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

Marian Willinger Ph.D.
Shavon Artis, Dr.P.H., M.P.H.
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](http://www.cdc.gov/sids/sceneinvestigation.htm)
    SUID investigation reporting forms and training materials
    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

- Sudden Infant Death Syndrome (SIDS): 56%
- Unknown Cause: 26%
- Accidental Suffocation and Strangulation in Bed: 18%

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

Source: CDC WONDER, Mortality Files
SIDS and SUID rates 2007-2010

Deaths per 100,000 infants

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

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.

Pediatrics 2015;135:10-17
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.
Table 3. Unadjusted and Adjusted Odds Ratios (ORs) for Sudden Infant Death Syndrome With 95% Confidence Intervals (CIs), Conditional Logistic Regression

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

*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.