

Sudden Infant Death Syndrome (SIDS) and Sudden Unexpected Infant Death (SUID)

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Sudden Unexpected Infant Death (SUID)

- The death of an infant younger than 1 year of age that occurs suddenly and unexpectedly. After a full investigation the cause of death may be:
- **EXPLAINED** such as:
 - Suffocation: When no air reaches a baby's lungs, usually caused by a block in the airway
 - Infection such as pneumonia or myocarditis
 - Trauma, accidental or non-accidental
- **UNEXPLAINED**
 - SIDS
 - Undetermined.

Sleep –Related SUID

- **Accidental Suffocation and Strangulation in Bed (ASSB):**
 - *Suffocation by soft bedding:* When soft bedding, a pillow, or a waterbed mattress blocks the infant's airway.
 - *Overlay:* When another person lays on or rolls on top of or against the infant while sleeping, blocking the infant's airway.
 - *Wedging or entrapment:* When an infant gets trapped between two objects, such as a mattress and wall, bed frame, or furniture, blocking the infant's airway
 - *Strangulation:* When something presses on or wraps around the infant's head and neck blocking the airway.
- **Sudden Infant Death Syndrome (SIDS)**

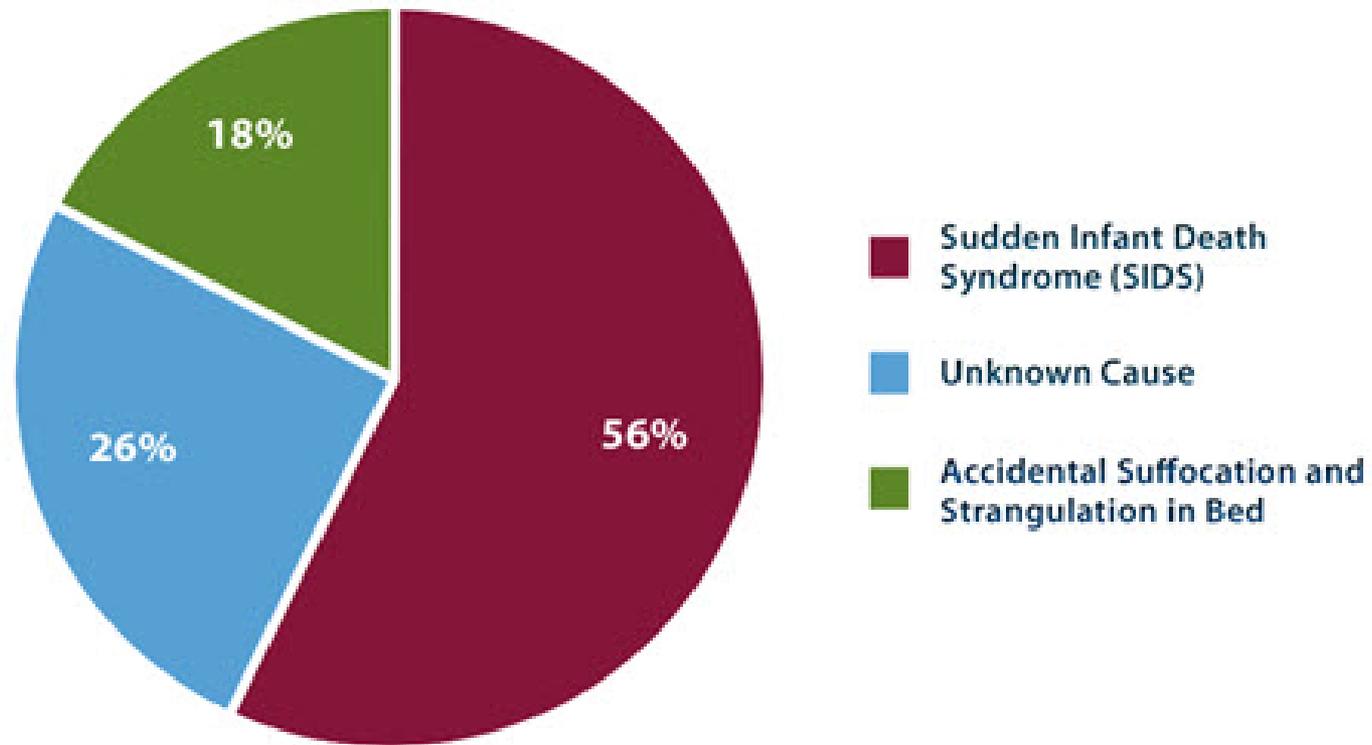
Sudden Infant Death Syndrome (SIDS)

- The sudden death of an infant under one year of age, which remains unexplained after a thorough case investigation, including performance of a complete autopsy, examination of the death scene, and review of the clinical history.

Importance of Full Case Investigation: Autopsy and Death Scene

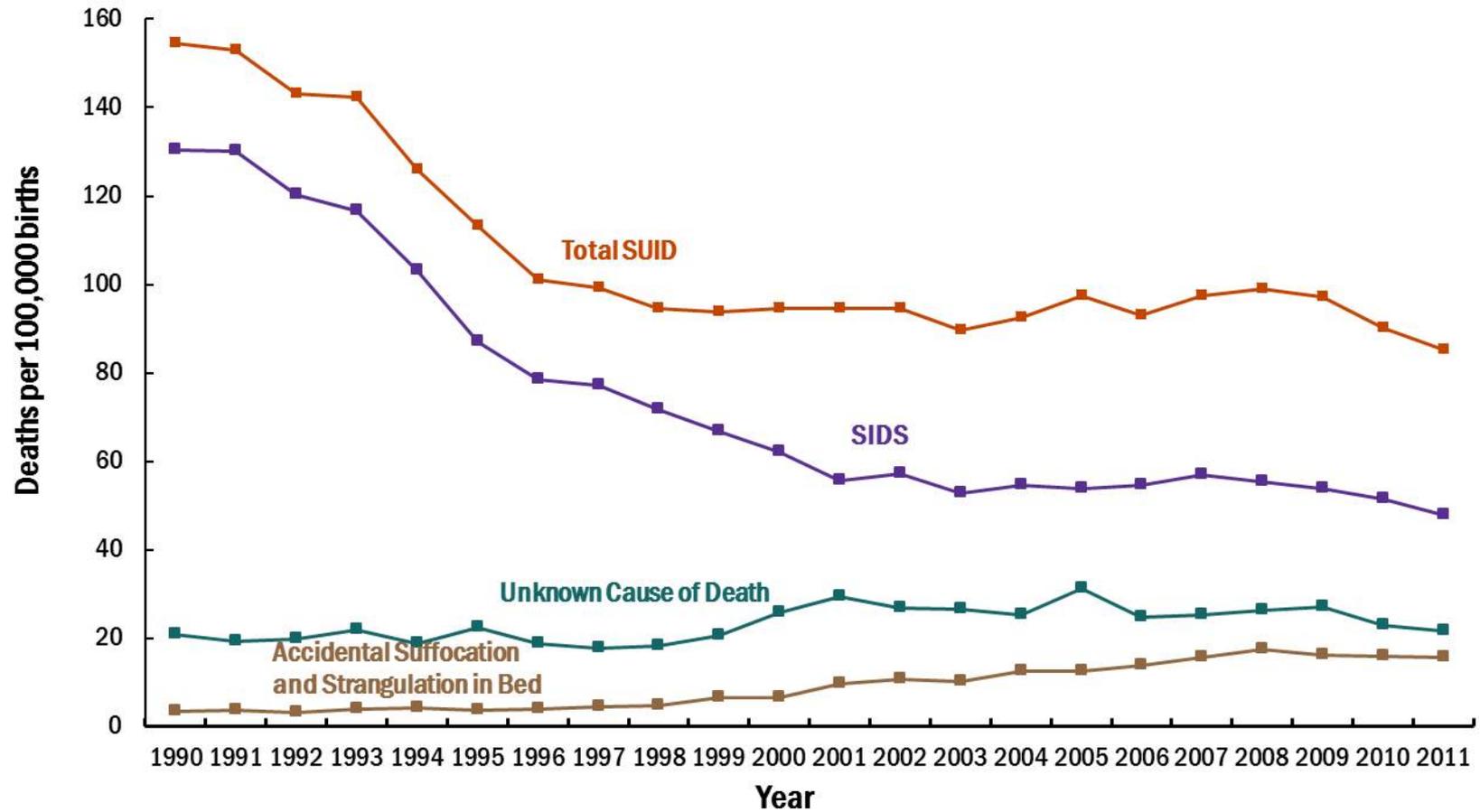
- Necessary for determining cause of death: undetected disease or anomalies; hazards in the environment
- Aids in counselling for future pregnancies and care of siblings
- Facilitates grieving and closure
- Resources:
 - <http://www.cdc.gov/sids/sceneinvestigation.htm>
SUID investigation reporting forms and training materials
 - Odendaal et al. Obtaining Consent for Autopsy Research in Unexpected Death in Early Life. *Obstet Gynecol* 2011; 117:167-171
Recommendations are provided about preparation for and the timing, setting, and content of the consent interview.

Breakdown of Sudden Unexpected Infant Death by Cause, 2011



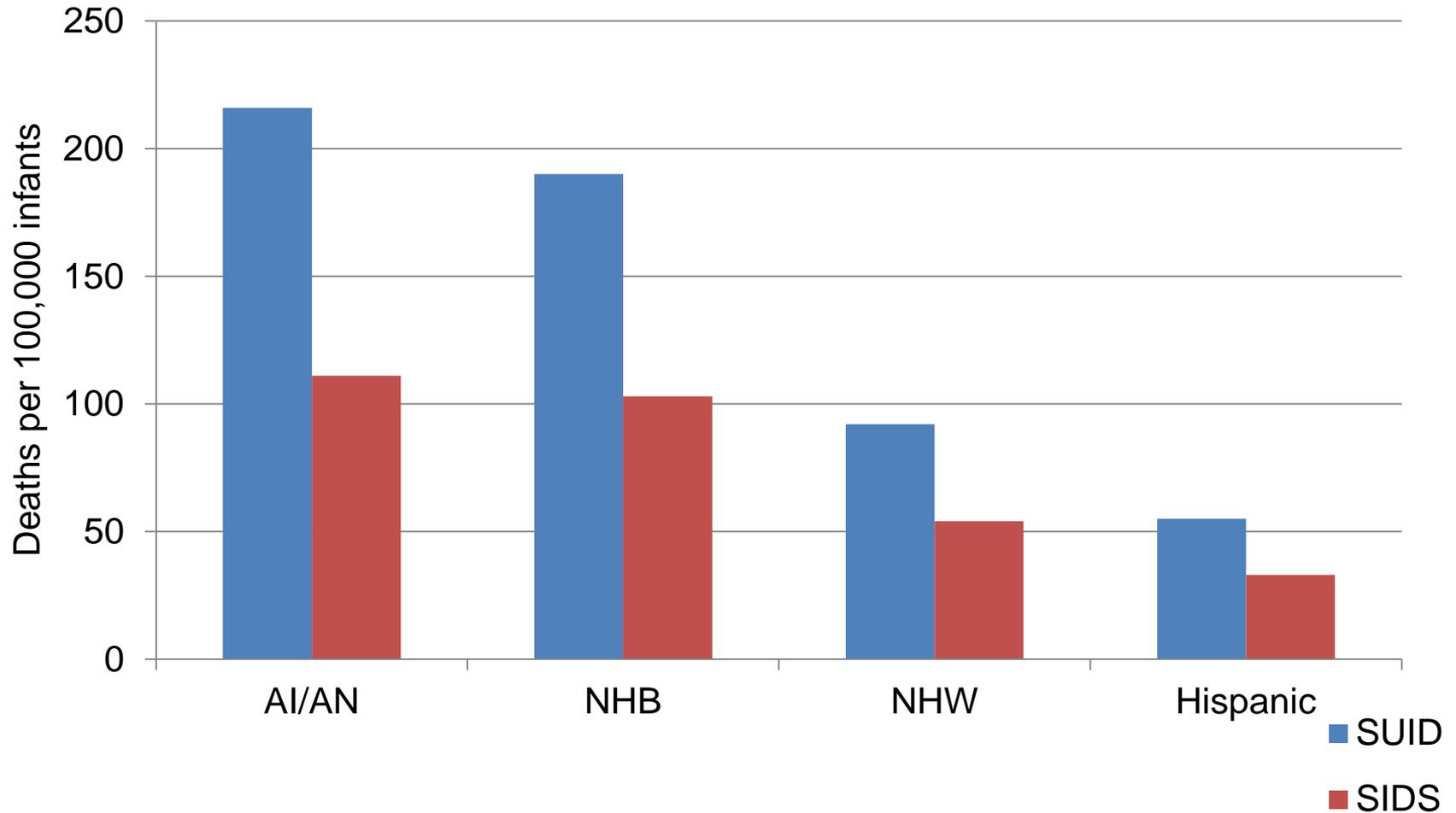
Source: NCHS

U.S. SUID-Specific Infant Mortality Rates (1990 - 2011)



Source: CDC WONDER, Mortality Files

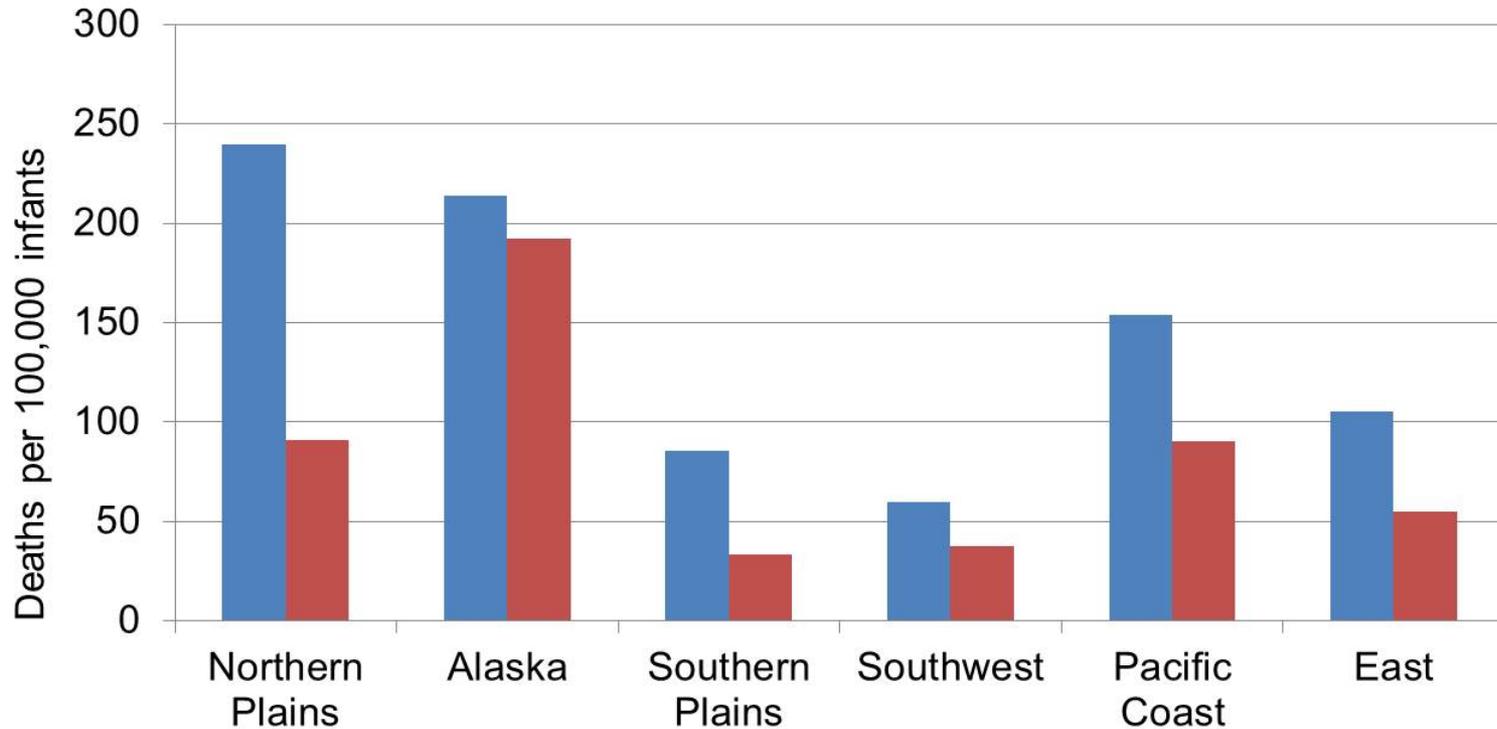
SIDS and SUID rates 2007-2010



Source: NCHS Period Linked Birth- Infant Death Files

American Indian/Alaska Native Infant Deaths, 1999-2009

Death Rates by IHS Region, Contract Health Service Delivery Area Counties



Am J Public Health. 2014;104: S320–S328.

■ SIDS

■ Unintentional Injuries

Maternal Risk Factors for SIDS

- Age <20 years at first pregnancy
- Short interpregnancy interval
- Low educational level
- Inadequate prenatal care
- Cigarette smoking during, after pregnancy
- Drug use during pregnancy
- Alcohol use in pregnancy

Infant Risk Factors for SIDS

- Increases risk:
 - Low birth weight- risk increases with decreasing birth weight
 - Prematurity- risk increases with decreasing gestational age
 - Small for gestational age
 - Overheating- too many clothes
- Decreases risk:
 - Pacifier use
 - Breastfeeding

SIDS Risk Factors in the Sleep Environment

- **Increases risk:**
 - **Placed to sleep on the stomach or side**
 - **Found on the stomach**
 - **Risk of stomach sleep position even greater if baby is usually placed on the back**
 - **Sleeping on soft bedding**
 - **Head covered by blankets**

SIDS Risk Factors in the Sleep Environment

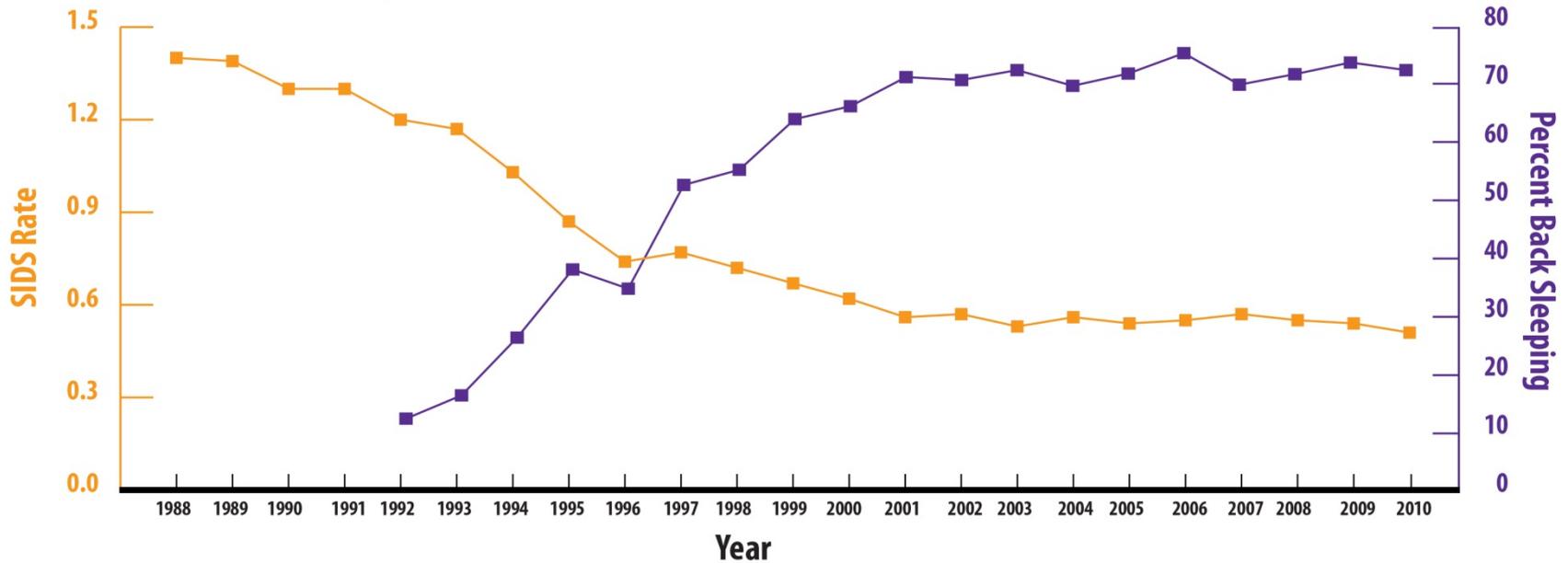
- **Increasing risk:**
 - Sleeping on an adult bed, couch, sofa
 - Bed sharing
 - Bed sharing risk for SIDS increases if the adults in the bed drink, smoke, or takes drugs
 - Bed sharing risk increases if infant is under 13 weeks postnatal age.
- **Decreases risk:**
 - Room sharing

Back to Sleep

- **June 1992-** The AAP Task Force publishes recommendation: “Healthy infants should be placed on their side or back to sleep...” .
- **June 1994-** “Back to Sleep” campaign is launched: A coalition of the U.S. PHS, AAP, and SIDS organizations
- **2005-** The AAP Task Force publishes recommendation that infant should be placed to sleep wholly on the back and side is not recommended
- Since Back to Sleep campaign launched in 1994, overall U.S. SIDS rate declined by 50% across all racial/ethnic groups.
- The rate of back sleeping among infants has increased almost 200% since 1994.

SIDS Rate & Sleep Position

U.S. SIDS Rate and Sleep Position, 1988–2010



Sleep Position Source: NICHD National Infant Sleep Position Study

SIDS Rate Source: National Center for Health Statistics, CDC

Influences on Use of Back Sleep Position

- Mothers who were not concerned about choking were 8 times more likely to report usual use of supine position compared to those who were concerned.
- Mothers not concerned about comfort had were 12 more likely to report usual use of the supine position.
- Mothers receiving positive advice from the physician to use supine position, were 2.62 times more likely to report usual supine position compared with no advice,
- Those receiving negative advice having 30% less likely to report usual supine position compared with those receiving no advice.

Trends in Bed Sharing

- In 1993 6.5% of the participants reported that the baby usually shared bed and that more than doubled to 13.5% in 2010.
- Compared with those who did not receive advice from a physician, those who reported their physicians was against bed sharing were less likely to have the infant share a bed (adjusted odds ratio, 0.66 [95%CI, 0.53-0.82])
- A neutral attitude was associated with increased bed sharing (1.38 [1.05-1.80]), compared to no advice.

Trends in Potentially Hazardous Bedding Use

- Inappropriate bedding use declined from 85.9 percent in 1993-1995, it still remained high, at 54.7 percent, in 2008-2010.
- From 1993-1995 to 2008-2010, covering with thick blankets declined from 39.2 percent to 7.9 percent.
- No declines were seen for bedding materials placed under infants, with 25.5 percent to 31.9 percent reporting placing blankets under infants, and 3.1 percent to 4.6 percent placing cushions under infants.
- The strongest predictors of bedding use were young maternal age, non-white race and ethnicity, and not being college educated.

Aberdeen Area Infant Mortality Study

- Aberdeen Area of the Indian Health Service: highest rate of infant mortality and SIDS among service areas
 - 1996-1998, SIDS rate 3.46/1000 compared with 0.75/1000 for US overall.
- AAIMS was a collaboration between IHS, NICHD, CDC, and Aberdeen Area Tribal Chairmen's Health Board
- Ten Northern Plains tribal communities participated in case-control study of American Indian infant deaths between December 1992 and November 1996.

Aberdeen Area Infant Mortality Study

- 72 deceased infants were enrolled; autopsy reports obtained on 56: 37 SIDS cases, 27 explained causes and 8 undetermined.
- 2 living controls were matched for each case on postnatal age and reservation or community of residence.
- Interviews were conducted on 33 SIDS cases and 66 controls.

From: **Risk Factors for Sudden Infant Death Syndrome Among Northern Plains Indians**

JAMA. 2002;288(21):2717-2723. doi:10.1001/jama.288.21.2717

Table 3. Unadjusted and Adjusted Odds Ratios (ORs) for Sudden Infant Death Syndrome With 95% Confidence Intervals (CIs), Conditional Logistic Regression

Variable	Unadjusted OR (95% CI)	Adjusted OR* (95% CI)
Model 1		
No. of layers of clothing ≥ 2	3.9 (1.4-10.9)	6.2 (1.4-26.5)
Periconceptional alcohol drinking	5.9 (1.9-17.8)	6.2 (1.6-23.3)
Any maternal smoking during pregnancy†	2.2 (0.8-5.8)	1.3 (0.4-4.7)
Public health nurse visits, any	0.3 (0.1-0.7)	0.2 (0.1-0.8)
Model 2		
No. of layers of clothing ≥ 2	3.9 (1.4-10.9)	6.2 (1.5-26.1)
Binge drinking during trimester 1	6.3 (1.8-22.8)	8.2 (1.9-35.3)
Any maternal smoking during pregnancy†	2.2 (0.8-5.8)	2.0 (0.6-7.6)
Public health nurse visits, any	0.3 (0.1-0.7)	0.2 (0.1-0.7)

*All variables were adjusted for each other.
 †Maternal drinking 3 months prior and/or in trimester 1.

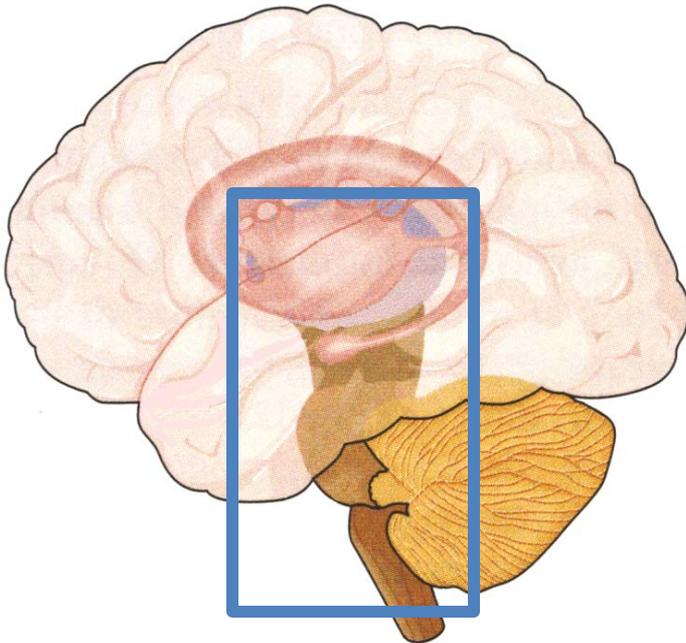
Aberdeen Area Infant Mortality Study

- The study identified SIDS risk factors that had not previously been reported.
- Infants were one-fifth as likely to die of SIDS if their mothers received visits from public health nurses before and after giving birth.
- Despite the reports that mothers reduced their alcohol consumption significantly by the second trimester, binge drinking during the first trimester of pregnancy increased the risk 8 times.
- Any maternal alcohol use during the periconceptional period was associated with a 6 fold increased risk.
- The baby wearing 2 or more layers of clothing was also associated with a 6 fold increased risk.

Brain Regulated Protective Responses to Challenges in the Sleep Environment

Life-Threatening Challenges:

- High levels of carbon dioxide (hypercarbia)
- Low levels of oxygen (hypoxia)
- Increased or decreased blood pressure
- Increased or decreased temperature



Protective Responses:

- Arousal
- Gasping to recover normal breathing following hypoxia (autoresuscitation)
- Blood pressure recovery
- Temperature recovery

Aberdeen Area Infant Mortality Study (AAIMS)

- Several studies have shown that many SIDS babies have abnormalities in the ability to use and recycle serotonin in the brainstem.
- Abnormal levels of serotonin receptor binding in AAIMS cases identical to that observed in these other studies.
- Serotonin receptor abnormalities in the arcuate nucleus were associated with exposure to adverse prenatal exposures, i.e., cigarette smoking ($p=0.011$) and alcohol ($p=0.075$), during the periconceptional period or throughout pregnancy.