

Sudden Infant Death Syndrome (SIDS)

Manisha Witmans, MD, FRCPC

Objectives

- Discuss the definition of SIDS
- Review the pathophysiology of SIDS
- Discuss genetic, epidemiological and individual factors that contribute to the prevalence of SIDS
- Discuss risk reducing strategies

Historical Perspective

- “And this woman’s child died in the night;” 1 Kings 3:19-20 (950 BC)
- 1291 a German poster forbid mothers from taking their infants under 3 years of age to bed with them.
- Research into SIDS has spanned the last 4 decades.

Definition

- Sudden Unexplained Infant Death Syndrome (SIDS):
 - The sudden and unexplained death of an infant under one year of age.
 - Despite a complete investigation of the circumstances of death, clinical history, coroner's investigation and complete autopsy, no obvious cause of death is found.
 - Diagnosis of exclusion
 - Leading cause of infant mortality in infants < 12 months of age in developed countries.

Krous HF, Beckwith JB, Byard RW, Rognum TO, Bajanowski T, Corey T, Cutz E, Hanzlick R, Keens TG, and Mitchell EA. *Pediatrics* 2004;114:234-238.

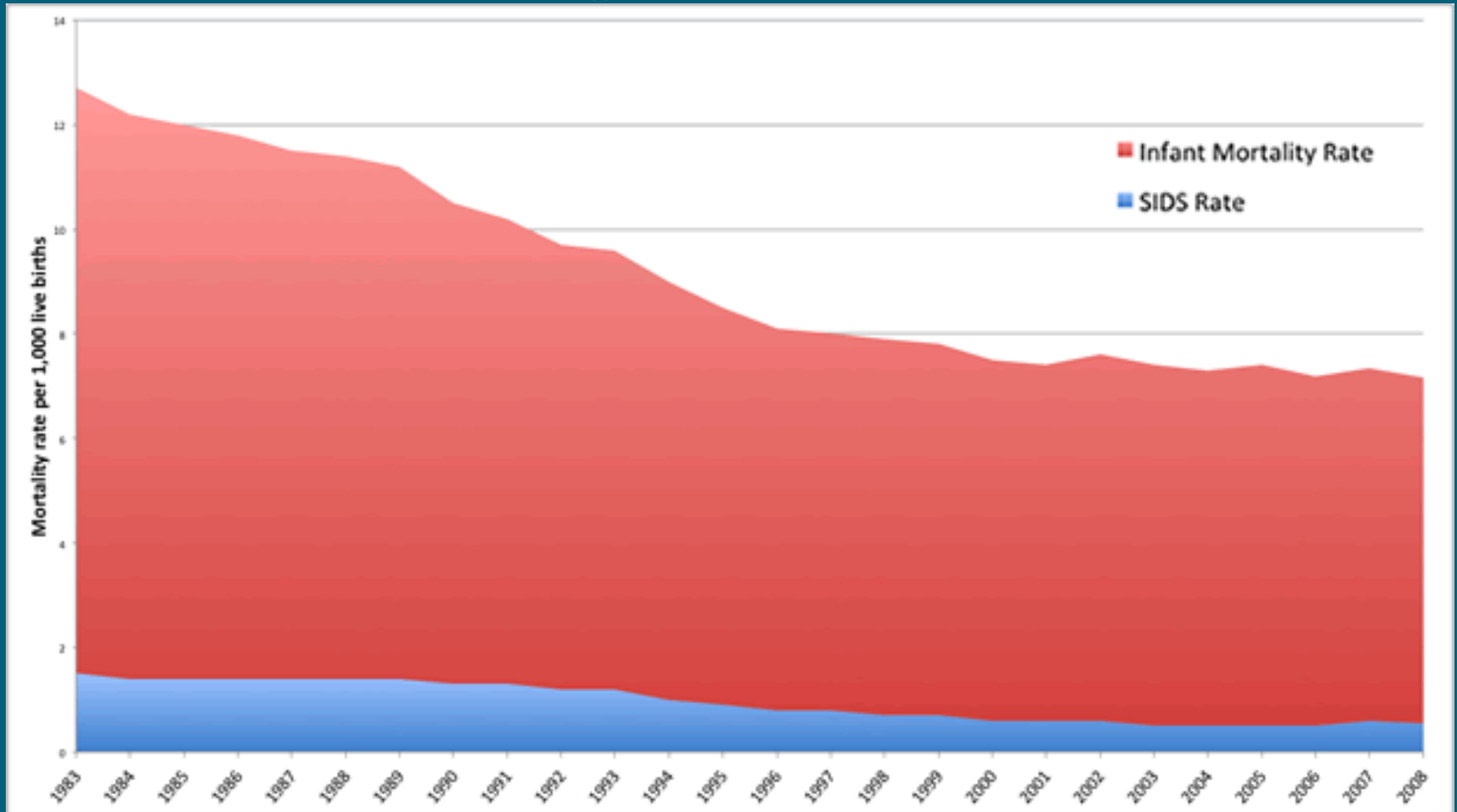
Cot deaths. *BMJ* 1995;310:7-10

SIDS Autopsy Findings

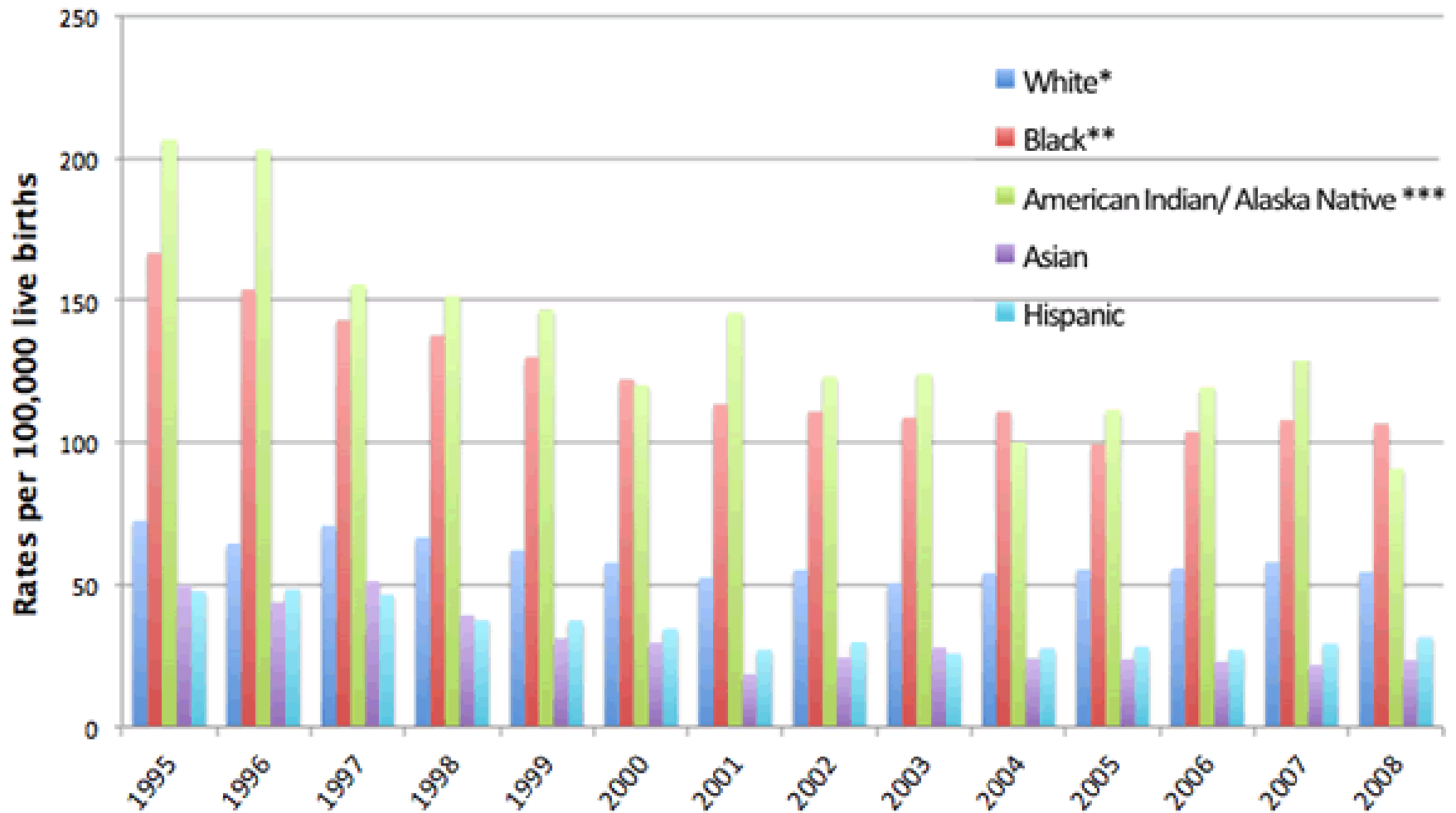
- Key Features:
 - No identifiable cause of death
 - No signs of severe illness
 - No significant signs of stress

SIDS Death Rates: USA

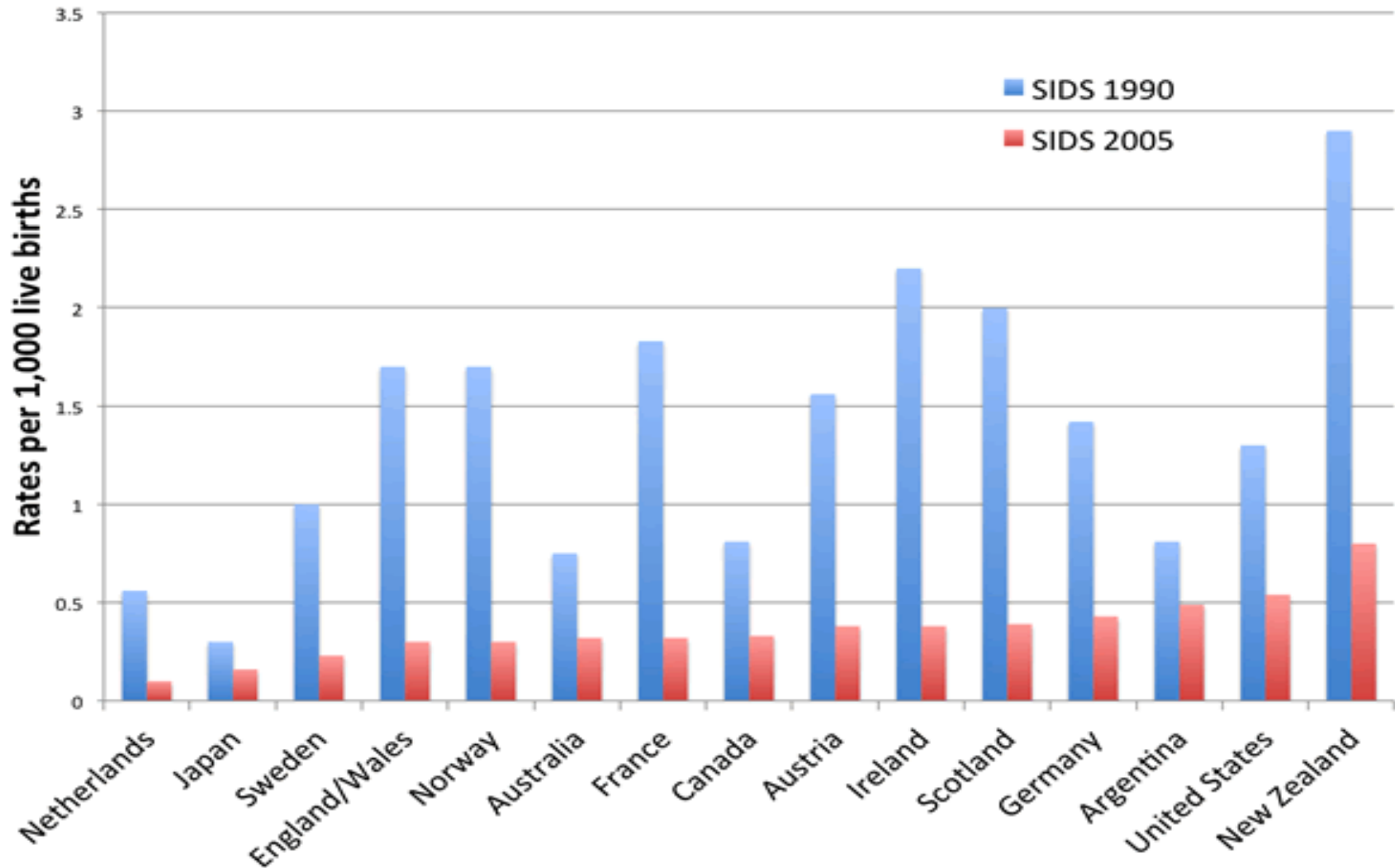
- 2008: 0.5 infant deaths per 1000 live births; 2226 infants



SIDS Death Rates by Race/Ethnicity



International Rates of SIDS



Brainstem Neurotransmitters in SIDS

- The brainstem is life support for the brain
- Autopsy findings found decreased serotonergic (5-HT) neurotransmitter receptor binding activity in SIDS brainstems versus controls.
- 5-HT regulation are abnormal: synthesis, release, processing, and clearance

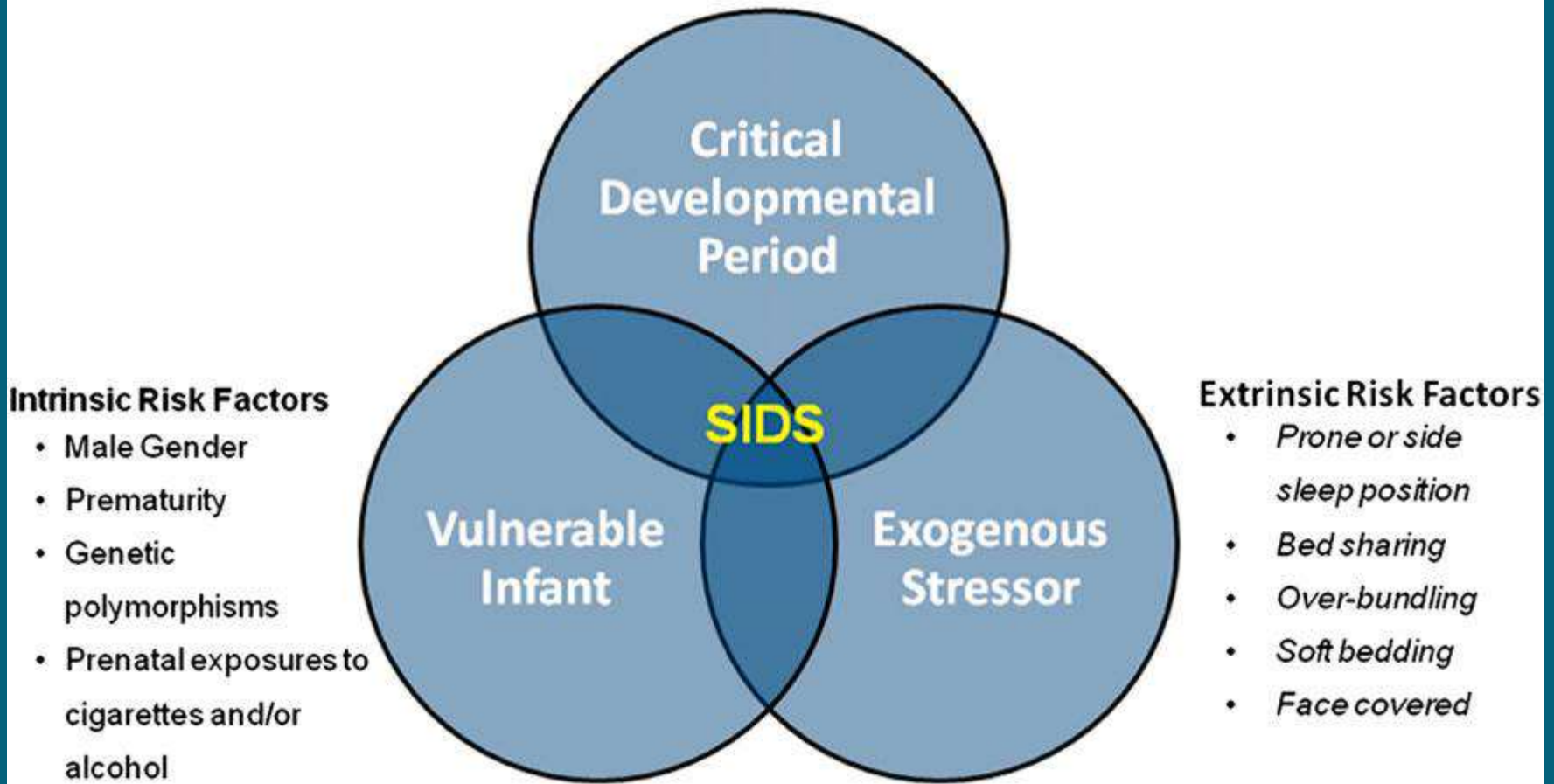
Kinney, H.C., et al. *J. Neuropath. Exp. Neurol.*, 60: 228-247, 2001.

Kinney, H.C., et al. *J. Neuropath. Exp. Neurol.*, 62: 1178-1191, 2003.

Brainstem Neurotransmitters in SIDS

- Abnormal regulation of 5-HT processing may be genetic or developmental
- Results in abnormal neurological control of cardiac, respiratory, and/or arousal function
- Provides a biological basis for SIDS
- Resulting complicated pathways between development, sleep, hypoxia, environment and autonomic nervous system dysfunction

0-12 Postnatal Months



Filiano, J.J., and H.C. Kinney. *Biol. Neonate*, 65: 194-197, 1994.

Trachtenbaerg FL, et al. *Pediatrics* 129;630:2012.



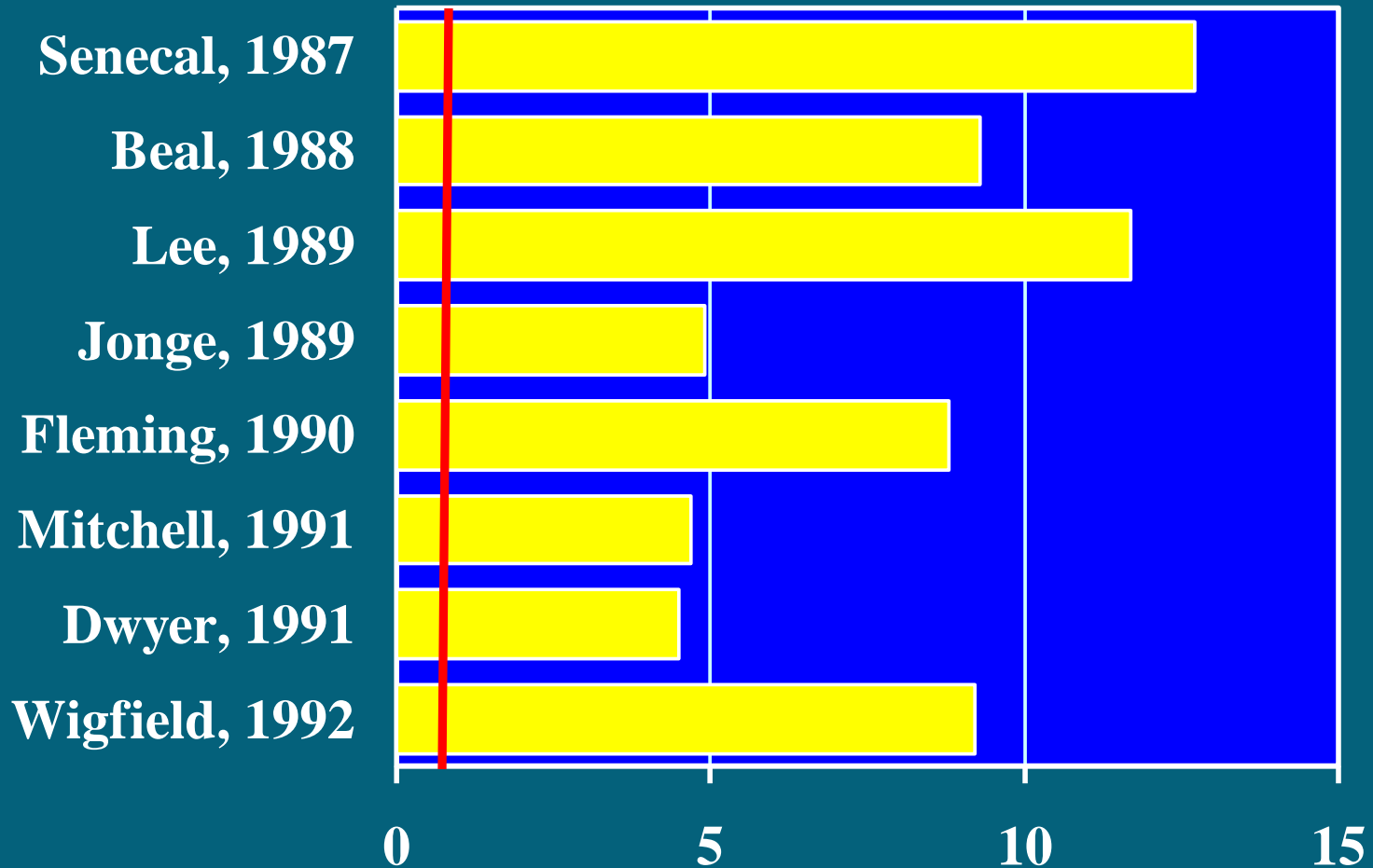
Cause of SIDS is not known
Based on what we know, we can only
decrease risk factors

Environmental Risk Factors

- Sleeping Position
 - Prone >>>>>>> Side lying> Supine
- Smoke exposure
 - Dose response curve and second hand smoke
- Bedding and Sleep Surfaces
 - Soft
- Temperature
 - How warmly the infant is dressed or bundled

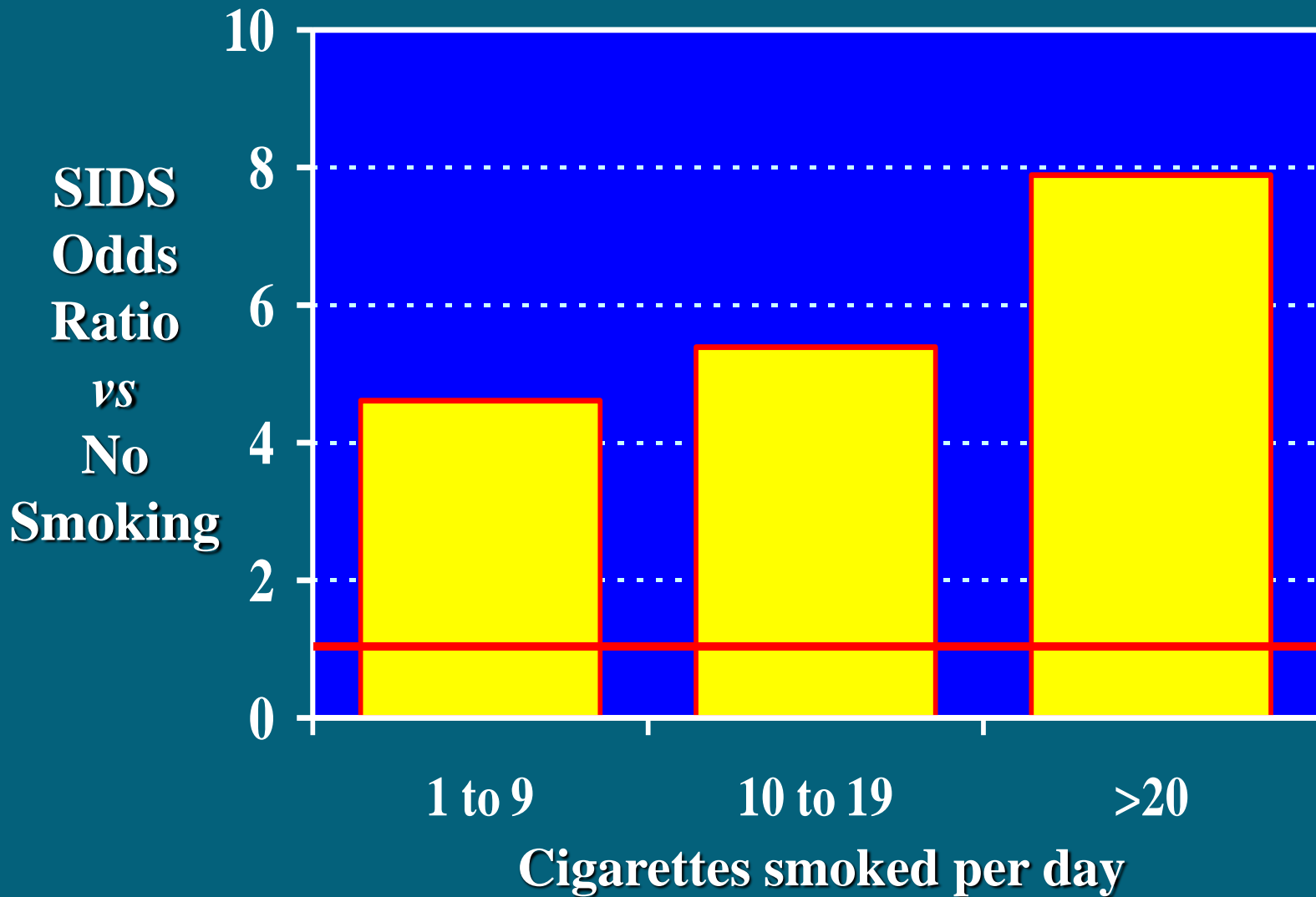


Prone Sleeping and SIDS (Odds Ratios)



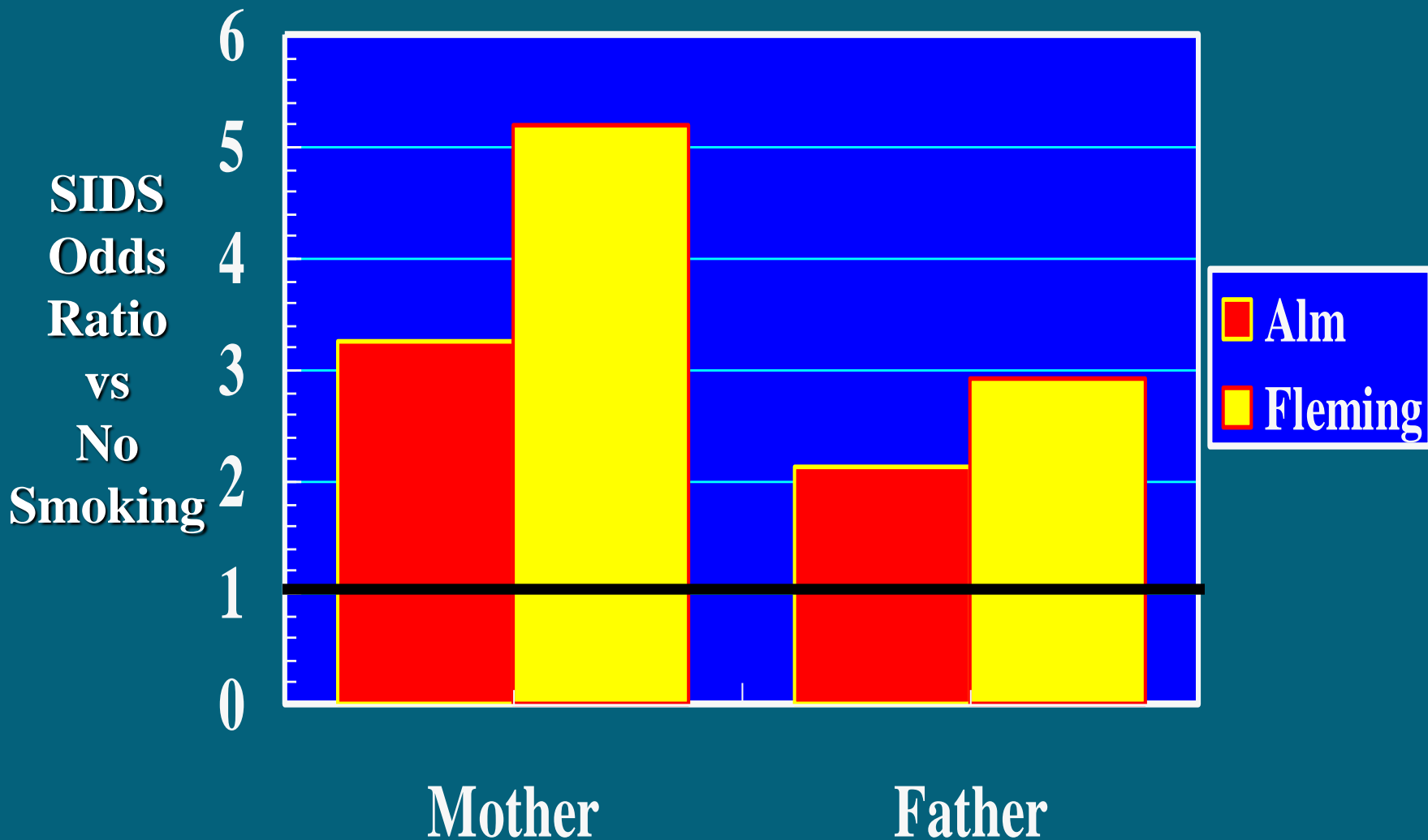
P.J. Fleming. *Proceedings of the 12th Conference on Apnea of Infancy.*
1994. Slide from Dr. Tom Keens

SIDS and Maternal Smoking During Pregnancy



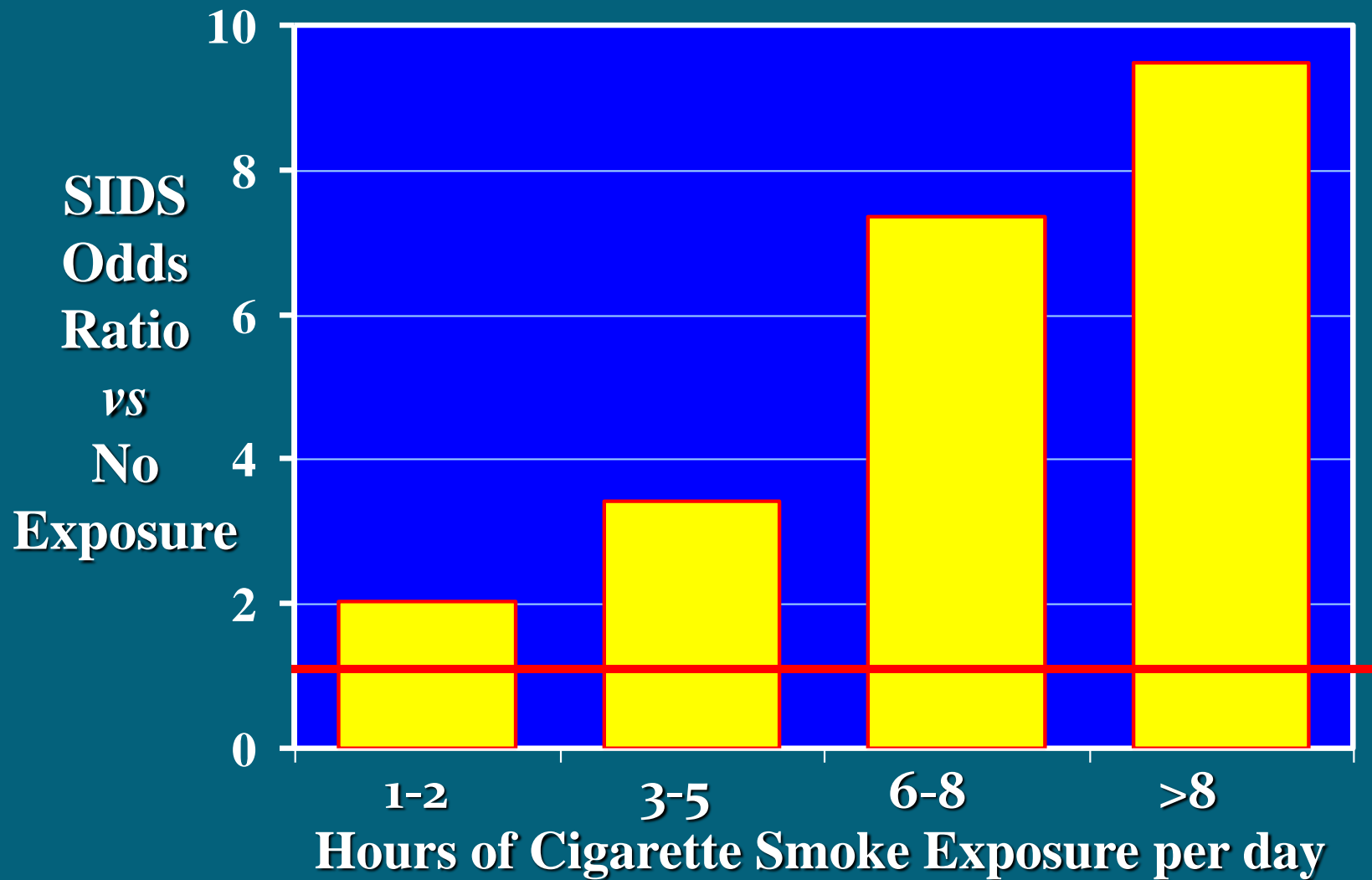
P.S. Blair, et al. *Br. Med. J.*, 313: 195-198, 1996.
Slide Courtesy of Dr. Tom Keens

SIDS and Cigarette Smoking After Pregnancy



Proceedings of the Fourth SIDS International Conference, 1996.
Slide Courtesy of Dr. Tom Keens

SIDS and Infant Exposure to Cigarette Smoke



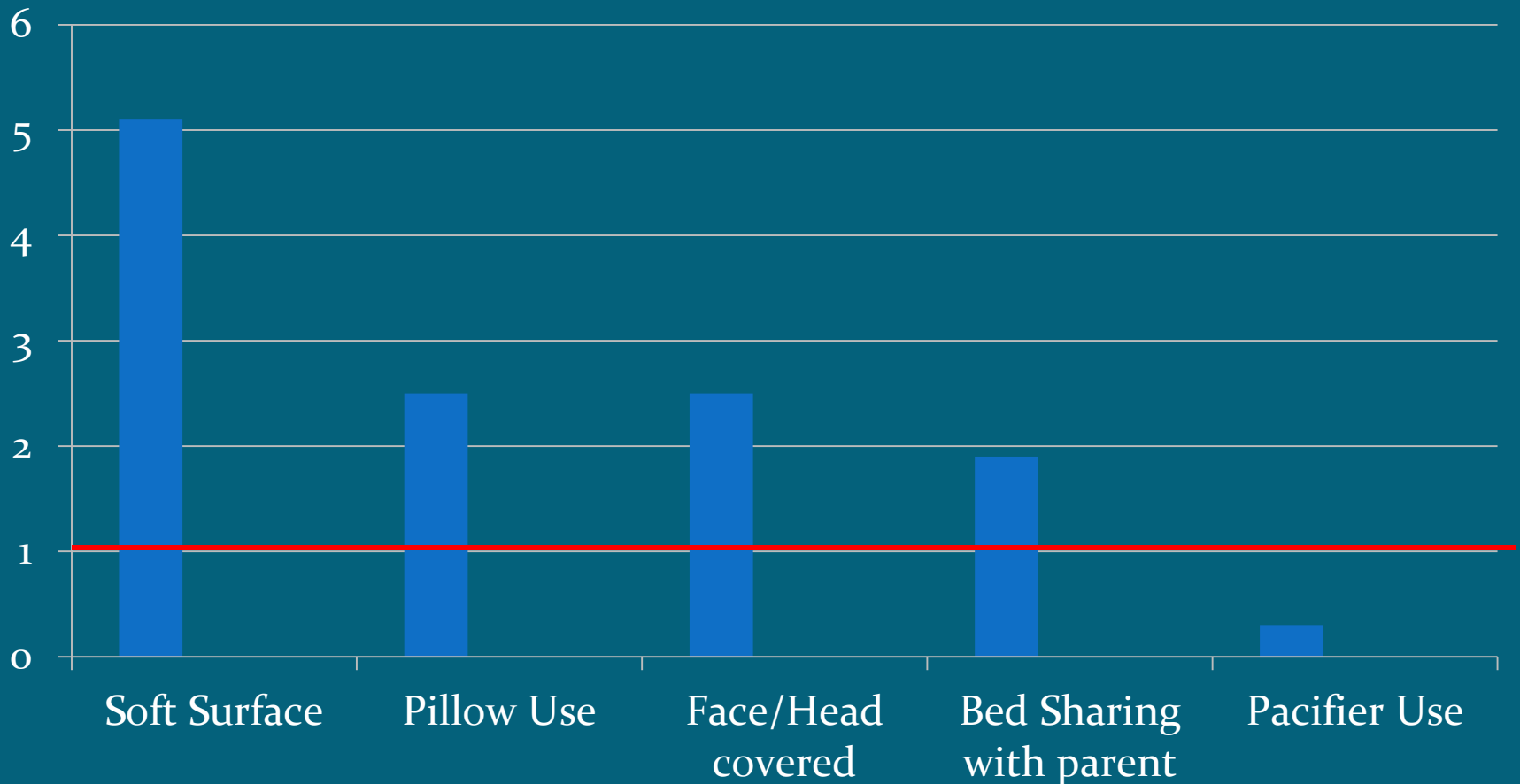
P.S. Blair, et al. *Br. Med. J.*, 313: 195-198, 1996.

Slide Courtesy of Dr. Tom Keens

Protective Factors Risk Factors

- Pacifier Use at Sleep Time
- Room Sharing
- Breast Feeding

Sleeping Environment and Risk of SIDS



Arousal Responses

- Narcotic use during pregnancy increase risk
- Immature cardiorespiratory autonomic control
- Failure of arousal responsiveness from sleep
- Gene polymorphisms relating to serotonin transport and autonomic nervous system development

Two Distinct Bedsharing Subgroups

```
graph TD; A[Two Distinct Bedsharing Subgroups] --> B[Elective: Breast feeders, Non-smokers, Firm mattress]; A --> C[Non-Elective: Bottle fed, Smokers, Risk factors]; B --- D[Less Risk]; C --- E[High Risk]
```

Elective:

Breast feeders
Non-smokers
Firm mattress

Less Risk

Non-Elective:

Bottle fed
Smokers
Risk 'factors'

High Risk

Bed Sharing

Safe

- Eliminate all the Risk Factors
- Bed is appropriate in the middle of the room
- Mattress firm
- No loose fitting sheets or heavy blankets
- Breastfed infant

Risky

- Smoking during pregnancy
- Current smoking
- Heavy bedding (comforter, duvet)
- Obesity
- Sleeping on multiple pillows
- Soft bedding
- Not sleeping in a bed
- Room overheated
- Alcohol Use
- Other children
- Pets
- Baby Sleeping Prone
- Other stuffed animals

Ideal BedSharing



- Baby brought to bed for breastfeeding and then back to own crib
- Crib/bassinet/cradle should be safe
- Mom sleeping on proper bed
- FEET to FOOT

Pacifiers

- No evidence that pacifier use inhibits breastfeeding or causes later dental complications.
- Recommends pacifier use throughout the first year of life.
- Do not force pacifiers if infants refuse.
- Should not be coated in sweet solutions.

Summary

- The cause of SIDS is not yet known
- We can help by decreasing risk factors
 - Encourage smoking cessation whenever possible
 - Encourage breastfeeding
 - Encourage optimal sleeping environment
- Education and public awareness are key