with breastfeeding. NICHD-funded researchers recently found that [more than half of women who were exclusively breastfeeding were following guidelines on sharing the sleeping room with their infants \(/news/releases/Pages/020916-safe-sleep.aspx\)](#) rather than sleeping with the baby.
- **Potential genetic causes of SIDS.** NICHD researchers identified a mutation in 5% to 10% of SIDS infants. The mutations were in a cardiac sodium-channel gene and have been found in congenital heart conditions and arrhythmia, which can lead to cardiac arrest. Recent studies have found rare mutations in several other genes that control cardiac rhythm that may be a potential cause for or contributor to some cases of SIDS.

## Other Activities and Advances



To achieve its goals related to SIDS, NICHD supports and participates in a variety of other activities. Some of these activities are managed through the components listed above; others are part of NIH-wide or collaborative efforts in which NICHD participates. Some of these are listed below:

- The [Safe to Sleep® Campaign \(/sids/Pages/sids.aspx\)](#) (formerly Back to Sleep) aims to raise awareness about and to educate parents, caregivers, and health care providers on ways to reduce the risk of SIDS and other sleep-related causes of infant death. Since NICHD and its collaborators launched the campaign in 1994, the U.S. SIDS rate has declined by more than 50%, and the percentage of infants placed on their backs to sleep has more than tripled.

- The Prenatal Alcohol and SIDS and Stillbirth (PASS) Network is designed to conduct community-linked studies to investigate the role of prenatal alcohol exposure in the risk for SIDS and adverse pregnancy outcomes, such as stillbirth and fetal alcohol spectrum disorders, and how they may be interrelated. The main study in this PPB-funded network is the Safe Passages Study, which will follow 12,000 pregnant women through their pregnancies and their children's first year.
- The [Collaborative Home Infant Monitoring Evaluation \(CHIME\) Study](/research/supported/Pages/chime.aspx) (</research/supported/Pages/chime.aspx>), now complete, was a multicenter cooperative study of home monitoring that aimed to determine whether home monitors are effective in identifying episodes that are dangerous to the infant's health.
- The [National Infant Sleep Position \(NISP\) Study](/research/supported/Pages/nisp.aspx) (</research/supported/Pages/nisp.aspx>), conducted from 1992 to 2008, was a multicenter cooperative study of infant sleep aimed to assess infant care practices and dissemination of infant sleep position recommendations. The NISP Study examined factors that affect infant sleep position, including infant sleep position choices made by caregivers. The Study also examined other aspects of infant sleep environment and caregiver choices for infant sleep environment, including bed sharing with adults or other household members, within the context of SIDS, entrapment, overlay, and suffocation. Researchers are still analyzing data from the NISP Study.
- The [Study of Attitudes and Factors Affecting Infant Care Practices \(SAFE\)](http://www.bu.edu/slone/research/studies/safe/) (<http://www.bu.edu/slone/research/studies/safe/>)  [\(/Pages/external-disclaimer.aspx\)](/Pages/external-disclaimer.aspx) picks up where the NISP Study left off to further understand infant sleep practices and SIDS risks within racial/ethnic minority and lower socioeconomic communities. SAFE researchers will survey a nationally representative group of caregivers—meaning the ethnic backgrounds of caregivers in the study are similar to those of caretakers in the United States as a whole—to better understand the factors that make them more or less likely to follow safe sleep practices.

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