

CDC PUBLIC HEALTH GRAND ROUNDS

Safe Sleep for Infants



Accessible version: <https://www.youtube.com/watch?v=NdjiihES8FY>

October 23, 2018



U.S. Department of
Health and Human Services
Centers for Disease
Control and Prevention

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Acknowledgments

- Cheryle Adams
- Wanda Barfield
- Bill Callaghan
- Carri Cottengim
- Shanna Cox
- Alexa Erck Lambert
- Paula Eriksen
- Stacy Fentress
- Sarah Foster
- Meredith Fulmer
- Brenda Holmes
- Luis Luque
- Frances Marrero
- Alicia May
- Jane Mezoff
- Christine Olson
- Emily Osteen-Johnston
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Trends of U.S. Sleep-related Infant Deaths



CDR Sharyn Parks Brown, PhD, MPH, USPHS

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National Center for Chronic Disease Prevention and Health Promotion

Centers for Disease Control and Prevention



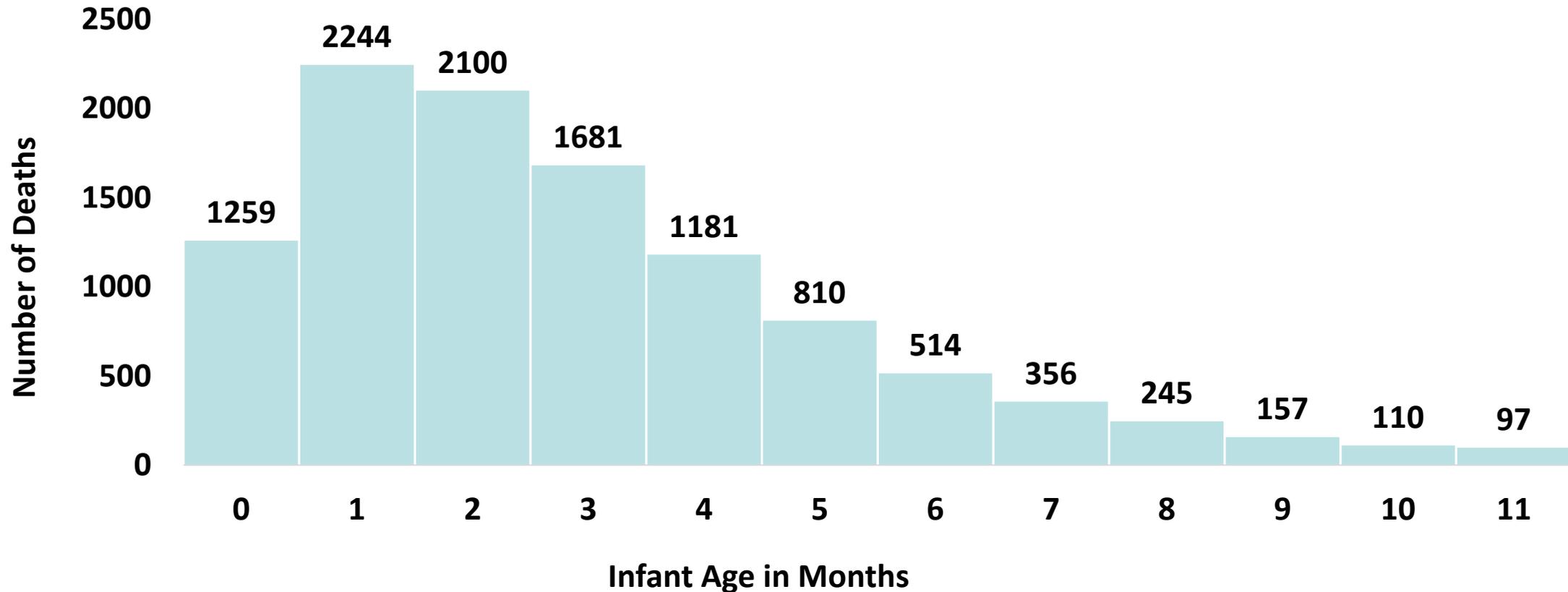
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Sleep-related Infant Deaths

- **3,500 deaths occur each year in the U.S.**
- **Also known as Sudden Unexpected Infant Death (SUID)**
 - Deaths of infants less than 1 year old
 - Occur during sleep or in a sleep environment
- **Sudden Unexpected Infant Death (SUID) includes:**
 - Sudden Infant Death Syndrome (SIDS)
 - Accidental suffocation and strangulation in bed
 - Undetermined causes

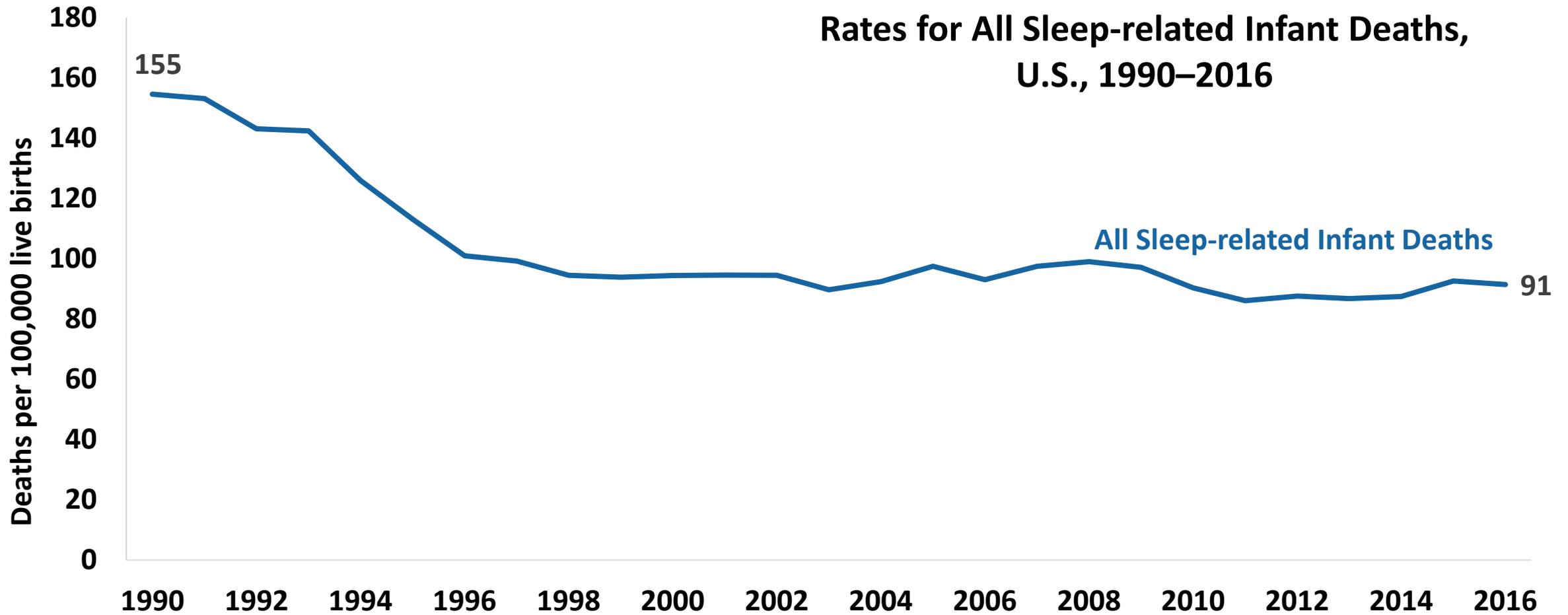
Almost 80% of Sleep-related Infant Deaths Occur Before Infants Are 4 Months Old

Age of Sleep-related Infant Deaths, U.S., 2014–2016; N=10,754



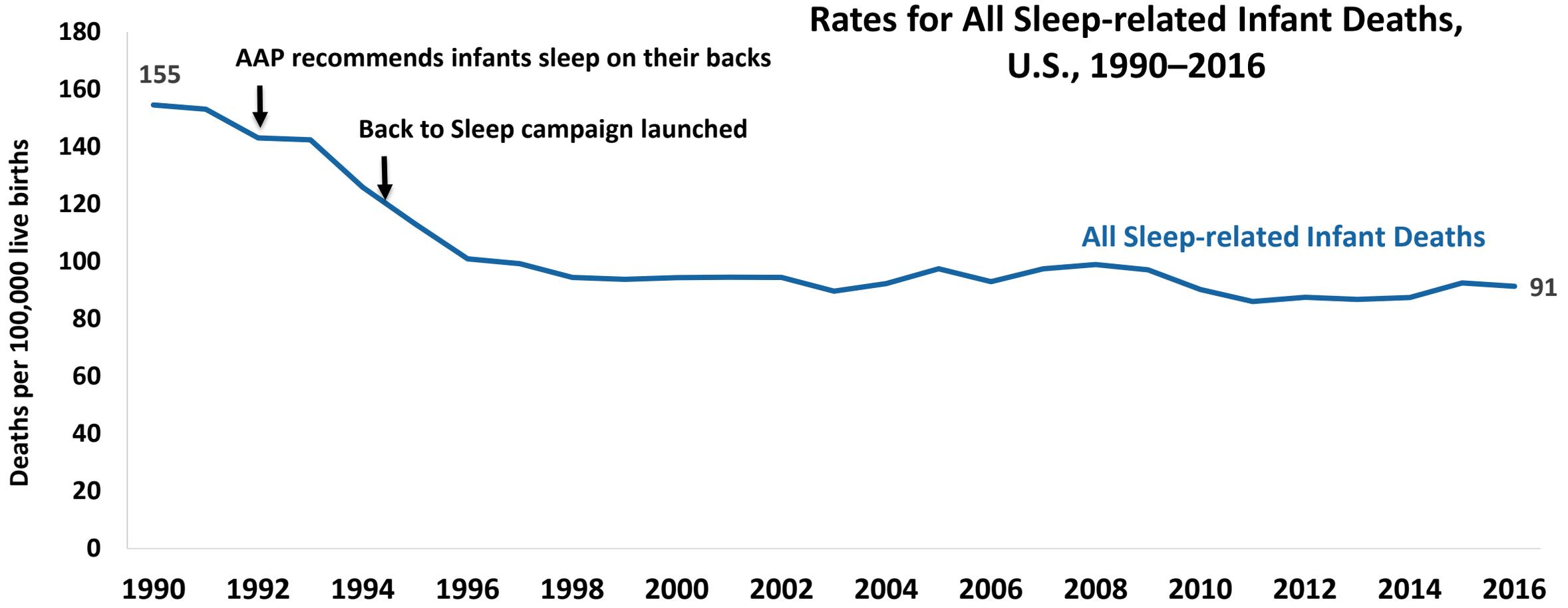
National Center for Health Statistics, *Public Use Data File Documentation: 2014–2016 Period Linked Birth/Infant Death Data Sets*, Centers for Disease Control and Prevention, Editor. 2016–2018, Department of Health and Human Services: Hyattsville, MD.

Rates of Sleep-related Infant Deaths



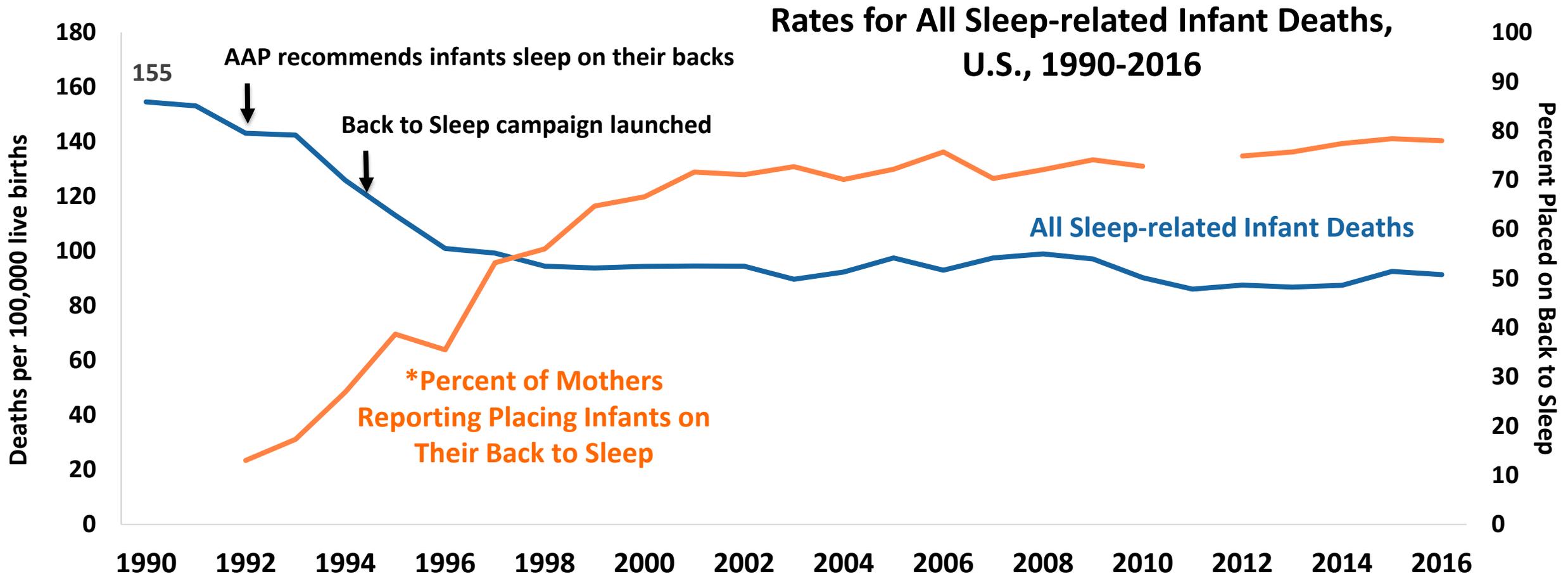
Released June 2017; wonder.cdc.gov/cmfi-icd10.html

Rates of Sleep-related Infant Deaths Dropped in 1990s But Have Not Declined Since 2000



Released June 2017. wonder.cdc.gov/cmfi-icd10.html

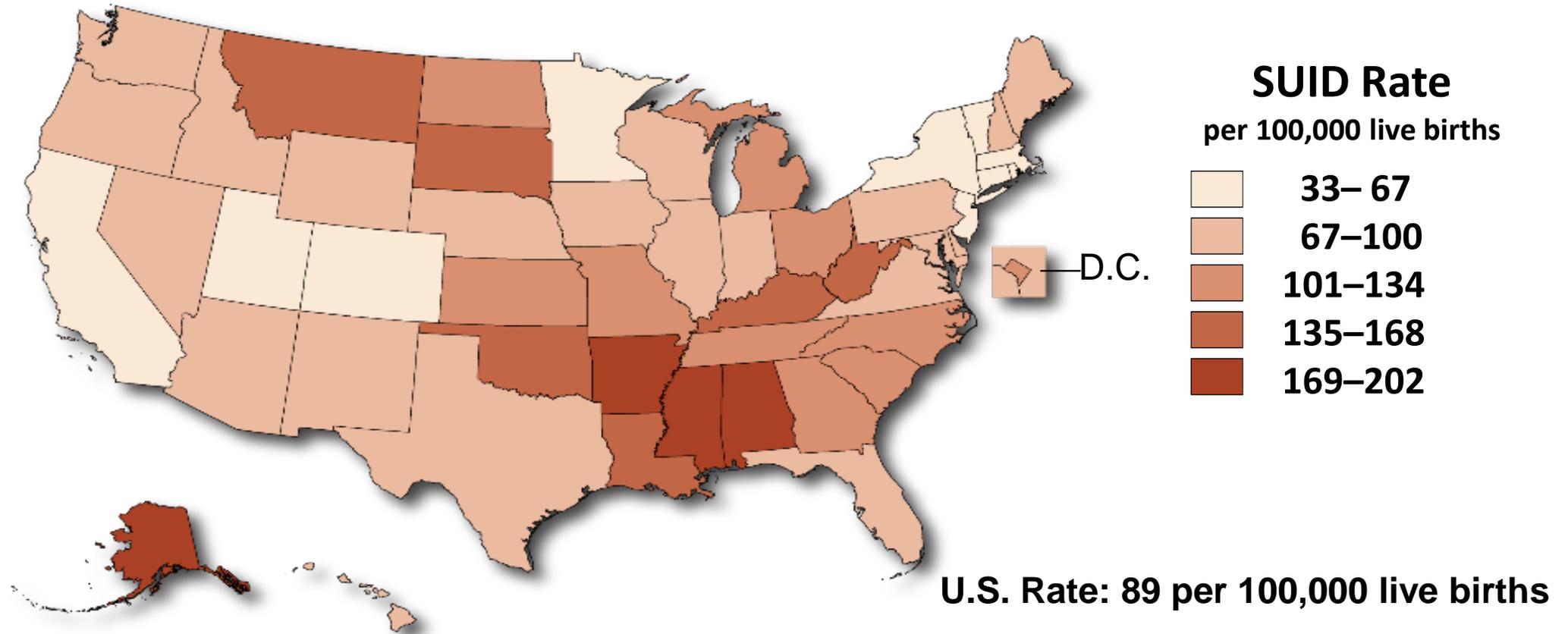
Sleep-related Infant Deaths Correspond to Numbers of Infants Placed on Their Back to Sleep



*Data for placing infants on their back to sleep is from 4 data sources: PRAMS 2016 data-unpublished; www.cdc.gov/prams/pramstat/pdfs/mch-indicators/PRAMS-All-Sites-2012-2015-508.pdf; Colson ER, Rybin D, Smith LA, et al. *Archives of Pediatric and Adolescent Medicine* 2009;163:1122–8; and Colson ER, Geller NL, Heeren T, et al. *Pediatrics* 2017; 140 (3) e20170596

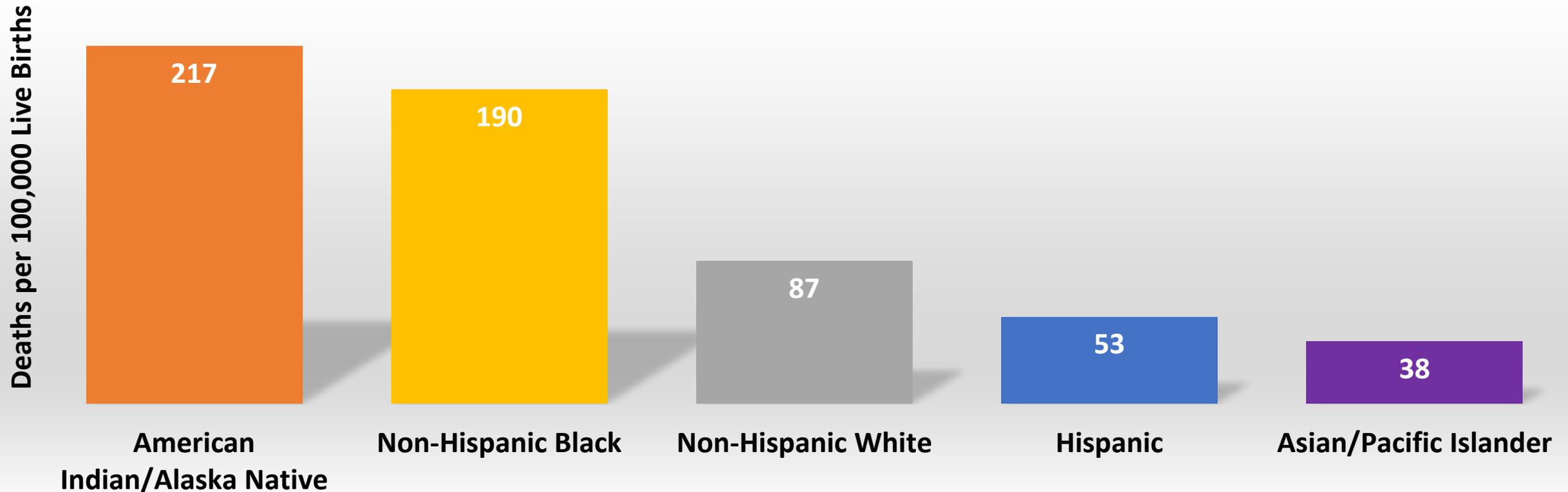
Rates Vary Widely among States

Rates of Sleep-related Infant Death by State, 2013–2015



Racial and Ethnic Disparities Exist in Sleep-related Infant Deaths

Racial and Ethnic Disparities in Sleep-related Infant Deaths, U.S., 2015



National Center for Health Statistics, *Public Use Data File Documentation: 2014–2016 Period Linked Birth/Infant Death Data Sets*, Centers for Disease Control and Prevention, Editor. 2016-2018, Department of Health and Human Services: Hyattsville, MD.

Factors that Increase Risk of Sleep-related Infant Death

Known Risk Factors
Non-supine position (e.g., on side or stomach)
Sleep surface sharing
Non-firm, non-flat sleep surface
Presence of soft bedding or other soft objects
Overheating during sleep
Tobacco exposure (prenatal & environmental)
Alcohol exposure (prenatal & environmental)

How to Reduce Risk of Sleep-related Infant Death

Known Risk Factors	This means infants should be...
Non-supine position (e.g., on side or stomach)	Placed on their back to sleep every time they go to sleep
Sleep surface sharing	Placed on a separate space to sleep, in same room as caregiver
What to avoid	Where the infant sleeps should be...
Non-firm, non-flat sleep surface	Flat and level surface, such as crib, portable crib or bassinette with tight-fitting sheet
Presence of soft bedding or other soft objects	Free of thick or plush blankets, bumper pads, stuffed animals, pillows, or infant positioners
Overheating during sleep	Kept at a moderate temperature in infant's sleep area, avoid excessive layering of clothing
What else to avoid	What else can you do?
Tobacco exposure (prenatal & environmental)	Stop smoking during and after pregnancy, and around infants
Alcohol exposure (prenatal & environmental)	Don't use alcohol during pregnancy or when caring for an infant

Where Can We Reduce Risks and Increase Prevention?

Estimated U.S. Prevalence of Selected Risk Factors	
Risk Factors	Prevalence (%)
Not sleeping in a crib, portable crib, or bassinet	76
Sleep surface-sharing	61
Use of soft bedding or soft objects	39
Non-supine sleep position	22
Prenatal tobacco exposure	10
Prenatal alcohol exposure	8

Bombard JM, Kortsmitt K, Warner L, et al. *MMWR* 2018;67:39–46 (non-supine, surface share, soft bedding)

Kemp JS, et al. *Pediatrics* Sep 2000, 106 (3) e41 (non-firm sleep surface)

Protective Factors for Sleep-related Infant Death

- **60% are breastfeeding at least through the infants' first 2 months**
- **32% of infants placed to sleep with a pacifier**



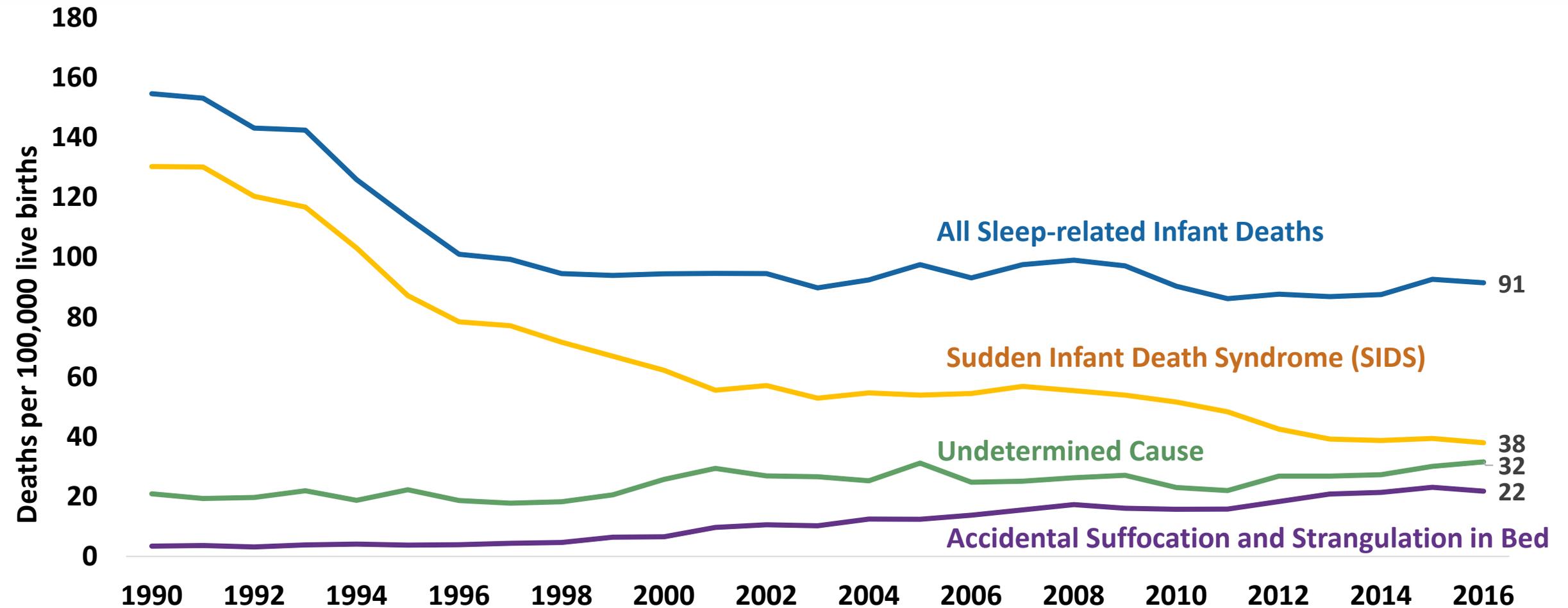
Bombard JM, Kortsmid K, Warner L, et al. *MMWR* 2018;67:39–46

Hauck FR, Herman SM, Donovan M, et al. *Pediatrics* 2003;111:1207–1214

Sudden Unexpected Infant Death (SUID) Case Registry

- **CDC supports the SUID Case Registry to monitor sleep-related deaths and related circumstances**
 - Demographics, infant health history, sleep position, location and contents of the sleep environment
- **CDC SUID classification algorithm**
 - Provides a standardized grouping method
 - Accounts for unknown and incomplete investigation
 - Acknowledges uncertainty about suffocation or asphyxiation
 - Allows calculation of SUID category-specific death rates

Since 2000, Decreases in SIDS Have Not Led to Decreases in Overall Sleep-related Infant Deaths



Released June 2017. wonder.cdc.gov/cmfi-icd10.html

Changes in Cause of Death Determination for Sleep-related Infant Deaths

- **Medical examiners and coroners (ME/Cs) certify cause of death**
 - Include terms that describe cause and manner of death
- **Cause-of-death codes (ICD-10) are used for national surveillance**
 - Sudden Infant Death Syndrome (SIDS): R95
 - Undetermined: R99
 - Accidental suffocation and strangulation in bed: W75
- **Moving away from SIDS as a diagnosis**
- **Reporting more deaths as undetermined or accidental suffocation**

Variability in Cause of Death Determination Limits Our Understanding and Prevention Efforts

➤ **Shifts in cause-of-death reporting**

- More thorough investigations lead to more deaths being classified as accidental suffocation or undetermined causes
- Increased influence of multidisciplinary child death reviews
- Changing death certifier diagnostic preference, away from SIDS

➤ **This variability influences surveillance and research**

- **Impacts true understanding of causes of sleep-related infant deaths**
- **Inhibits ability to prevent future deaths**

Other CDC Initiatives and Efforts

- **PRAMS infant safe sleep questions**
- **Promoting recommendations and educational campaigns**
 - American Academy of Pediatrics safe sleep recommendations
 - NIH's Safe to Sleep public health education campaign
- **Supporting hospital-based quality improvement initiatives**
 - CDC-funded Perinatal Quality Collaborative (PQC)
 - National Network of PQCs



Death Investigations and Safe Sleep



Roger A. Mitchell, Jr., MD

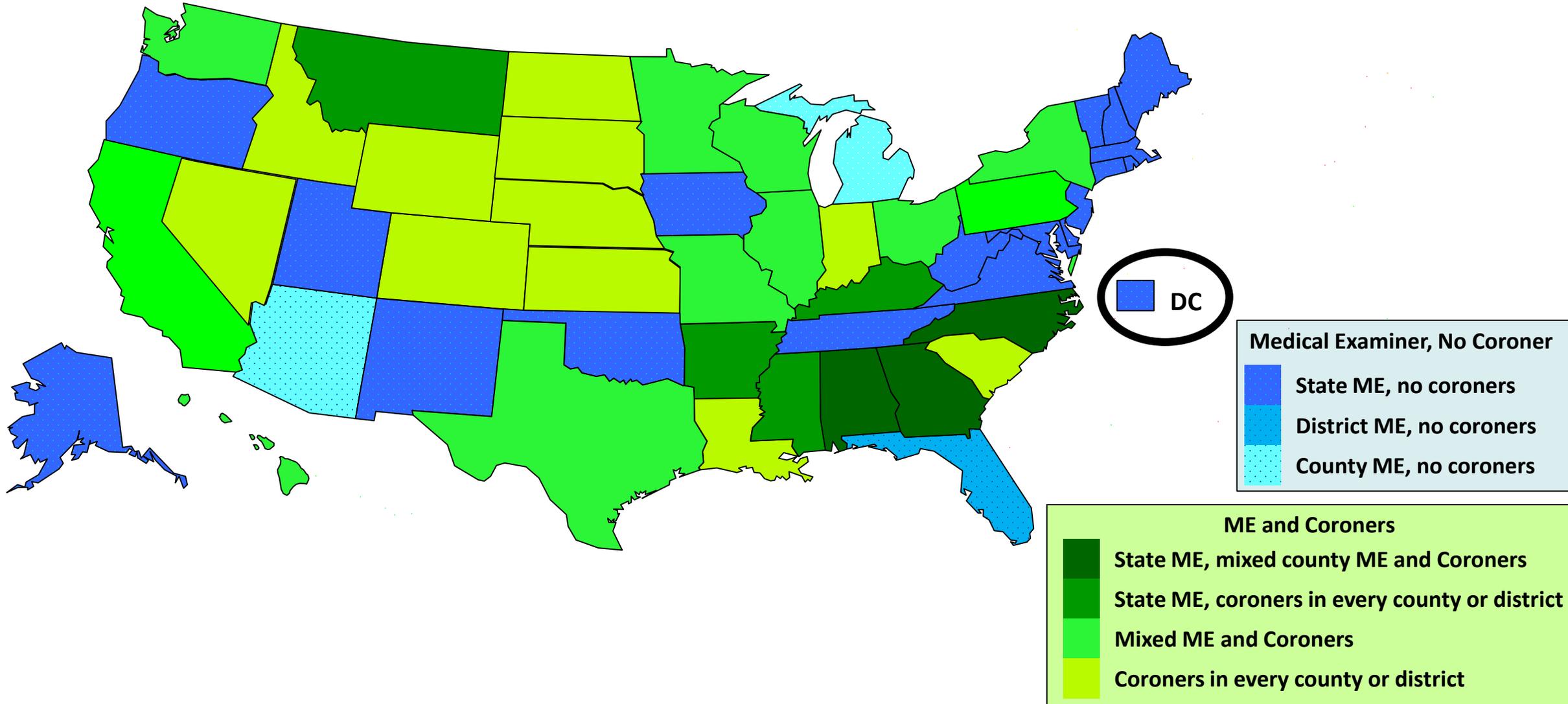
Chief Medical Examiner

Office of the Chief Medical Examiner
Government of the District of Columbia

D.C. Office of the Chief Medical Examiner



U.S. Medical Examiners and Coroners, 2010



CDC Recommended Sudden Unexplained Infant Death Investigation (SUIDI) Form

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
Division of Reproductive Health
Maternal and Infant Health Branch
Atlanta, Georgia 30333

Sudden Unexplained Infant Death Investigation
SUIDI
Reporting Form

[Reset Form](#)

INVESTIGATION DATA

Infant's Last Name: _____ Infant's First Name: _____ Middle Name: _____ Case Number: _____

Sex: Male Female Date of Birth: _____ Age: _____ SS#: _____

Race: White Black/African Am. Asian/Pacific Isl. Am. Indian/Alaskan Native Hispanic/Latino Other _____

Infant's Primary Residence:
Address: _____ City: _____ County: _____ State: _____ Zip: _____
Incident Address: _____ City: _____ County: _____ State: _____ Zip: _____

Contact Information for Witness:
Relationship to deceased: Birth Mother Birth Father Grandmother Grandfather
 Adoptive or Foster Parent Physician Health Records Other Describe: _____
Last: _____ First: _____ M.: _____ SS#: _____
Address: _____ City: _____ State: _____ Zip: _____
Work Address: _____ City: _____ State: _____ Zip: _____
Home Phone: _____ Work Phone: _____ Date of Birth: _____

WITNESS INTERVIEW

1 Are you the usual caregiver? No Yes

2 Tell me what happened:

3 Did you notice anything unusual or different about the infant in the last 24 hrs?
 No Yes Specify: _____

4 Did the infant experience any falls or injury within the last 72 hrs?
 No Yes Specify: _____

5 When was the infant LAST PLACED?
Date: _____ Military Time: _____ Location (room): _____

6 When was the infant LAST KNOWN ALIVE(LKA)?
Date: _____ Military Time: _____ Location (room): _____

7 When was the infant FOUND?
Date: _____ Military Time: _____ Location (room): _____

8 Explain how you knew the infant was still alive.

9 Where was the infant - (P)laced, (L)ast known alive, (F)ound (write P, L, or F in front of appropriate response)?

<input type="checkbox"/> Bassinet	<input type="checkbox"/> Bedside co-sleeper	<input type="checkbox"/> Car seat	<input type="checkbox"/> Chair
<input type="checkbox"/> Cradle	<input type="checkbox"/> Crib	<input type="checkbox"/> Floor	<input type="checkbox"/> In a person's arms
<input type="checkbox"/> Mattress/box spring	<input type="checkbox"/> Mattress on floor	<input type="checkbox"/> Playpen	<input type="checkbox"/> Portable crib
<input type="checkbox"/> Sofa/couch	<input type="checkbox"/> Stroller/carriage	<input type="checkbox"/> Swing	<input type="checkbox"/> Waterbed
<input type="checkbox"/> Other - describe: _____			



Sudden Unexplained Infant Death Investigation (SUIDI)

➤ Name, age, race, gender

➤ Response to hospital

- Names of physician
- Findings during clinical examination

➤ Response to home

- Household relationships
 - Identification of caregivers
- Recent change in behavior
- Recent illness or injury (condition within 72 hours)

➤ Last placed and known alive

- Where: bassinet, bed, sofa, crib, etc.
- Position: back, side, front, including neck and face position, etc.

➤ How is the infant found

- Position: back, side, front, including neck and face position, etc.
- Items near infant's nose, mouth, face

➤ Clothing and bedding: blankets, comforter, sheets, pillow

Sudden Unexplained Infant Death Investigation (SUIDI)

➤ Doll Scene Reenactments

- Communicate purpose and acknowledge difficulty
- Reaffirm that the process of the Office of the Chief Medical Examiner is to understand all circumstances
- Allow caretaker to place the doll in “Placed” and “Found” locations
- Take Photographs at each step
- Additional scene investigation documentation should follow standard death scene protocol

SUIDI Doll



Autopsy Protocol

➤ **Complete organ dissection**

- Photography, weight, and histology

➤ **Complete head dissection**

- Neuropathology consultation (routine)
- Optic nerve dissection
- Eye globe removal and dissection (as needed)

➤ **Skeletal assessment**

- Anthropology consultation (as needed)

➤ **Cardiac pathology consultation** (as needed)

➤ **Molecular pathology** **consultation** (future)

➤ **Toxicology, microbiology,** **histology, and metabolic**

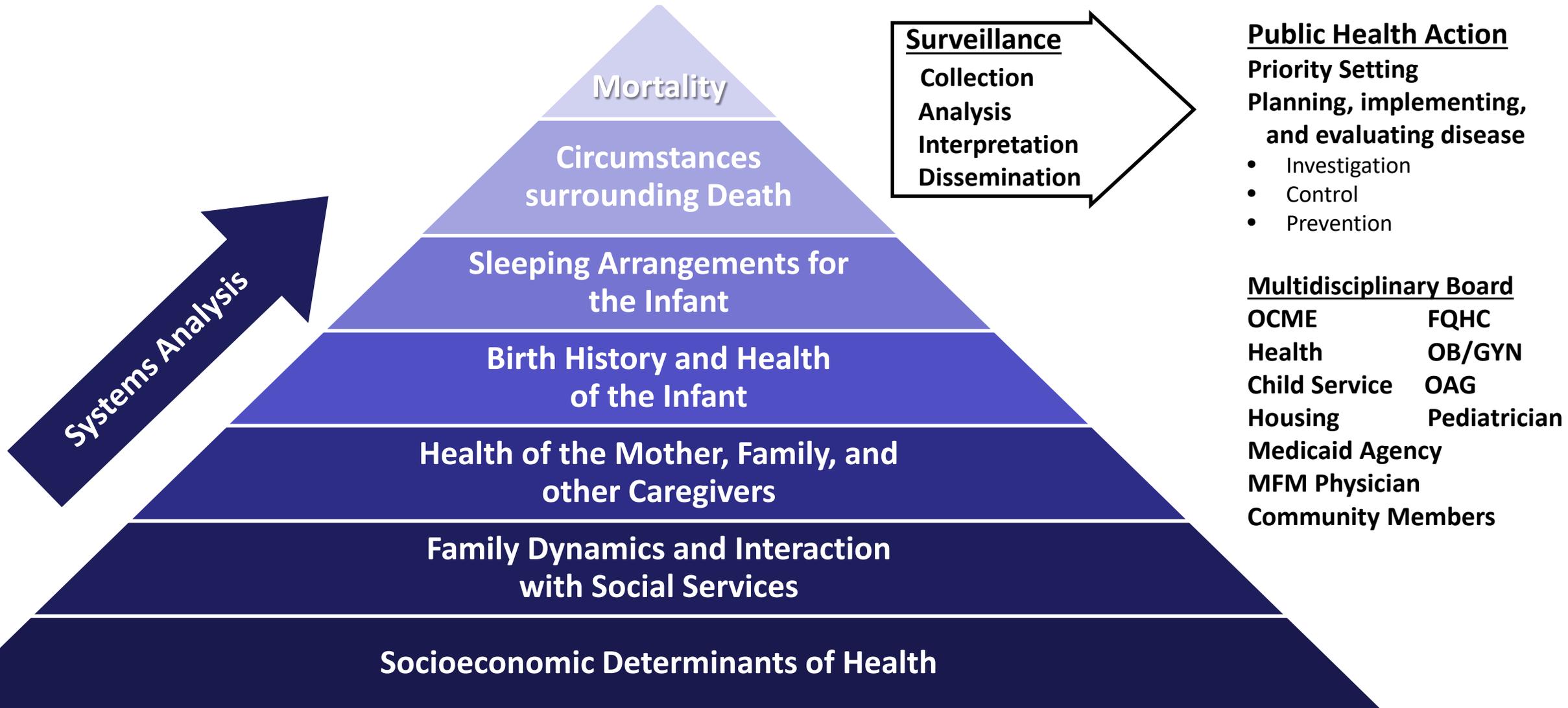
Death Certification: Bedsharing/Co-sleeping

- **Based upon information found during investigation and autopsy findings**
- **Looking for evidence of asphyxia**
 - Anterior lividity
 - Petechial hemorrhage of the eyes, mouth, and thymus
 - History of “roll-over” as given by the bed-sharing adult
- **If this type of information is available or observed, then cause and manner of death are certified as**
 - Cause of death: Asphyxia Manner of death: Accident
- **If this type of information is *not* available or observed, then the cause and manner of death are often certified as**
 - Cause of death: Undetermined (bedsharing) Manner of death: Undetermined

Death Certification: Unsafe Sleep

- **Based upon information found during investigation and autopsy findings**
- **These cases are for infants who are:**
 - **Placed face down**
 - Sleeping on adult beds with soft bedding
 - Sleeping in cribs with soft bedding
 - Sleeping on couches, car seats, recliners, etc.
 - **Often these cases have no physical or gross evidence of asphyxia**
 - **Many of these cases are certified as**
 - Cause of death: Undetermined Manner of death: Undetermined

Infant Mortality Review Team Conducts Review and Analysis for Policy Development



Case Example

- **2-month-4-day-old male infant found unresponsive by father bedsharing in a supine position. Father describes placing the baby down and then “dozing off.” Father woke up and found the baby unresponsive in the same position**
- **No recent illness or injury**
 - Weight: 50th percentile for age
 - Height: 50th percentile for age
 - Developmentally normal
 - No external or internal evidence of injury
 - No anatomic cause of death identified

Hospital



Home of Infant



Possible Risk Factors



Possible Risk Factors



Possible Risk Factors



Doll Reenactment



Doll Reenactment



Doll Reenactment



Recording Temperature of the Room



Behavior Change and Infant Sleep



Eve R. Colson, MD, MHPE

Professor of Pediatrics

Washington University School of Medicine

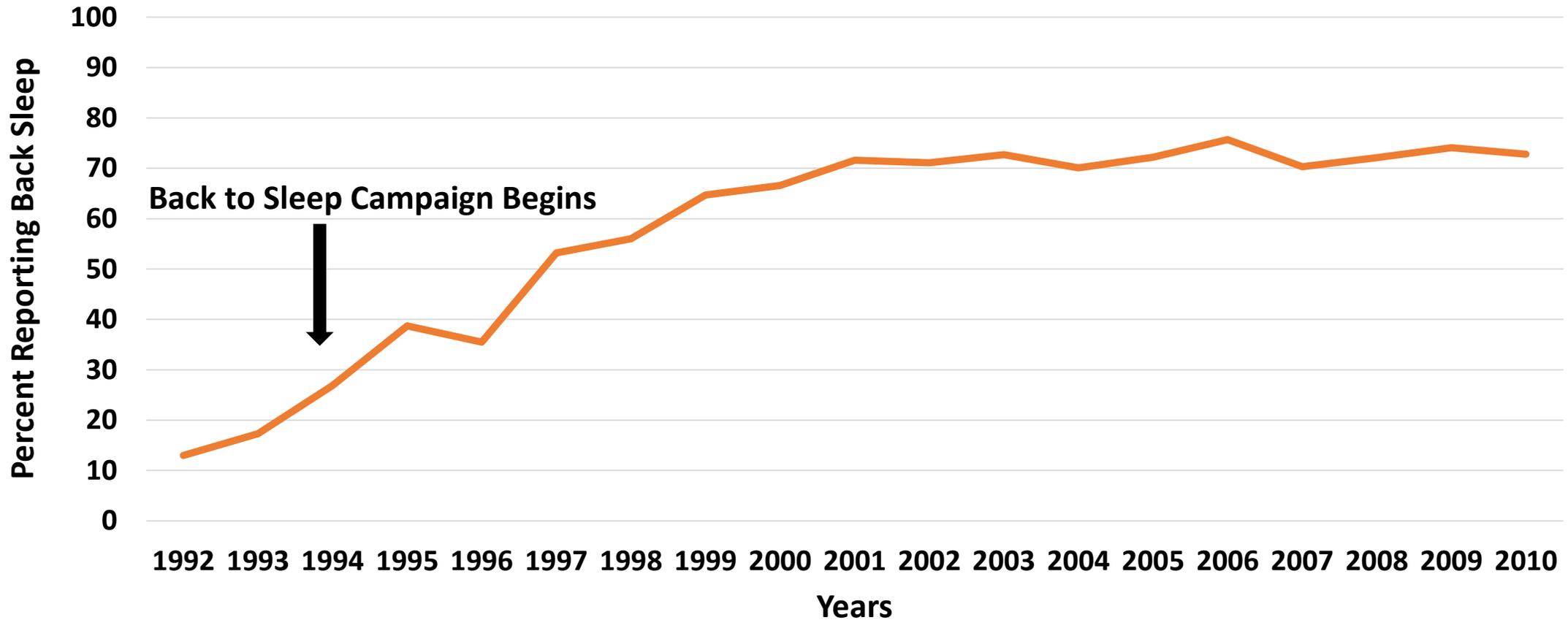
American Academy of Pediatrics Recommends...



Aimed at the risk of sleep-related deaths in infants include always back sleeping, no things in the infant sleep space, for example, no soft blankets, no pillows, no stuffed animals and no bumpers. In addition, infants should “room share” but not bedshare.

Success in Back Sleeping

Maternal Report of Sleep Position for Their Infants ≥ 60 Days of Age, 1992–2010



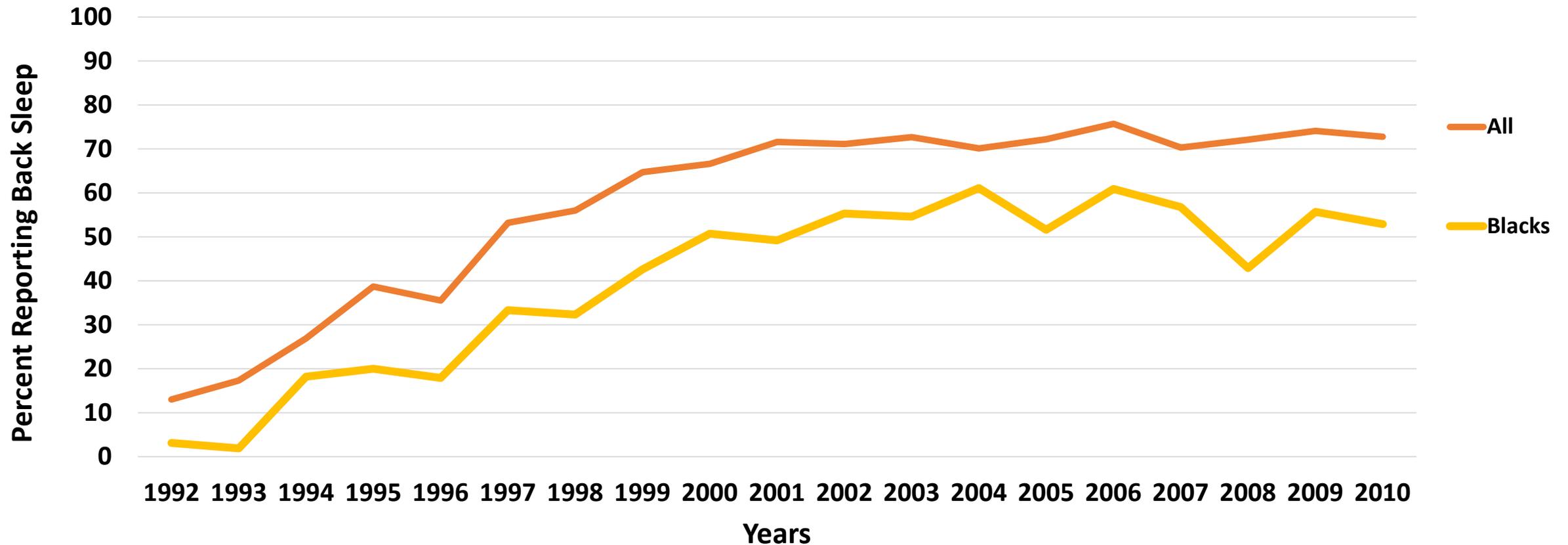
Colson ER, Rybin D, Smith LA, et al. *Archives of Pediatric and Adolescent Medicine* 2009;163:1122–28

Colson ER, Geller NL, Heeren T, et al. *Pediatrics* 2017; 140: e20170596

Opportunities for Prevention

Increase Back Sleeping

Maternal Report of Sleep Position for Their Infants ≥ 60 Days of Age, 1992–2010



Colson ER, Rybin D, Smith LA, et al. *Archives of Pediatric and Adolescent Medicine* 2009;163:1122–28

Colson ER, Geller NL, Heeren T, et al. *Pediatrics* 2017; 140: e20170596

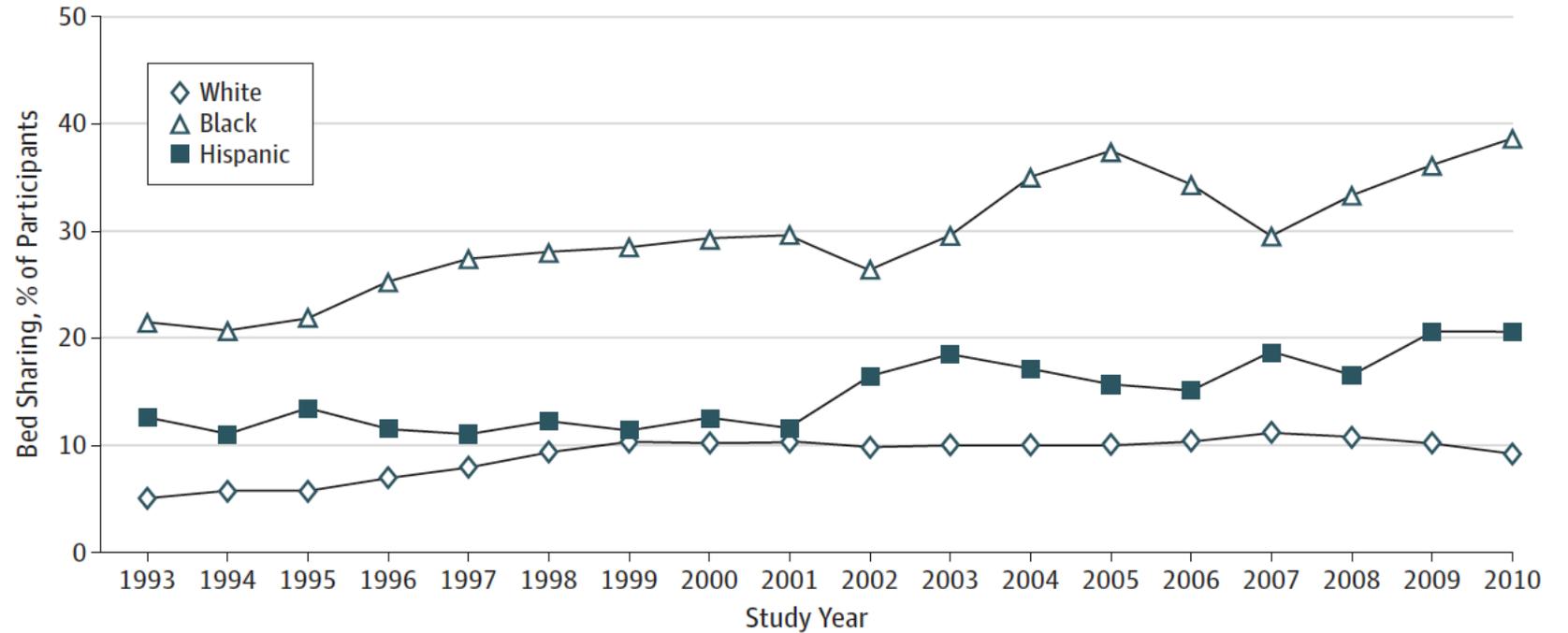
Opportunities for Prevention

Decrease Bedsharing

Room sharing, not bedsharing

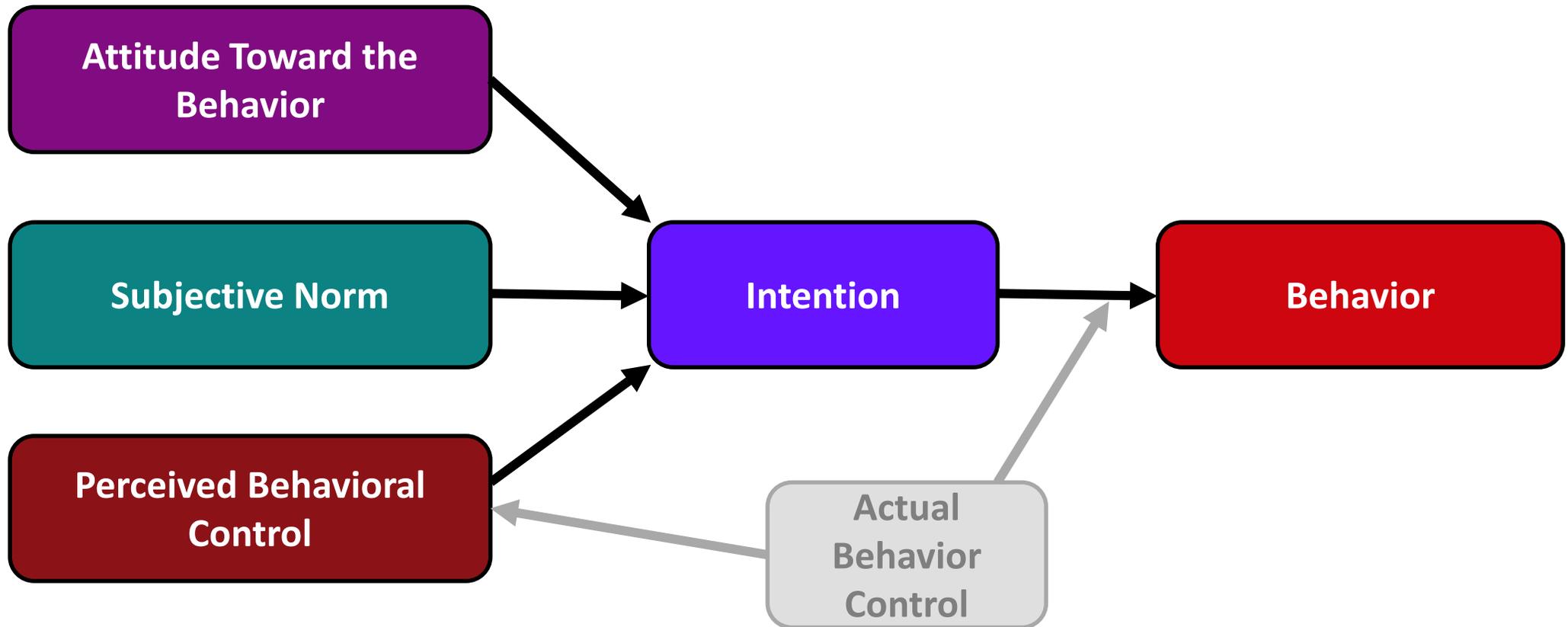


Figure 1. Trends in Infant Bed Sharing as a Usual Practice



Understanding Behavior

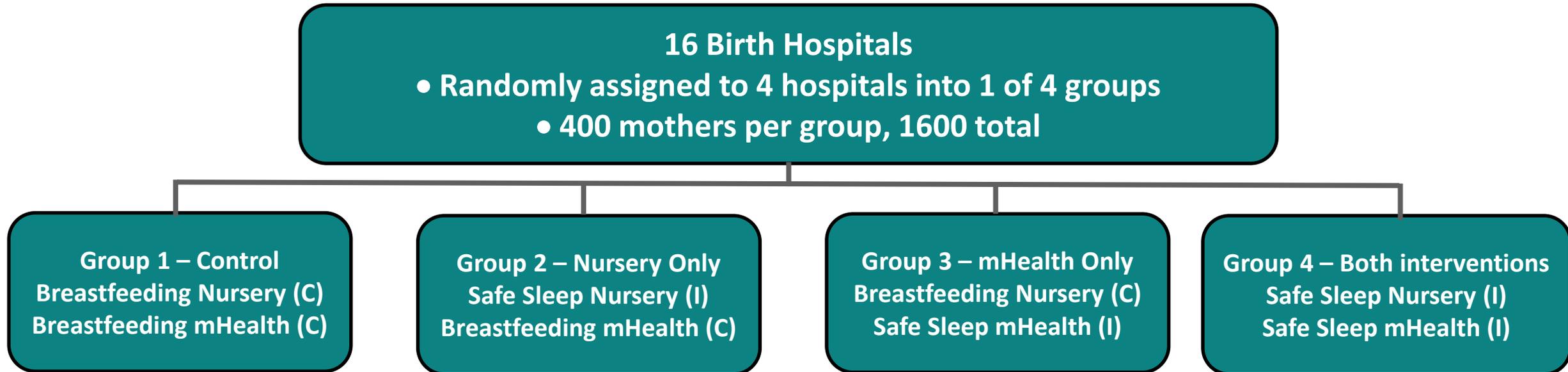
The Theory of Planned Behavior



Adapted from: Ajzen, I. *Organizational Behavior and Human Decision Processes*, 1991, Vol.50(2), pp.179–211

Changing Behavior

Social Media and Risk Reduction Training (SMART)



- **Control (C) groups received breastfeeding information**
- **Intervention (I) groups received safe sleep information**
- **Two-part intervention: 1. In the hospital nursery, after birth
2. At home, through mobile health texts and videos**

Developing the Intervention

- **Conducted focus groups and interviews with**
 - Hospital staff
 - Parents of young infants
- **Crafted messages**
 - Used social marketing principles
 - Worked with marketing firm
 - Worked with video production company
- **Developed a logo and brand**



Postpartum Hospital Intervention

➤ **Safe sleep laminated cards and slides**

- To aid nurses in teaching mothers about safe infant care practices
- For slide presentations for staff or email blasts

➤ **Motivational poster**

- To be hung in staff common areas and break rooms

➤ **Sample protocol**

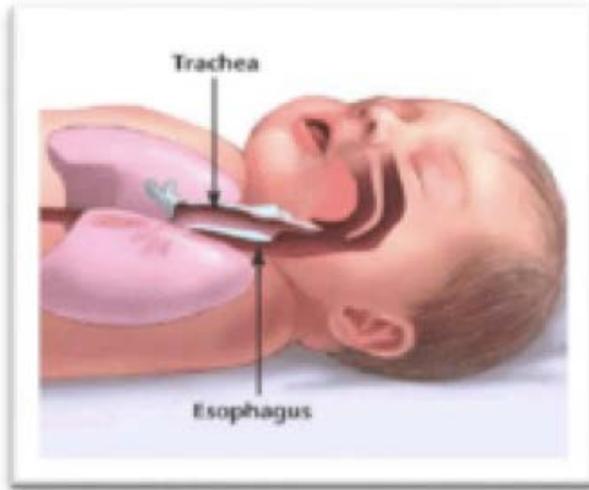
- To be used to create or modify hospital protocols

➤ **Announcement letters**

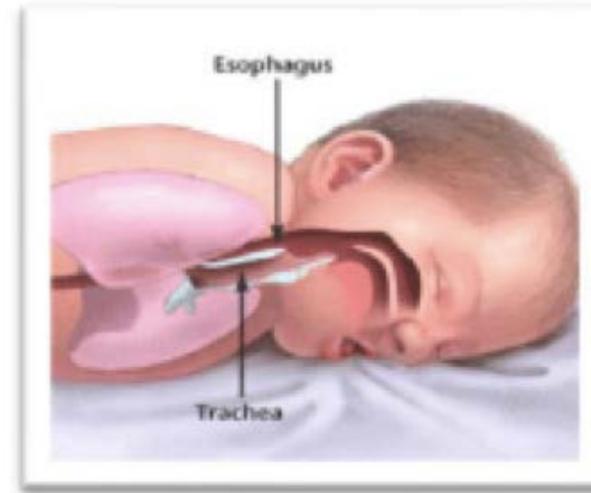
- Templates for campaign announcement letters for hospital staff and administration

Example of Laminated Cards Addressing Concerns about Choking

BACK SLEEPING: What about choking?



Here the trachea (airway) is above the esophagus (food pipe). Anything that is spit up will be pushed back down by gravity to the lowest point. The airway is protected.



On the stomach, the trachea (airway) is below the esophagus (food pipe). Anything that is spit up will be pushed back down by gravity to the lowest point. On the stomach it is easier to aspirate into the lungs.

Example of Laminated Cards

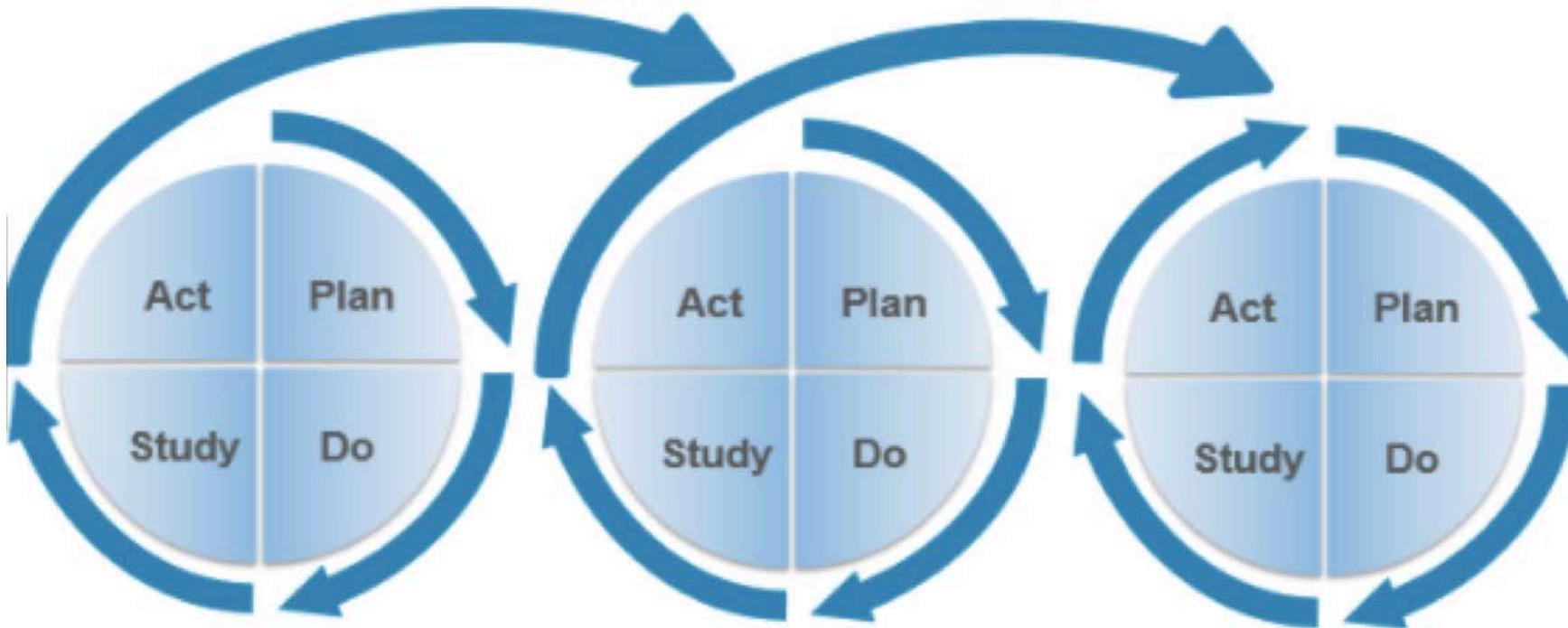
Memory Prompt for Nursing Staff

SMILE! Today You Can Save a Life

- **Share** the testimonials
- **Model** safe sleep behaviors to decrease risk
 - Always sleep on the back
 - Firm mattress and no soft bedding
 - Room sharing but NOT bedsharing
 - Offer a pacifier at sleep time once breastfeeding is established
- **Include** as many family and friends as possible
 - Family and friends may recommend unsafe sleep practices
 - Your advice is very important
- **Learn** about family beliefs
- **Engage** families in discussion of beliefs

Quality Improvement Approach Plan, Do, Study, Act (PDSA)

Hospitals in the safe sleep intervention went from about 50% recommending to keep soft bedding out of the sleep area to 90% making that recommendation to families



Mobile Health Intervention: Texts and Short Safe Sleep Videos

- **Importance of sleep position**
- **Choking and sleep position**
- **Importance of sleep space**
- **Bedsharing**
- **Handling advice from others**
- **Mattress safety**
- **Soft bedding**
- **Feeding baby in bed**
- **Pacifiers**
- **Dangers of smoking**
- **Infant sleep patterns**

Intervention Outcome

Percent of Caregivers Who Self-reported Recommended Behavior As Usual Practice in 2 Weeks Before Survey, N=1263

RECOMMENDATION	<u>Control</u> (BF in hospital and BF in mobile health)	<u>Intervention nursery only</u> (SS in hospital and BF in mobile health)	<u>Intervention mHealth only</u> (BF in hospital and SS in mobile health)	<u>Both interventions</u> (SS in hospital and SS in mobile health)
Supine Sleep Position	80%	76%	88%	93%
Room Sharing Without Bedsharing	70%	74%	80%	86%
No Soft Bedding Use	68%	68%	79%	82%
Any Pacifier Use	60%	67%	69%	76%

BF: Breastfeeding

SS: Safe sleep

Moon RY, Hauck FR, Colson ER, et al. *JAMA* 2017;318:351–359

Nursing Quality Improvement and Mobile Health Interventions Could Reduce Infant Mortality Rates

- **A nursing quality improvement intervention improved maternal reports of education and observed infant safe sleep practices in the hospital but did not, on its own, improve adherence to all infant practices**
- **Among mothers of healthy term newborns, a mobile health intervention improved adherence to infant safe sleep practices compared with control interventions**
- **These interventions, if implemented more widely, may improve adherence to Safe Sleep practices and therefore have the potential to reduce infant mortality rates**

Next Steps

- **Randomized control trial with a prenatal component—start safe sleep and breastfeeding education early**
- **Targeting specific populations to reduce disparities**
 - Lower-income
 - Minorities, including Spanish speakers, with tailored messaging and images
- **Exploring maternal falling asleep while feeding—a common occurrence and the idea of “planning” for a sleepy feeding space and what that would look like**

From Pain to Purpose—Using SUID Families Stories to Promote Safe Sleep Practices



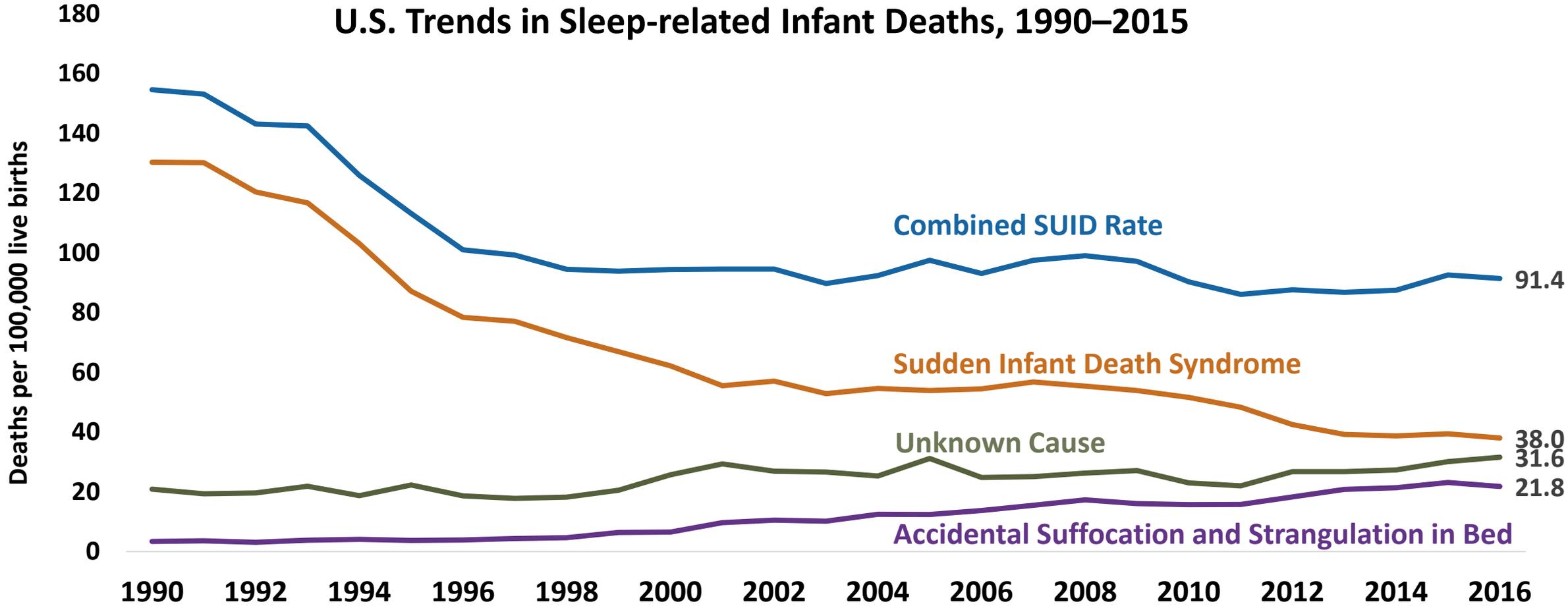
Samuel Hanke MD, MS

Charlie's Dad, President of Charlie's Kids Foundation

Pediatric Cardiologist, Assistant Professor Cincinnati Children's Hospital

Chief Patient Experience Officer, Cincinnati Children's Hospital

Beyond the Numbers: The Personal Impact



Released June 2017; wonder.cdc.gov/cmfi10.html

Charlie's Story



Charlie's Story



Charlie's Story



Charlie's Story



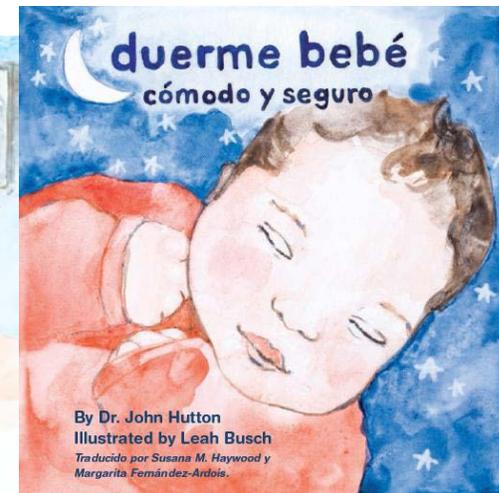
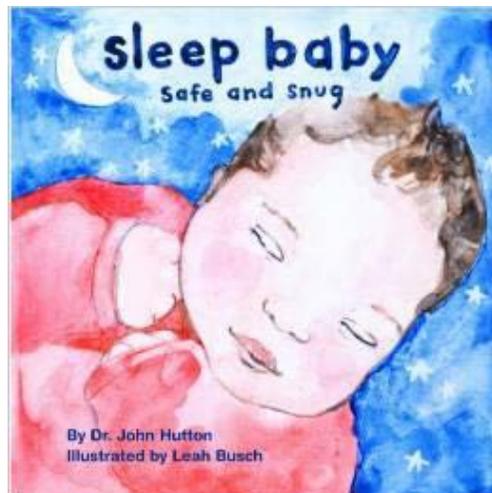
Charlie's Kids Foundation

- **Founded in 2011, 501(c)3, all-volunteer organization**
- **Mission**
 - Raise awareness for SUID by educating families about SIDS, SUID and safe sleep practices



Sleep Baby Safe and Snug©

- Provides timely and repetitive safe sleep messaging in an approachable, easy-to-read book
- Targets all levels of education, language, and literacy abilities
- Promotes parent and child bonding
- Distributed in bulk through hospitals, health departments, nonprofits



Sleep Baby Safe and Snug© Impact Summary

- **Distributed to over 2.5 million babies across the U.S. since 2013**
- **Increases observed safe sleep behaviors and parent and baby bonding when used as part of a home visiting program**
- **Increases in-hospital safe sleep compliance on direct crib audits**
- **Is associated with fewer sleep-related deaths when distributed through statewide safe sleep campaigns**

Hutton JS, Gupta R, Gruber R, et al. *AcaPediatr* 2017 Nov–Dec;17(8):879–886

Heitmann R, Nilles EK, Jeans A, et al. *Maternal and Child Health J* 2017 Nov;21(11):1995–2000

Tennessee Department of Health, Child Fatality Review Database

The Power of Parents—Why Parents Need to be Engaged

- **No clear “brand” of SUID**
- **Link between SIDS and safe sleep practices is not obvious to parents**
- **Sharing SUID family stories with statistics → changes the culture of infant sleep**
- **Integrating families stories should be a critical component of safe sleep interventions**

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