

Breastfeeding and Infant Mortality



“Born to Die”
Community gravesite in Memphis, TN
Commercial Appeal, March 2005
Karen Pulfer Focht, photojournalist

Julie Ware, MD, MPH, IBCLC
Cincinnati Children’s Hospital Medical Center
TIPQC Annual Meeting, March 25, 2024



Disclosure



- I and/or my spouse/partner have NO personal or professional financial relationships with commercial interests that could be perceived as a conflict of interest related to the content of this activity.
- I do not intend to discuss an unapproved/investigative use of a commercial product/device in my presentation.
- This is not an official CDC talk. It has been approved to be presented by me as co-author of our published papers.

Objectives

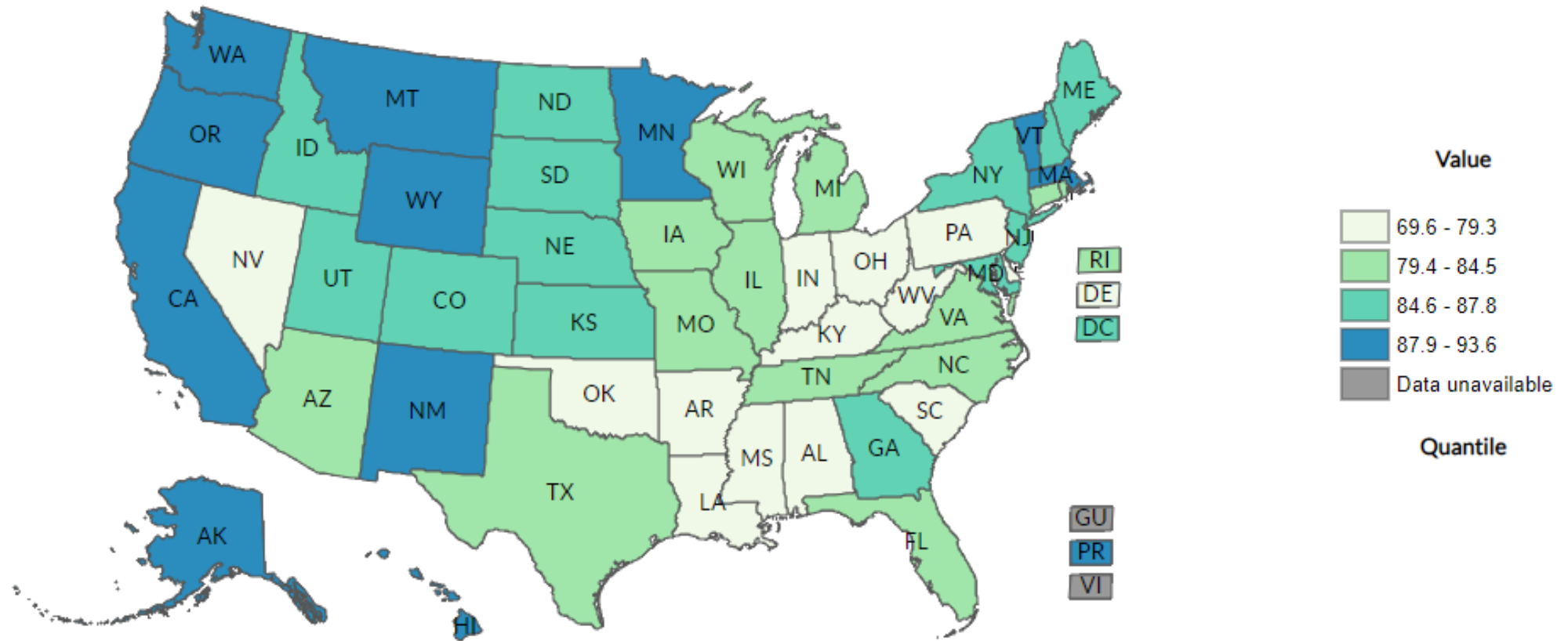
- Identify the association between breastfeeding and post-perinatal infant mortality in the US
- Explain the opportunity for breastfeeding promotion, protection, and support in infant mortality reduction initiatives

US Breastfeeding Rates

2020

Percent of infants who were ever breastfed †‡§

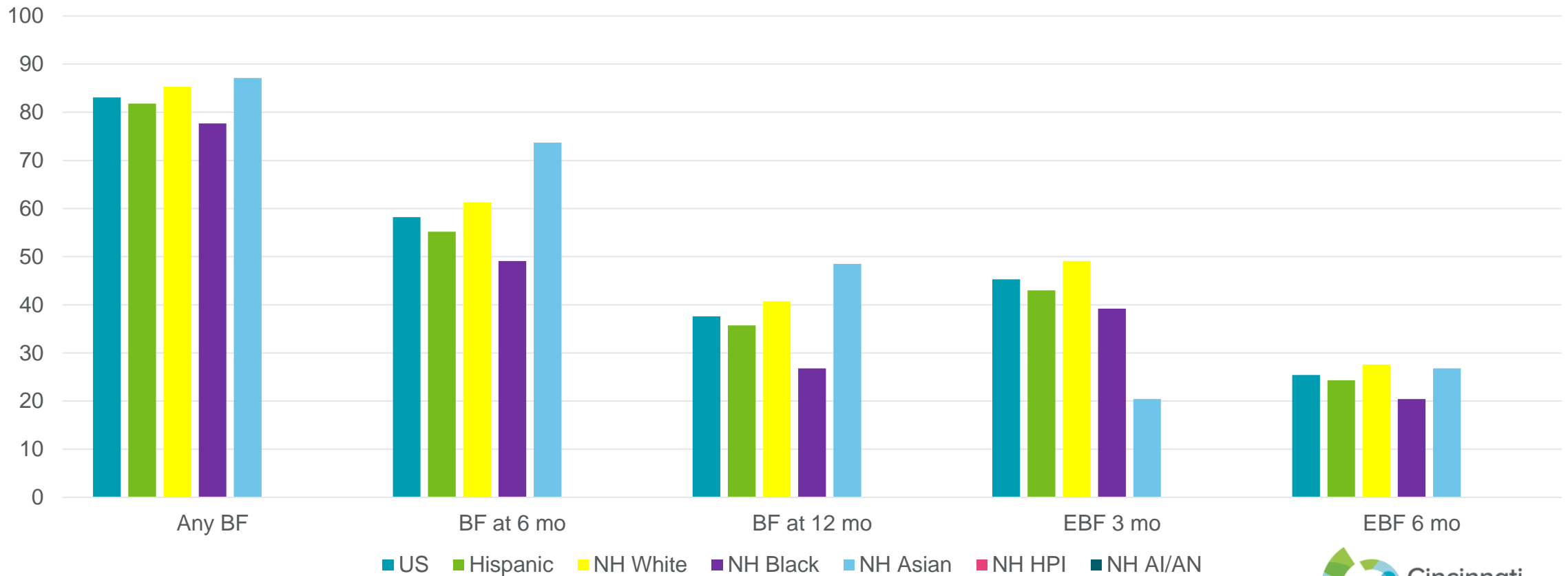
View by: Total



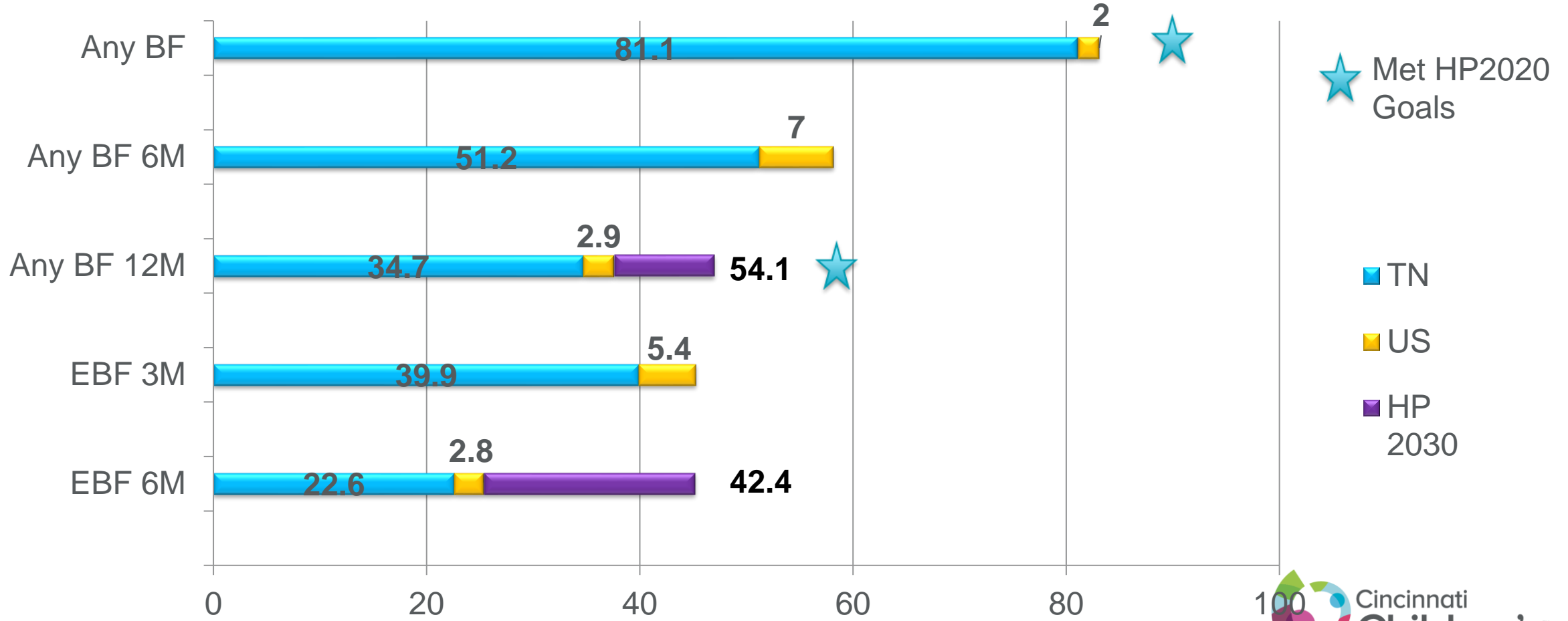
<https://www.cdc.gov/nccdphp/dnpao/data-trends-maps/index.html>

Breastfeeding Disparities in US

US Breastfeeding Rates for 2020 Births by Race/Ethnicity



TN Breastfeeding Rates (%) Below Targets, 2023





2022 Tennessee Results Report

State Total Score*



National Total Score*



What is mPINC™?

mPINC is CDC's national survey of Maternity Practices in Infant Nutrition and Care.

What does mPINC measure?

The survey measures care practices and policies that impact newborn feeding, feeding education, staff skills, and discharge support.

Who is included in mPINC surveys?

CDC invites all hospitals with maternity services in the U.S. and territories to participate. In 2022, 45 of 59 eligible hospitals in Tennessee participated (76%).



TENNESSEE BREASTFEEDING REPORT

WIC Program Breastfeeding Performance Measures

The Special Supplemental Nutrition Program for Women, Infants and Children (WIC) program provides supplemental foods, health care referrals, and nutrition education for low-income pregnant, breastfeeding, and non-breastfeeding postpartum women, and to infants and children up to age five. The WIC program serves approximately 53 percent of all infants born in the United States.

	Fully Breastfed Rate	Partially Breastfed Rate	Total Breastfed Rate	Fully Formula Fed Rate
Tennessee WIC Rates	8.7%	18.7%	27.5%	72.5%
National WIC Rates	12.1%	21.9%	33.9%	66.1%

Source: [Fiscal Year 2021 WIC Breastfeeding Data Local Agency Report](#). Breastfeeding and formula feeding rates are measured as a percentage of participating children under one year of age.

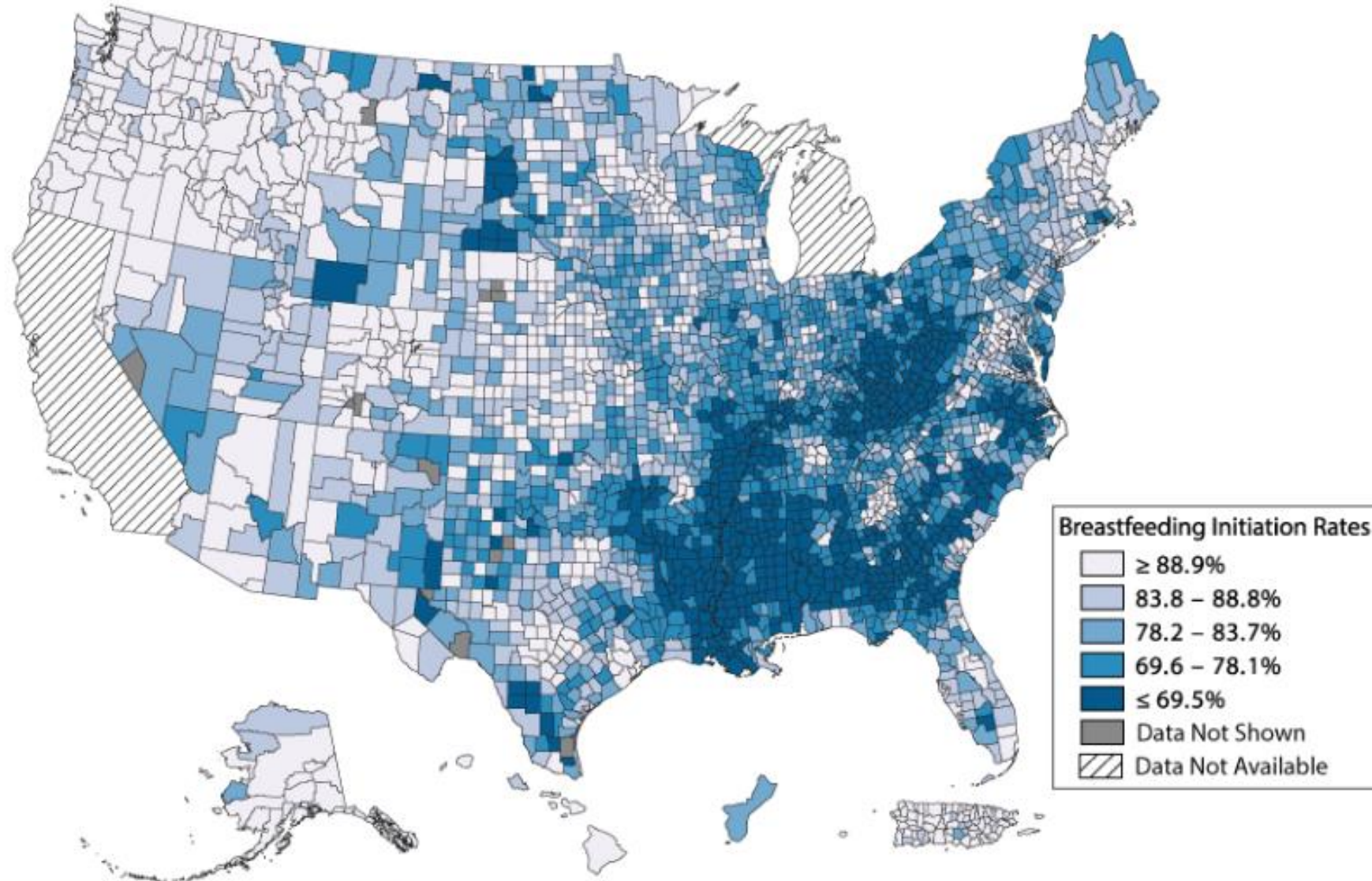
Creating a Landscape of Support

The policy, systems, and environments that surround and shape our lives have a profound impact on the infant feeding experience, either helping or hindering breastfeeding. Maternity care practices, paid family and medical leave, and childcare practices are proven to impact breastfeeding outcomes, and are highlighted in the CDC Breastfeeding Report Card.

	% of live births occurring at Baby-Friendly facilities	mPINC Score	Has enacted paid family and medical leave legislation	# of weeks available to care for a new child	ECE licensing breastfeeding support score
Tennessee	14.8%	70	No	--	70
U.S. National	28.9%	81	No	--	--

Source: [CDC Breastfeeding Report Card](#). CDC's national Maternity Practices in Infant Nutrition and Care (mPINC) survey assesses maternity care practices that affect how babies are fed. Among states with enacted paid family and medical leave legislation, the number of weeks presented are those that can be claimed by eligible employees for the care of a new child by birth, adoption, or foster care. ECE score indicates the extent to which a state's licensing regulation for early child education centers meet the Caring for our Children's standard to encourage and fully support breastfeeding/feeding of breast milk.

US Breastfeeding Initiation by County

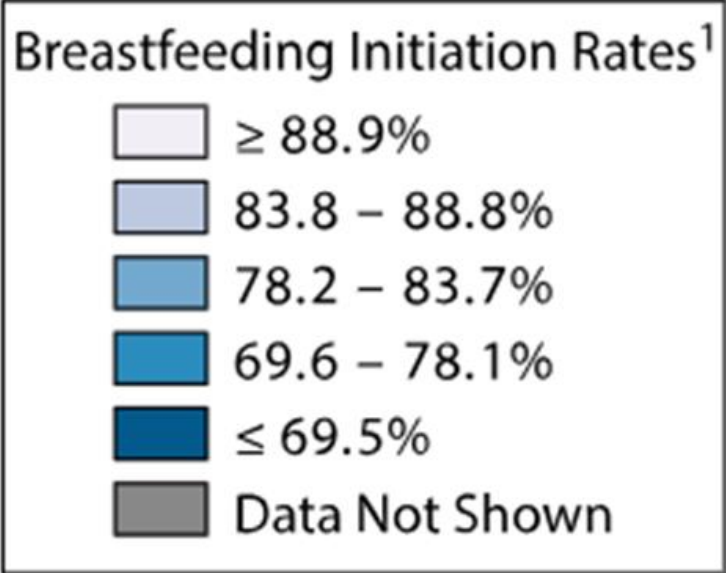
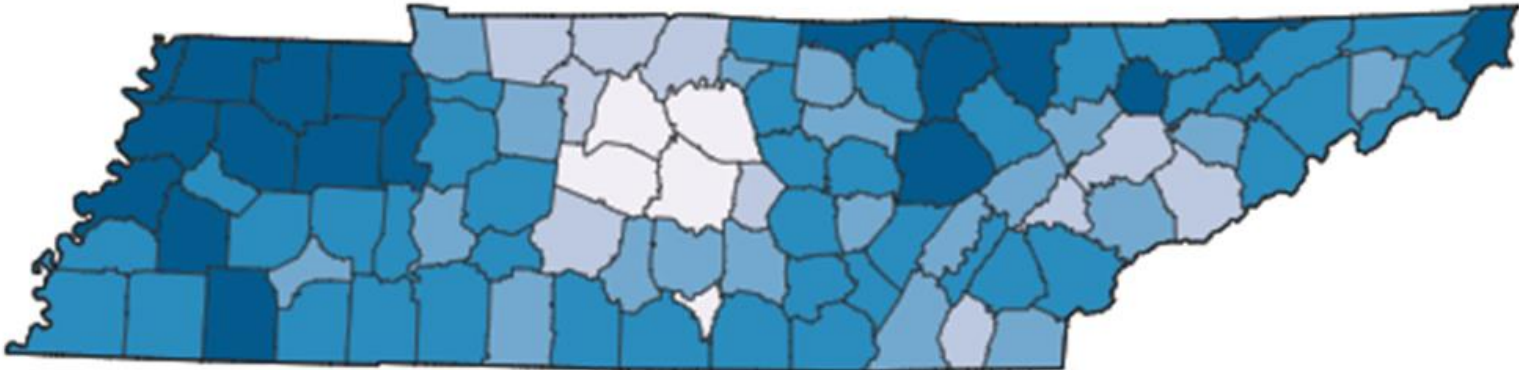


<https://www.cdc.gov/breastfeeding/data/county/breastfeeding-initiation-rates.html>

Breastfeeding Initiation Rates by County or County Equivalent in Tennessee

[Print](#)

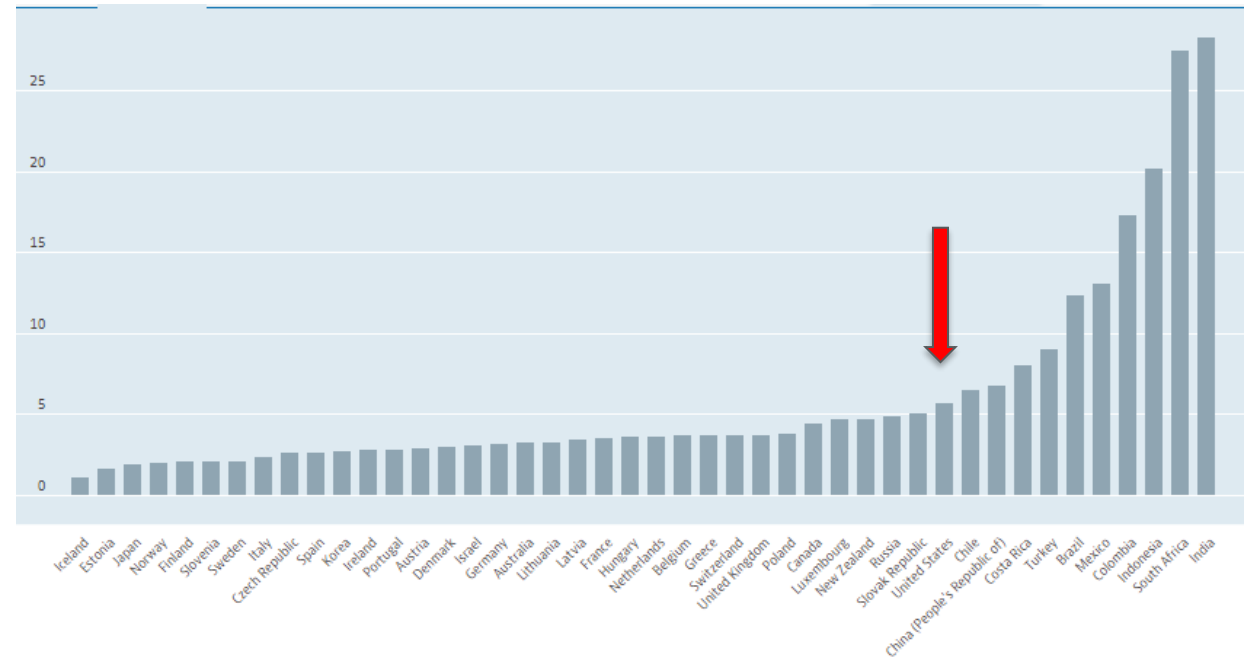
US Birth Certificate Breastfeeding Initiation Data, 2018-2019



<https://www.cdc.gov/breastfeeding/data/county/breastfeeding-initiation-rates.html>

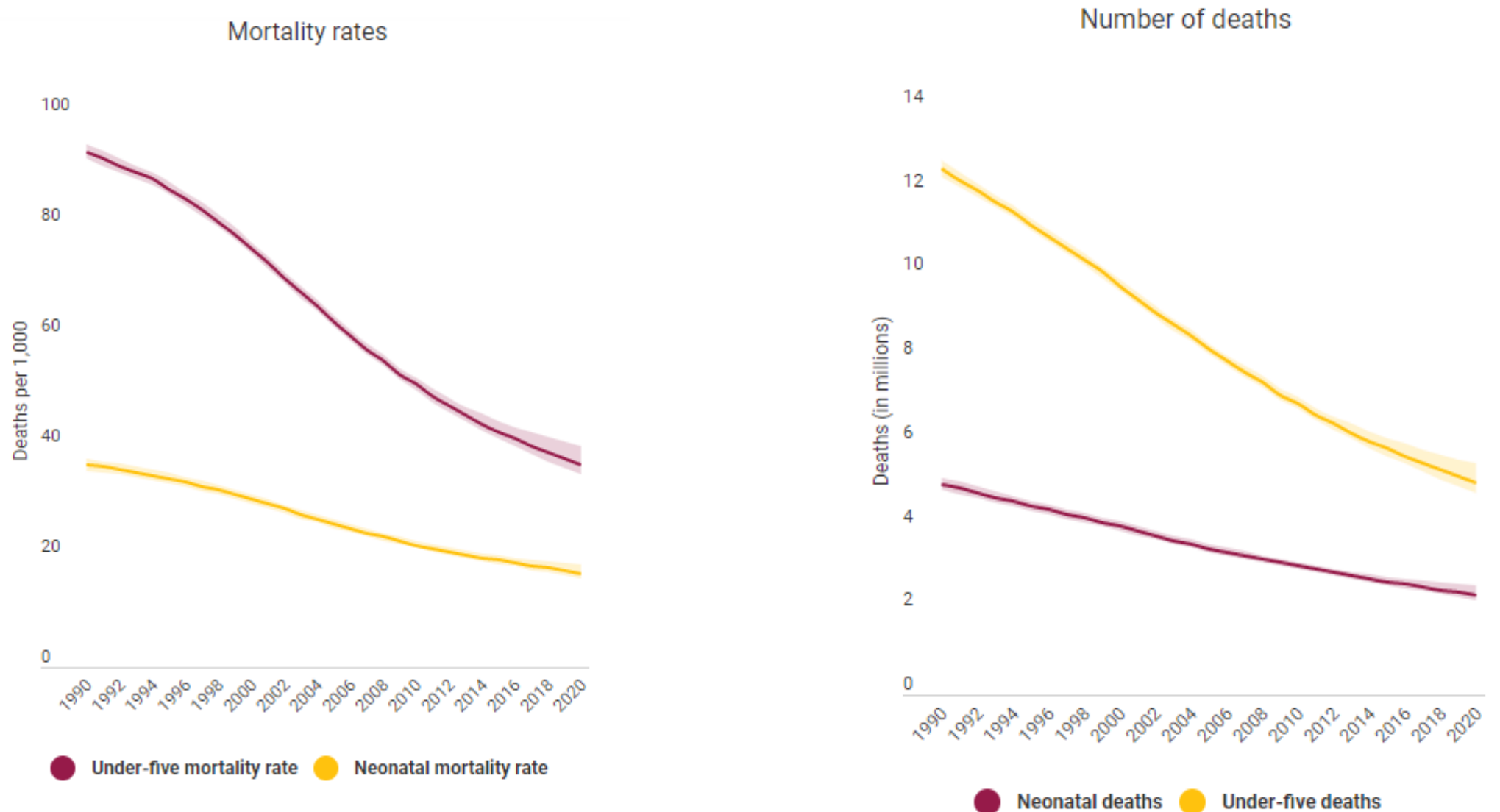
Infant Mortality

- Infant mortality is defined as death of a child before the first birthday.
- The IMR (infant mortality rate – defined as deaths per 1000 live births) is an overall indicator of a nation's well-being.
- US IMR is higher than other high-income countries, and disparities exist by race/ethnicity.



<https://data.oecd.org/healthstat/infant-mortality-rates.htm>

Global Mortality Rates by Age, 1990-2020



Source: [United Nations Inter-agency Group for Child Mortality Estimation \(UN IGME\), 2021](#)

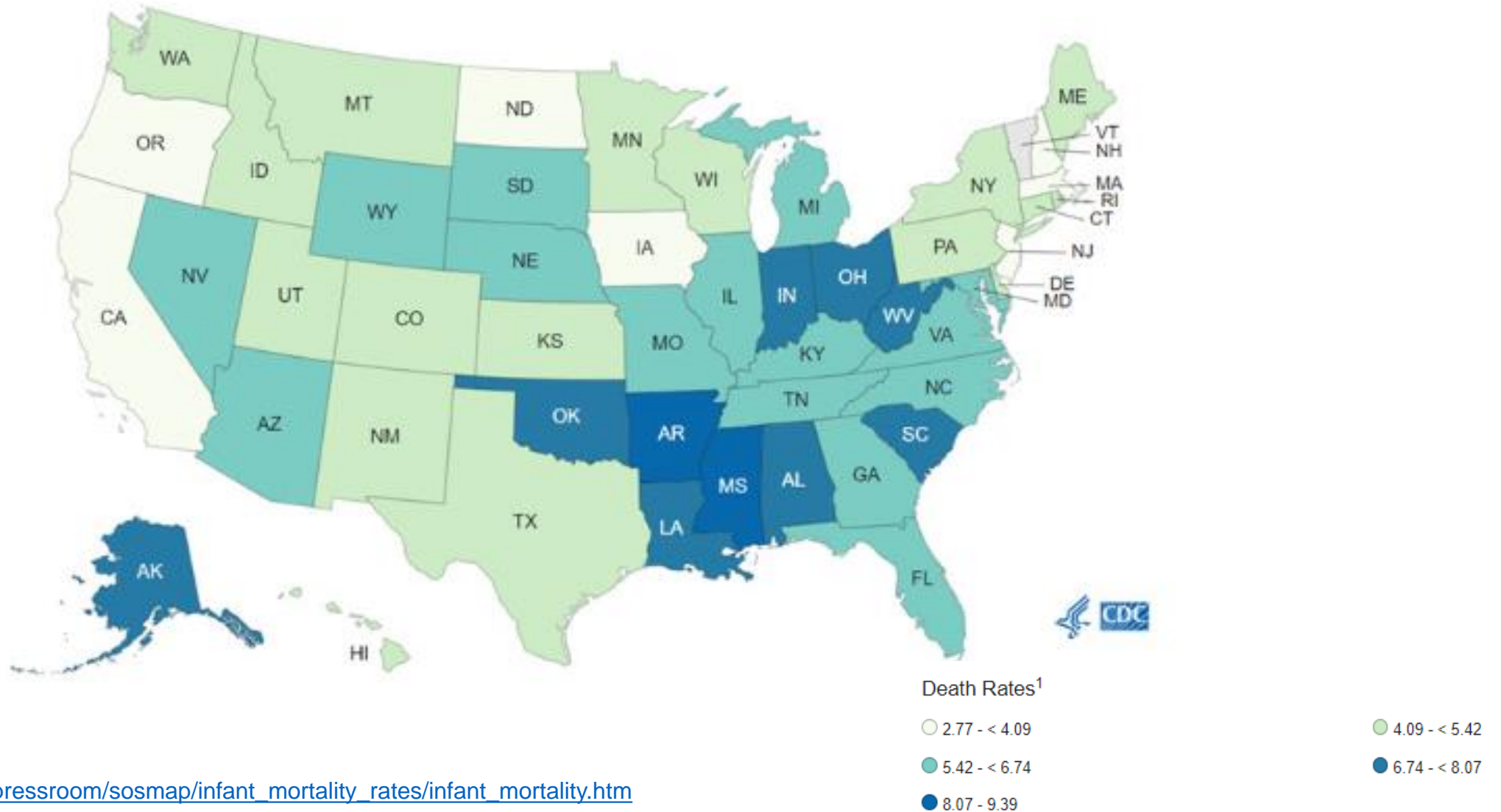
US Infant Mortality

- 5.44 deaths per 1000 live births (2021)
- Healthy People 2030 goal, 5.0 deaths per 1000 live births
- Leading causes of death:
 - Congenital malformations
 - Short gestation and low birth weight
 - Maternal complications of pregnancy
 - Sudden infant death syndrome
 - Unintentional injuries

<https://www.cdc.gov/reproductivehealth/maternalinfanthealth/infantmortality.htm>

<https://health.gov/healthypeople/objectives-and-data/browse-objectives/infants/reduce-rate-infant-deaths-mich-02>

US Infant Mortality Rates 2021



US Infant Mortality Trends

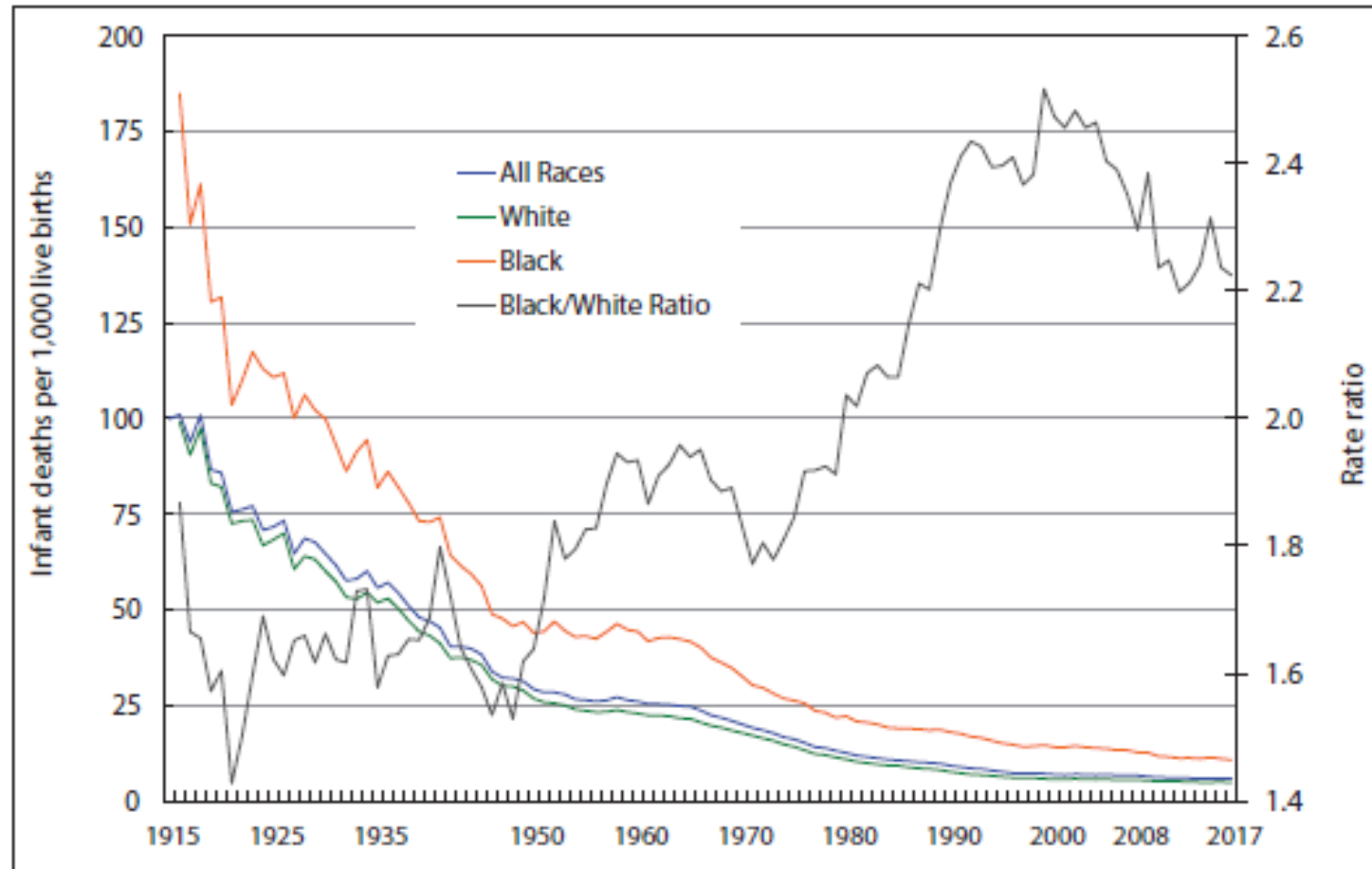
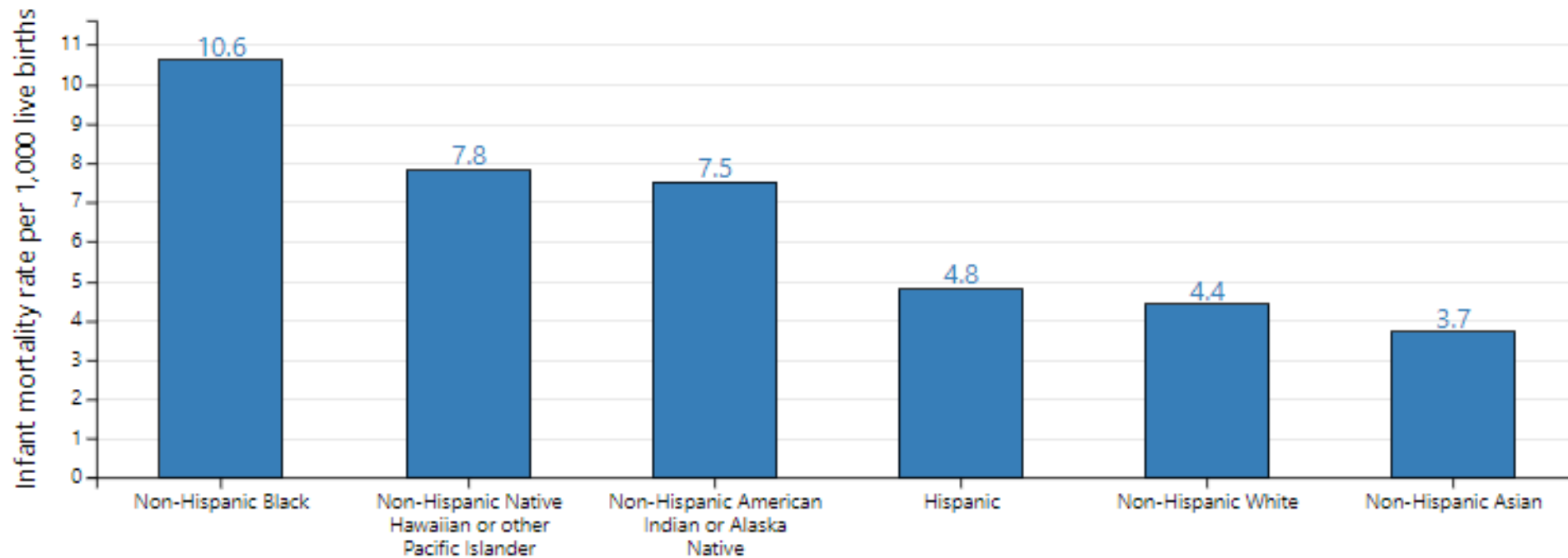


Figure 2: Infant Mortality Rate by Race, United States, 1915-2017

Source: US National Vital Statistics System.

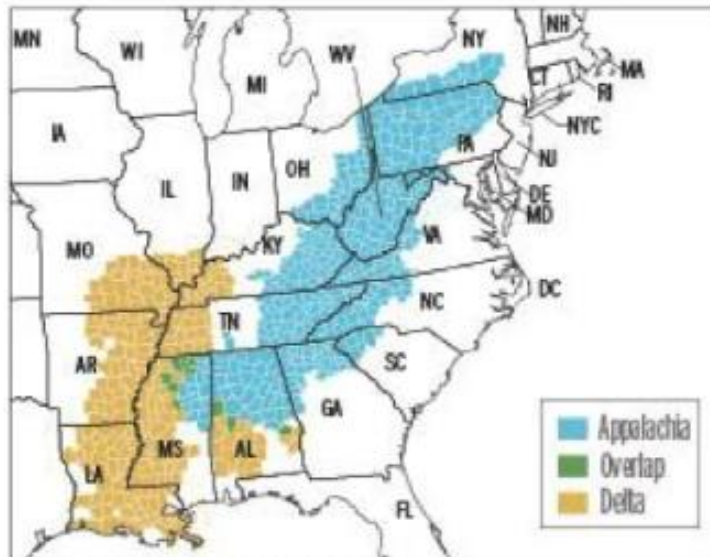
Infant Mortality by Race and Ethnicity

Infant Mortality Rates by Race and Ethnicity, 2021



Appalachia and Delta Regions

Appalachia and Delta regions

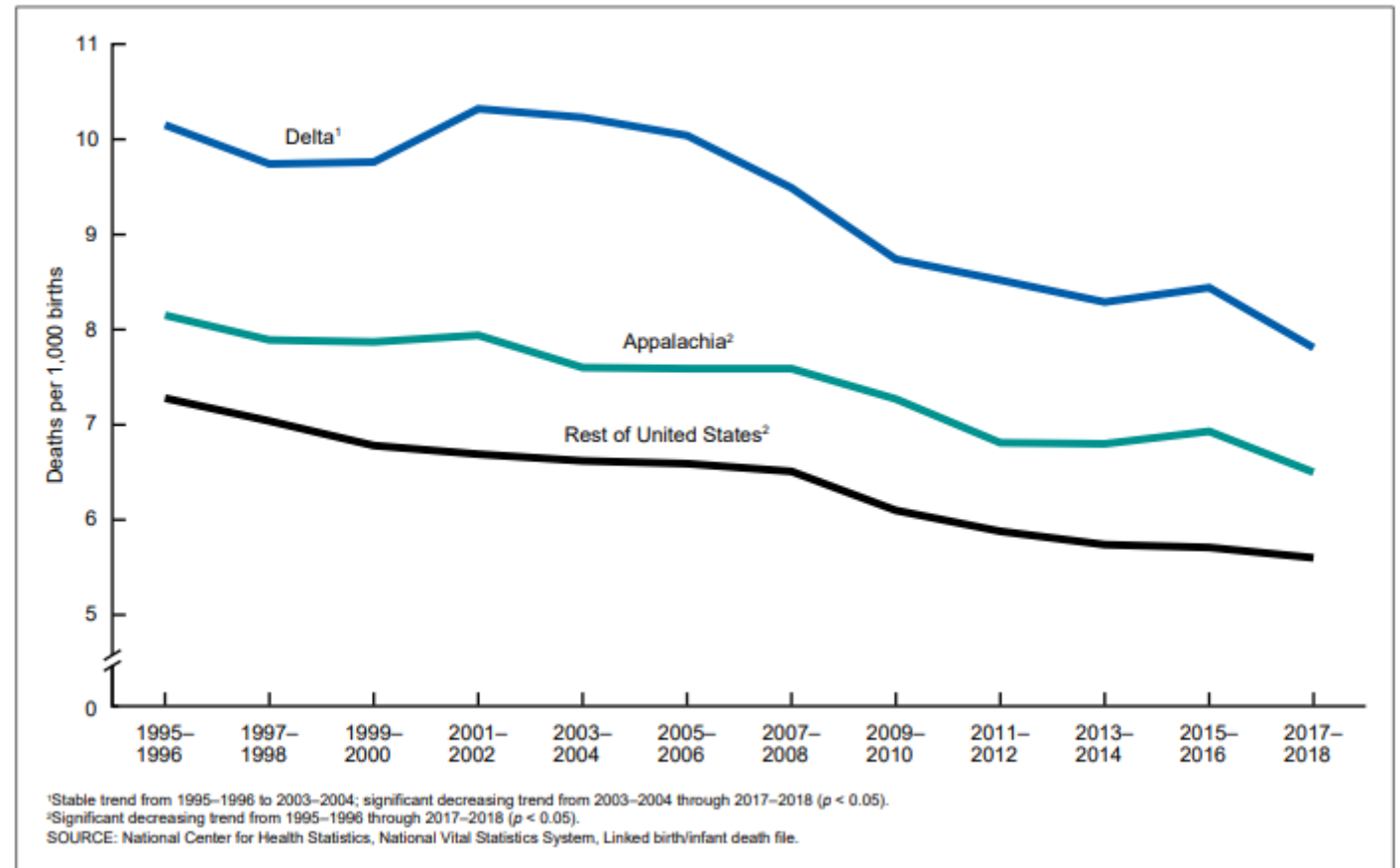


NOTES: The Appalachia region includes 420 counties in 13 states. The Delta region includes 252 counties and parishes in eight states.

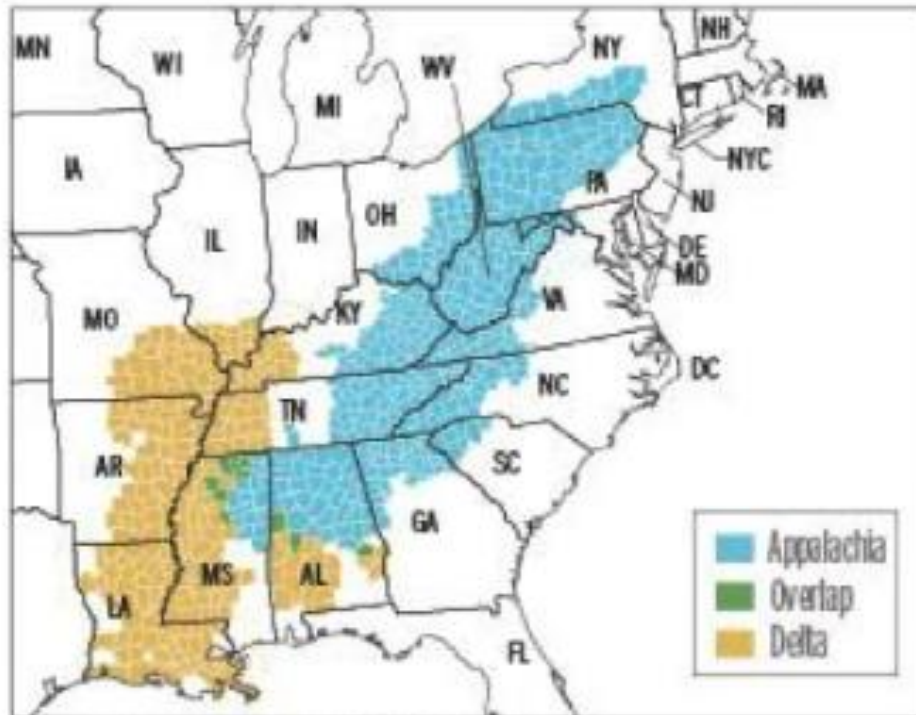
SOURCE: CDC National Vital Statistics Report

Deseret News

Figure 1. Infant mortality rate, by region: 1995–1996 through 2017–2018



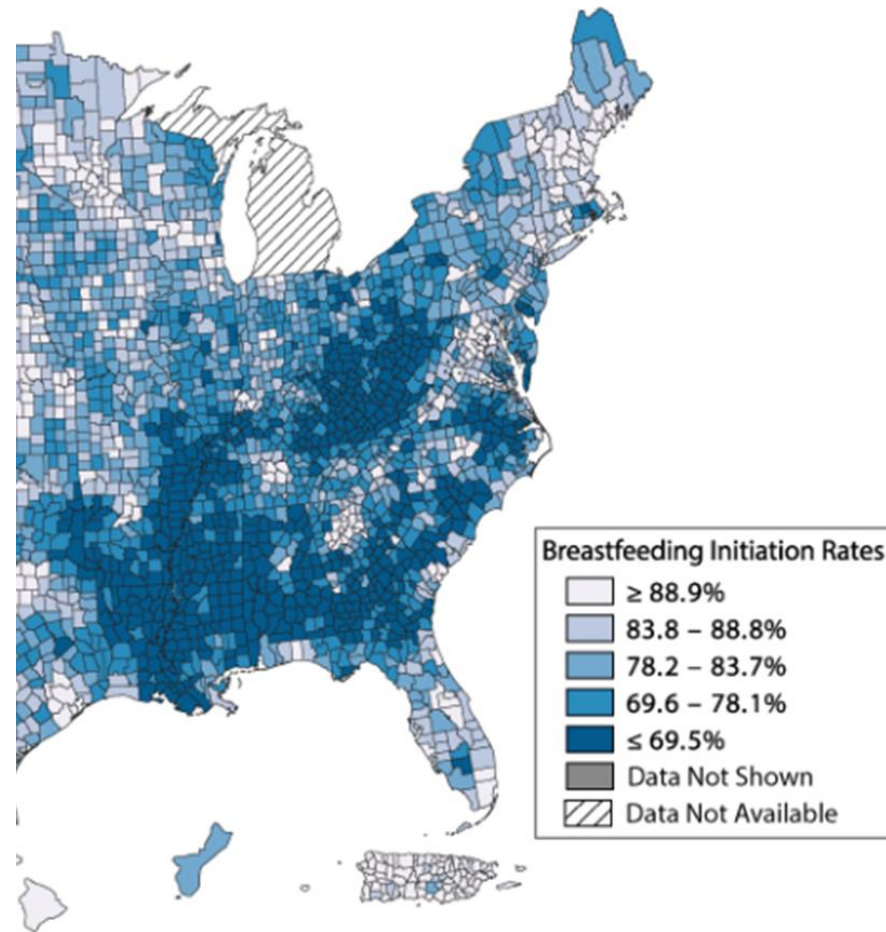
Appalachia and Delta regions



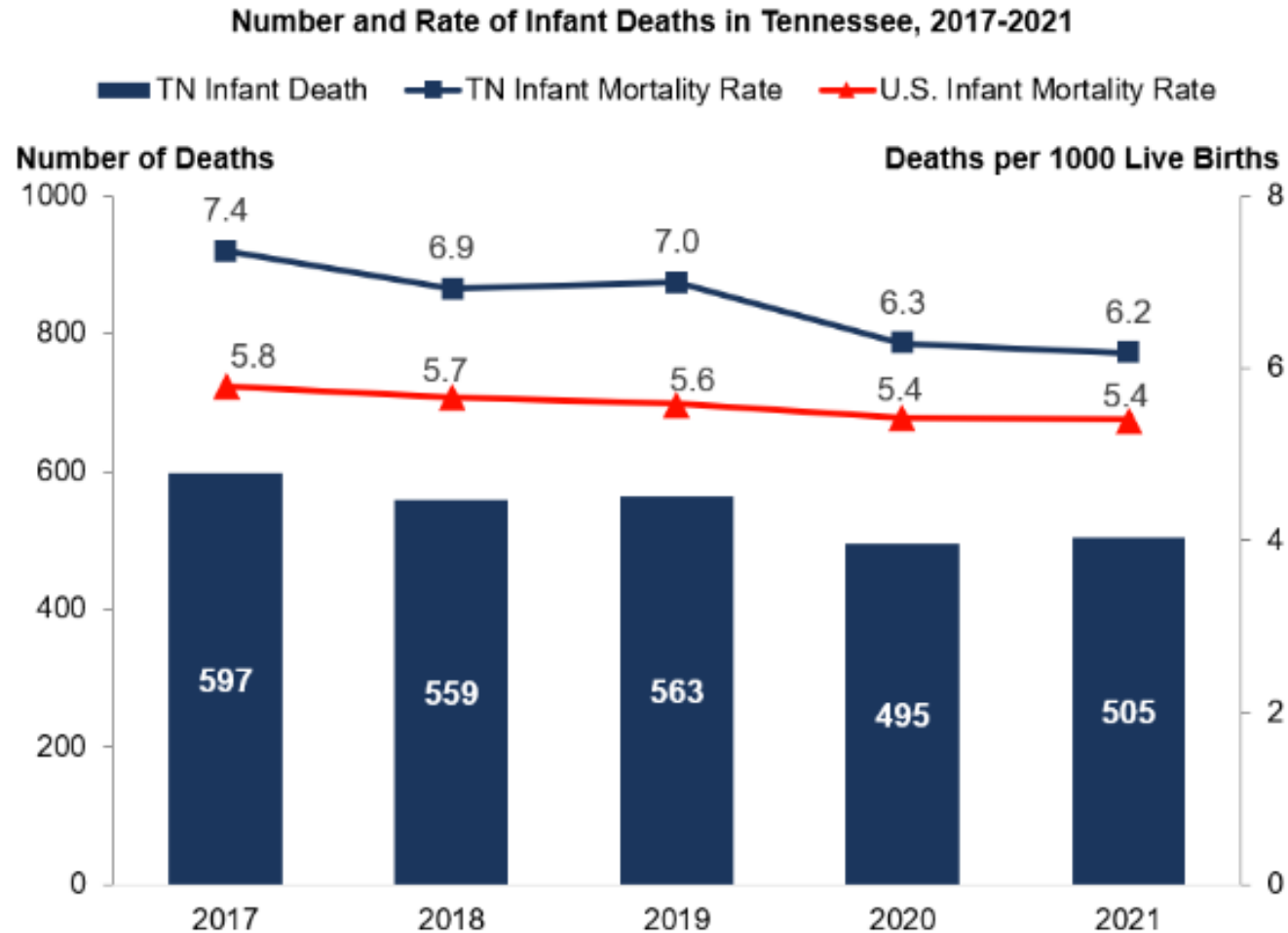
NOTES: The Appalachia region includes 420 counties in 13 states. The Delta region includes 252 counties and parishes in eight states.
SOURCE: CDC National Vital Statistics Report

Deseret News

Breastfeeding Initiation by County



Tennessee Infant Mortality Rates



Data Source: Tennessee Department of Health, Division of Vital Records and Health Statistics, Death Statistical File, 2017-2021

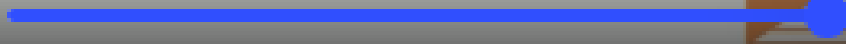
“505... that’s the equivalent of 26 kindergarten classrooms!”



What can we do about it?



- 1 Support low income families through WIC, TennCare eligibility
- 2 Support pregnancy smoking cessation
- 3 Promote contraceptive education
- 4 Teach safe sleep and full-term pregnancy benefits
- 5 Breastfeeding and baby friendly workplace policies



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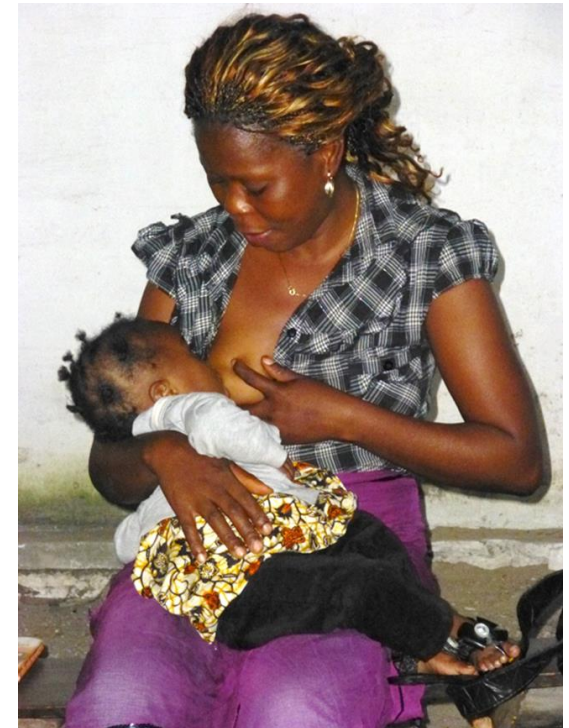
POWTOON

HD



Breastfeeding is...

- The normative standard for infant feeding and nutrition
- Associated with reduced risk of:
 - Otitis Media
 - Gastrointestinal and severe respiratory infections
 - Type I Diabetes Mellitus
 - Necrotizing Enterocolitis (NEC)
 - Sudden Infant Death Syndrome
 - Asthma
 - Childhood obesity



Breastfeeding associated with reduced risks for infants



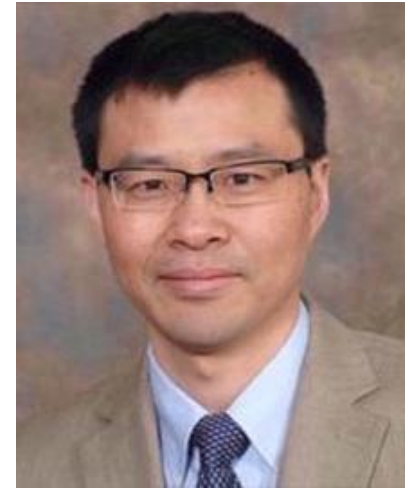
- SIDS – 40% lower risk with breastfeeding 2-4 months (60% 4-6 months) Thompson, et al., 2017.
- Infant mortality in developing countries – threefold greater risk (partial vs. exclusive) 14-fold greater risk (no breastfeeding vs. exclusive) Sankar, et al., 2015
- Necrotizing enterocolitis – lower risk with exclusive human milk diet Sullivan, et al., 2010
- Post-neonatal mortality in US - 20% lower risk with any breastfeeding Chen and Rogan, 2004

Association of Breastfeeding and Postneonatal Death in the US



PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS



Aimin Chen, MD, PhD



Walter Rogan, MD

Breastfeeding and the Risk of Postneonatal Death in the United States

Aimin Chen and Walter J. Rogan

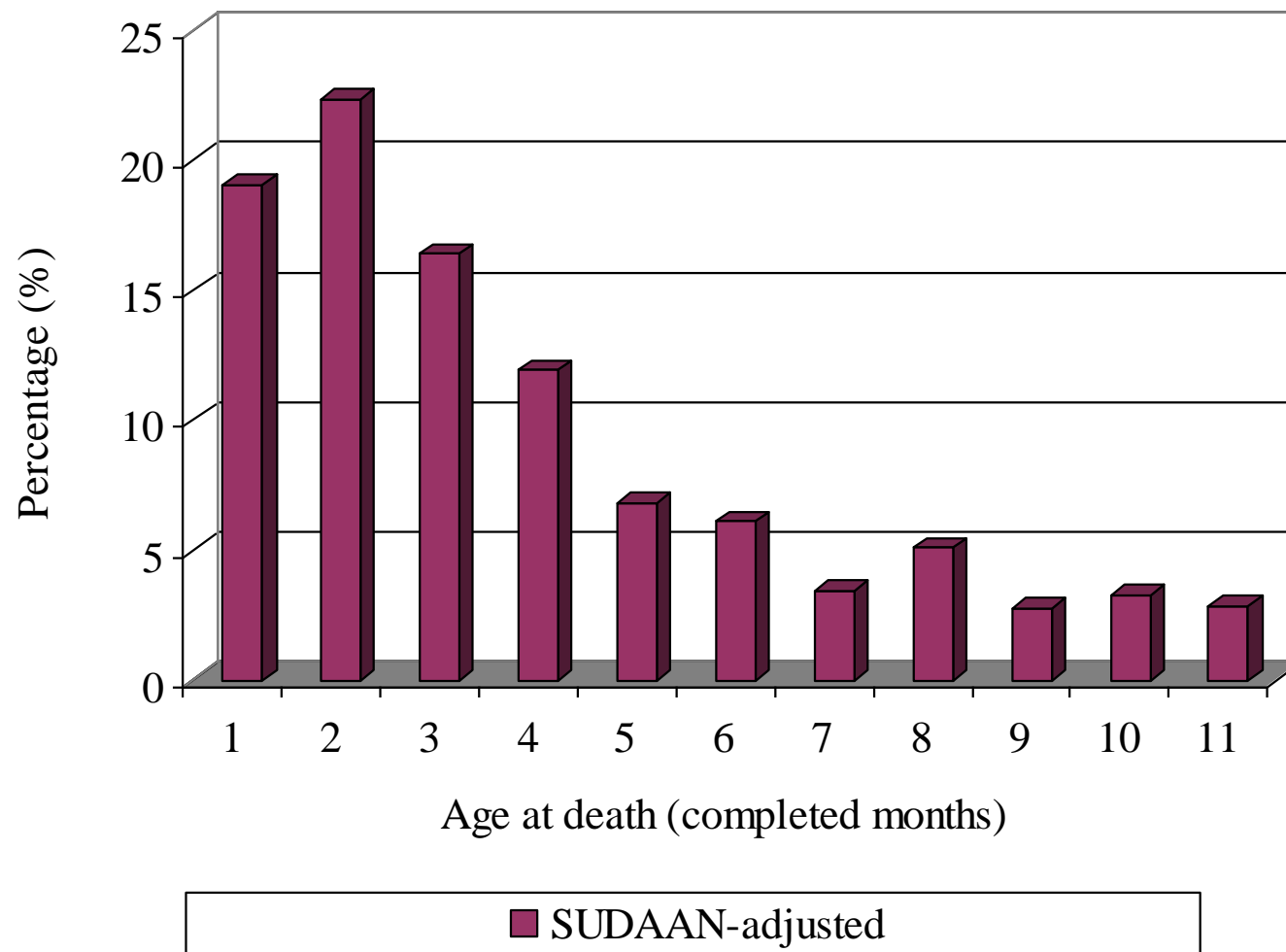
Pediatrics 2004;113:e435

Study design



- 1988 National Maternal and Infant Health Survey (NMIHS)
Representative sample of live births and infant deaths in US in 1988
Oversampling of black and low birth weight babies
- Case-control study
Cases: Post-neonatal death
 - Exclude death < 28 days
 - Exclude deaths from congenital anomalies and malignanciesControls: live born child, survived 1st year of life
Breastfed ever/never

Age at death for cases



Ever Breastfed and Odds Ratios for Postneonatal Deaths (PNN)

	Alive @ 1 year		PNN deaths		AOR (95% CI)
	N	% BF	N	% BF	
All	7,740	40	1204	31	0.8 (0.7-0.9)
Black	4,038	26	561	16	0.7 (0.5-0.9)
Non-Black	3,702	55	643	44	0.8 (0.7-0.98)

Shelby County, Tennessee

BREASTFEEDING MEDICINE
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Associations Between Breastfeeding Initiation and Infant Mortality in an Urban Population

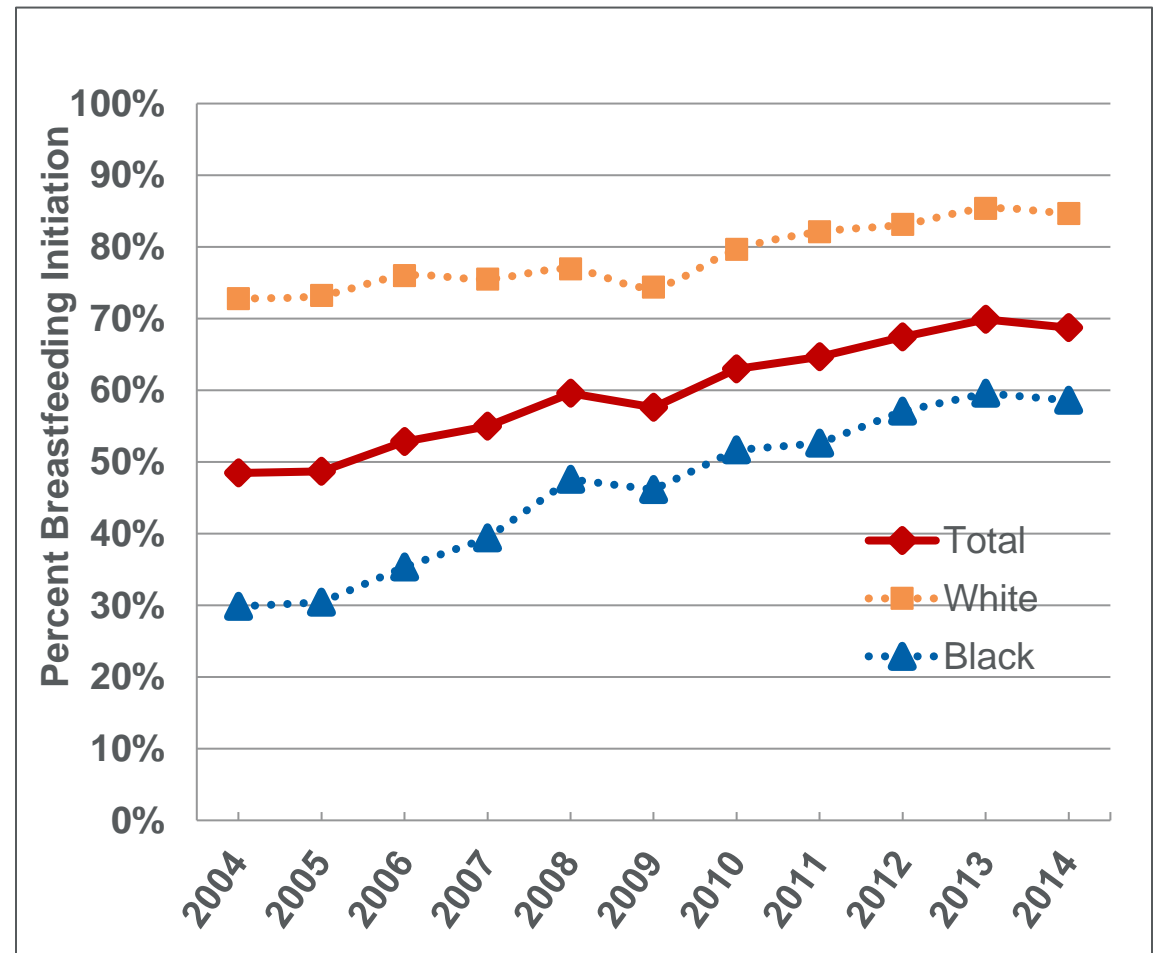
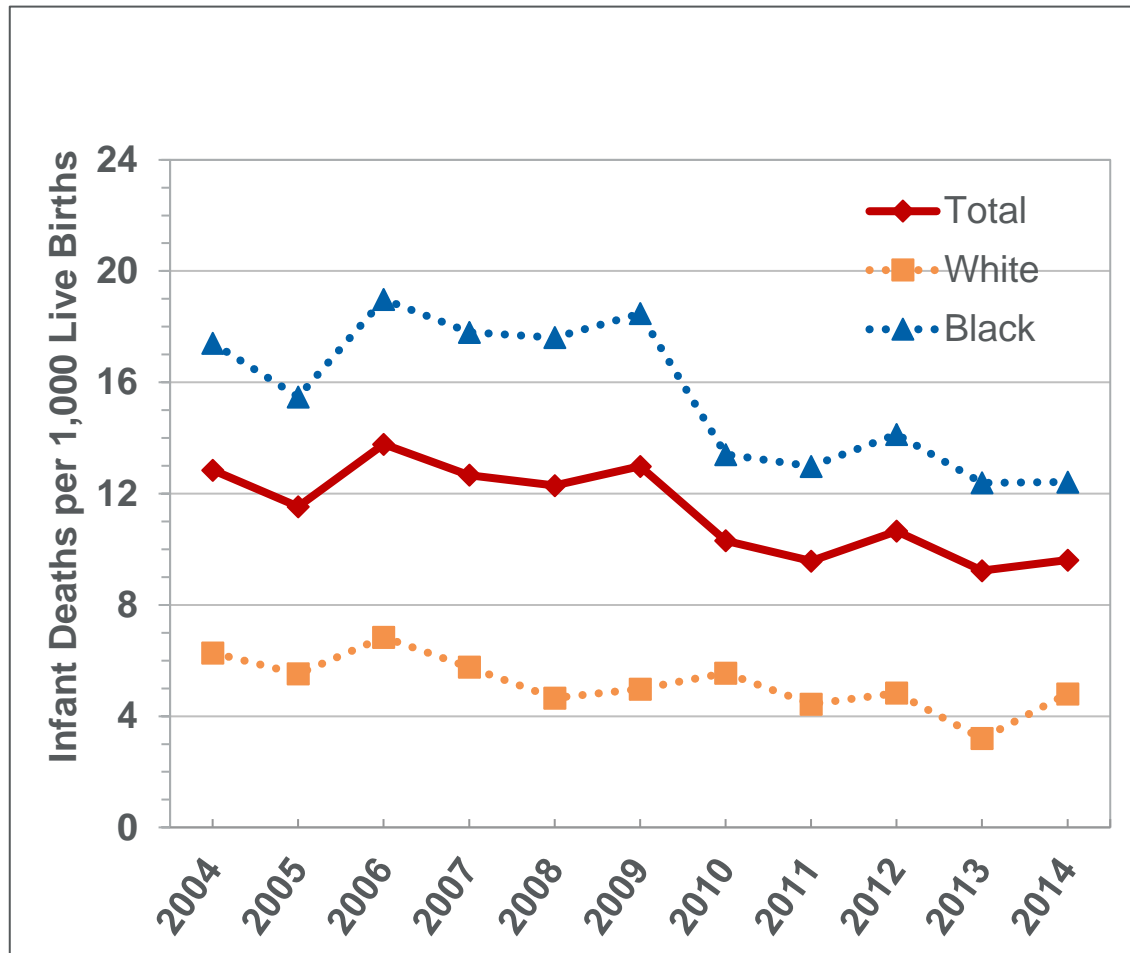
Julie L. Ware,¹ Aimin Chen,² Ardythe L. Morrow,² and Jennifer Kmet³



“Born to Die”

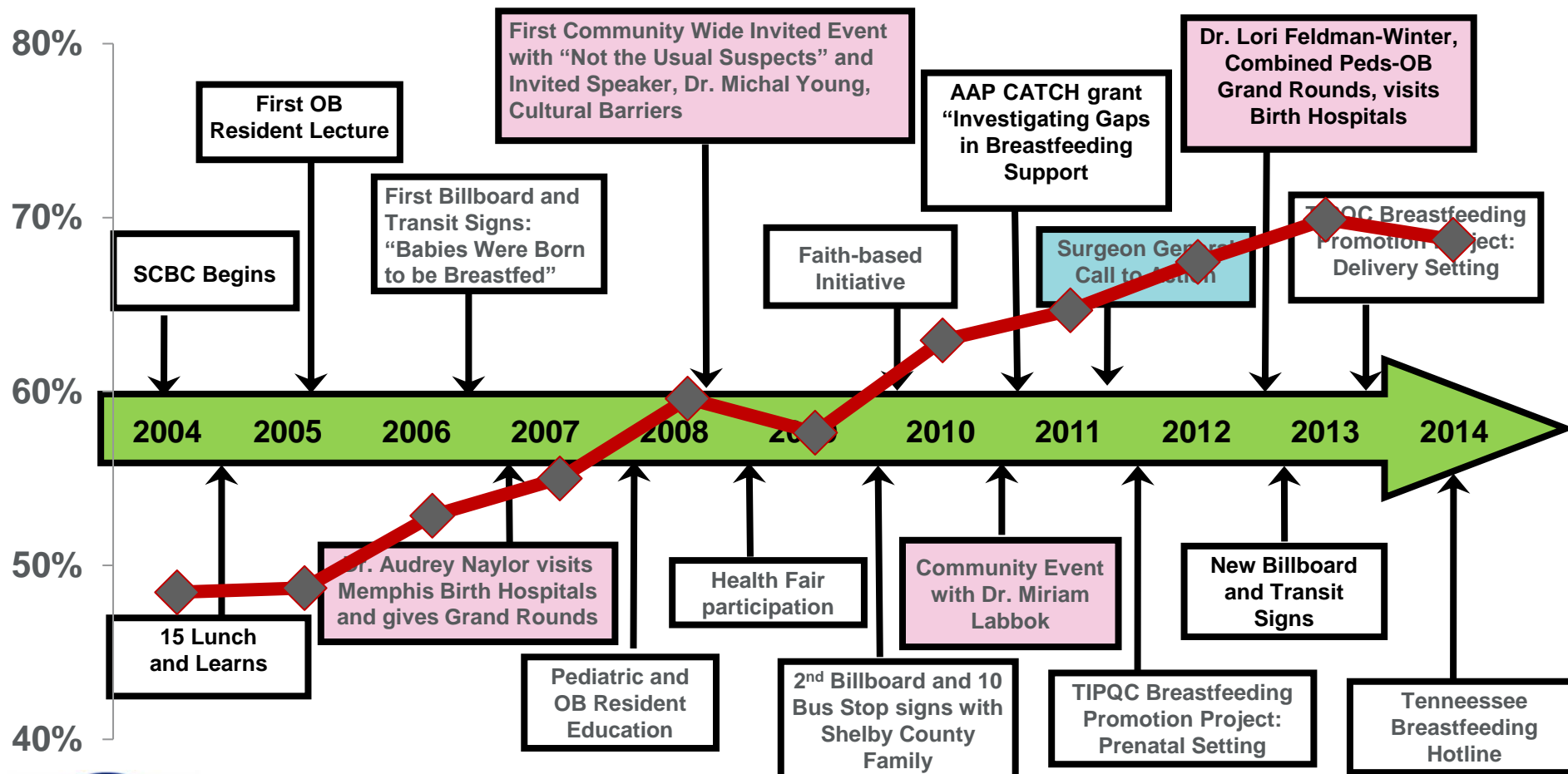
Community gravesite in Memphis, TN
Commercial Appeal, March 2005
Karen Pulfer Focht, photojournalist

Inverse Relationship Over Time



Data Source: Tennessee Department of Health, Office of Policy, Planning and Assessment, Division of Health Statistics, Birth and Death Certificate Files for Shelby County Residents, 2004 – 2015.

Shelby County Breastfeeding Timeline



“Picture-Perfect Family for Campaign”

March 2009



- Shelby County Infant Mortality Reduction Initiative provided funding, as well as community members.
- 1 Billboard and 10 transit signs placed
- Billboard stayed up for over 2 years!



Not the Usual Suspects



Methods

- 2004 to 2014 Birth Cohort
 - Data source: Tennessee Department of Health, Birth and Death Certificate Data, 2004-2014
 - Live Birth Certificate linked to Infant Death Certificate
 - Excluded infants <500g, death < 7 days, deaths due to congenital anomalies and malignant neoplasms
 - 148,679 live births, 598 infant deaths, (153 neonatal deaths, 445 post-neonatal deaths)

Methods

- Univariate analyses comparing infants who survived vs. infant deaths on maternal and infant characteristics
- Cochran-Mantel Haenszel analyses comparing breastfeeding and infant death on maternal and infant characteristics
- Logistic regression analysis
 - Outcome - Infant death (death before 1st birthday)
 - Neonatal death (death < 28 days)
 - Post-neonatal death (death \geq 28 days & before 1st birthday)
 - Exposure - Breastfed ever/never
 - Adjustment for potential confounders

Covariates

- Race
- Maternal age
- Maternal education
- Medicaid/WIC status
- Marital Status
- Maternal BMI
- Smoking During Pregnancy
- Prenatal Care
- Cesarean Delivery
- Birth Plurality
- Sex
- Birth order
- Birth weight



Shelby County Birth Cohort 2004-2014




59.1% self-reported as black
37.4% self-reported as white
56.1% maternal age between 20-29
73.8% had at least a high school education
68.6% in poverty (WIC/Medicaid as proxy)
60.2% unmarried
7.2% smoking during pregnancy
48.1% overweight or obese
33% Cesarean delivery
12.3% < 37 weeks
10.6% < 2500 grams
7.9% admitted to NICU



Breastfeeding Characteristics of Cohort

- 59.6% of entire cohort initiated breastfeeding
 - 78.5% white babies initiated breastfeeding
 - 46.7% black babies initiated breastfeeding
- Among overall infant deaths
 - 54.1% white babies initiated breastfeeding
 - 36.4% black babies initiated breastfeeding
- Significant differences in breastfeeding between infant deaths and survived births for each characteristic and overall, neonatal, and post-neonatal mortality

Results

- Initiation of any breastfeeding is significantly associated with reduced infant mortality in a cohort of Shelby County, Tennessee babies
 - even when controlling for selected possible confounders
 - adjusted OR = 0.81, (95% CI 0.68-0.97)  **19% reduced risk**
- This association holds for neonatal deaths, but was not statistically significant for post-neonatal deaths
 - Neonatal Mortality: -- adjusted OR = 0.49, (95% CI 0.34-0.72)  **51%**
 - Post-neonatal Mortality: -- adjusted OR = 0.95, (95% CI 0.78-1.17)  **5%**

Causes of Death

Cause of Death	Live births used in model (N)	Infant deaths (N)	Adjusted* Odds Ratio Ever/Never BF (95% CI, p-value)
Infection	146,818	107	0.492** (0.316-0.765, 0.002)
SIDS	146,798	87	1.165 (0.738-1.841, 0.5120)
Injuries	146,815	104	1.189 (0.789-1.793, 0.4081)
Other	146,972	266	0.795 (0.605-1.044, 0.0987)

Logistic Regression Models by Causes of Death * All models were adjusted for maternal race, maternal age, maternal education, poverty indicator, marital status, maternal BMI, smoking during pregnancy, prenatal care, type of delivery, birth plurality, birth order, sex, and birth weight < 2500 grams. ** p < 0.05.

Breastfeeding and Post-perinatal Infant Deaths in the United States, A National Prospective Cohort Analysis



Ruowei Li,^{a*} Julie Ware,^b Almin Chen,^c Jennifer M. Nelson,^{a,h} Jennifer M. Kmet,^d Sharyn E. Parks,^{e,h} Ardythe L. Morrow,^{f,g} Jian Chen,^a and Cria G. Perrine,^{a,h}

Methods



National Vital Statistics System

- National Vital Statistics System (NVSS), led by the National Center for Health Statistics (NCHS)
- Census of all live births and deaths, derived from Standard Certificates for Live Births and Deaths
- In 2016, all 50 states and DC adopted the 2003 birth certificate revision.
 - Includes the question, “Is the infant being breastfed at discharge?” with a “Yes” or “No” option

<https://www.cdc.gov/nchs/data/dvs/birth11-03final-ACC.pdf>

58. IS THE INFANT BEING
BREASTFED AT DISCHARGE?
 Yes No

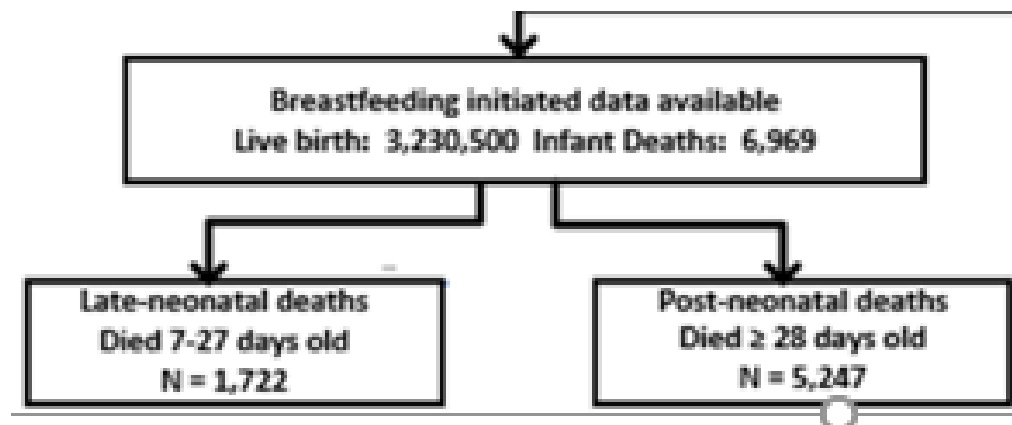


Methods – the 2017 Birth Cohort

- Linked Live Births to Deaths from 2017-2018 (1 year after birth)
- Births and deaths occurred in all 50 states and DC
- 3,864,754 births with 22,197 deaths before 1st birthday
- IMR 5.74/1000
- Exclusions
 - Birth weight < 500 grams; death < 7 days, death due to malignant neoplasm or congenital anomalies
 - California and Michigan births excluded due to not reporting, and inconsistent reporting, respectively.

Outcomes

- Total 6969 post perinatal deaths (7-364 days)
- 1722 late neonatal deaths (7-27 days)
- 5247 post neonatal deaths (28-364 days)



Main Exposure Variable

- Breastfeeding at Discharge
 - Determined through review of medical record
 - Receipt of any breastmilk between delivery and hospital discharge
 - Yes or No response
- No exclusivity or duration noted



Covariates from Birth Certificate

- Maternal Characteristics

- Age
- Education
- Race/ethnicity
- Participation in WIC, Insurance
- Marital status
- Timing of prenatal care
- Smoking
- Pre-pregnancy BMI
- Mode of delivery
- Birth plurality
- Maternal diabetes and hypertension

- Infant Characteristics

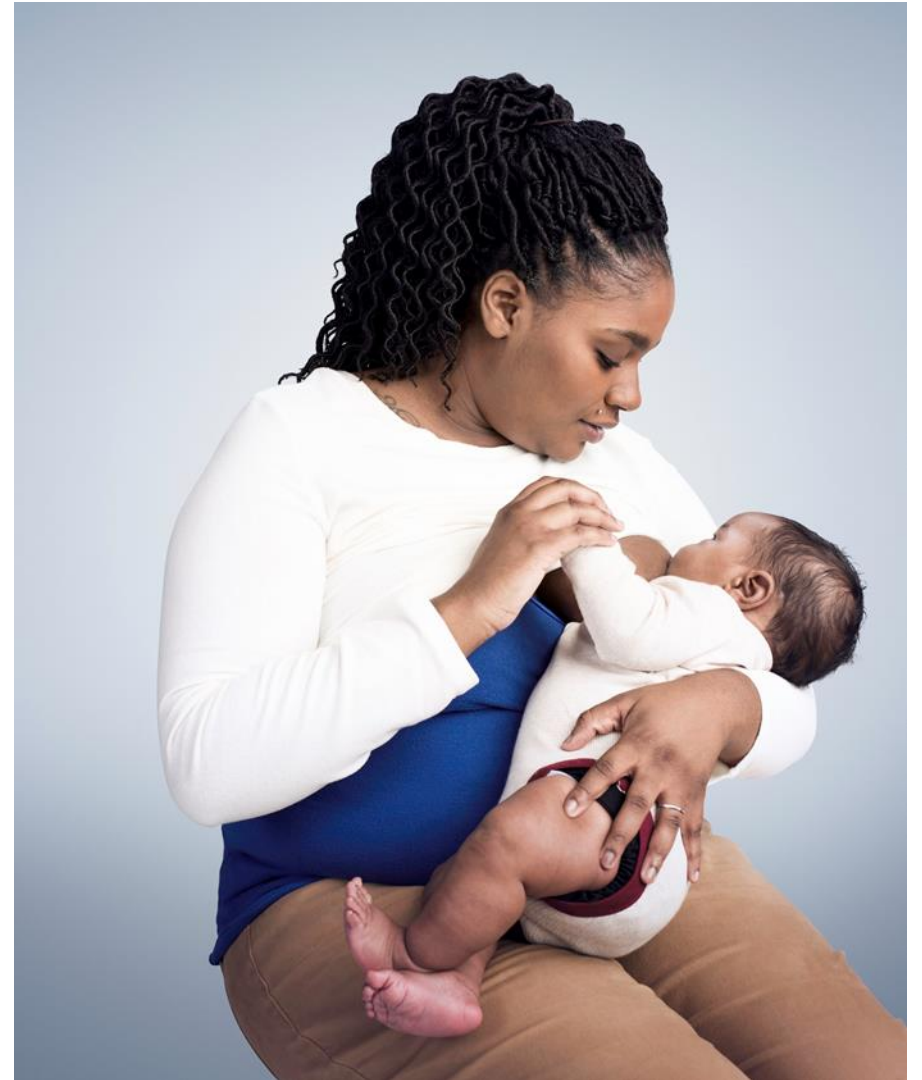
- Admission to NICU
- Gestational age
- Birth order
- Birth weight
- Infant sex

Results

- Live births
 - 20.5% Hispanic
 - 54.8% Non-Hispanic White
 - 15.7% Non-Hispanic Black
 - 5.3% Non-Hispanic Asian
 - 0.2% Non-Hispanic Hawaiian/Pacific Islander
 - 0.9% Non-Hispanic American Indian/Alaskan Native
- Majority of mothers
 - 74.1% prenatal care in first trimester
 - 92.1% non-smoking during pregnancy
- Pre-pregnancy BMI
 - 25.5% overweight
 - 26.6% obesity
- Cesarean delivery – 32.0%

Infants

- 8.9% – NICU admission
- 11.6% – Preterm (< 37 weeks)
- 8.1% – Low Birth weight <2500 grams



Breastfeeding Initiation

- 83.6% among all births
- Significantly associated with each maternal and infant characteristic



Ever Breastfeeding Rates among 2017 Cohort

	Total live births Breastfed n (% breastfed of total)	Infant deaths 7-364 days Breastfed n (% breastfed of total)	Late neonatal deaths 7-27 days Breastfed n (% breastfed of total)	Post-neonatal deaths 28-364 days Breastfed n (% breastfed of total)
Overall	2,700,334 (83.6)	4603 (66.0)	1076 (62.5)	3527 (67.2)
Maternal Characteristics				
Race				
Hispanic	580,921 (87.5)	782 (73.3)	173 (64.6)	609 (76.2)
NH white	1,500,110 (84.8)	2181 (67.1)	534 (64.8)	1647 (67.8)
NH black	365,640 (72.2)	1202 (59.4)	263 (56.8)	939 (60.2)
Education				
< High school	308,369 (72.5)	818 (55.8)	159 (50.5)	659 (57.3)
≥ College	971,033 (93.6)	729 (80.5)	216 (70.6)	513 (85.5)

Logistic Regression – Total and Race/Ethnicity

	Live Birth	Overall infant deaths (7-364 days)		Late Neonatal Deaths (7-27 days)		Post-neonatal deaths (28-364 days)	
	Number	n	AOR	n	AOR	n	AOR
Total	3,230,500	6969	0.74 (0.7-0.79)	1722	0.60 (0.54-0.67)	5247	0.81 (0.76-0.87)
Hispanic	663,545	1067	0.64 (0.55-0.74)	268	0.47 (0.36-0.62)	799	0.73 (0.61-0.88)
NH White	1,769,279	3252	0.75 (0.69-0.81)	824	0.61 (0.52-0.72)	2428	0.81 (0.73-0.89)
NH Black	506,440	2022	0.83 (0.75-0.91)	463	0.71 (0.58-0.87)	1559	0.87 (0.78-0.98)
NH Asian	171,023	187	0.51 (0.36-0.72)	64	0.33 (0.20-0.55)	123	0.67 (0.64-1.03)

Statistically significant for total cohort and all race/ethnicities except Non-Hispanic HPI and Non-Hispanic AIAN, and 2 or more races

Controlled for maternal race (except race subgroup), maternal age, maternal education, WIC, marital status, prenatal care, Smoking, prepregnancy BMI, type of delivery, birth plurality, insurance, maternal diabetes, maternal hypertension, birth order, Sex, and birth weight (except for birth weight subgroup).

Causes of Death

Cause of Death	Live births (N)	Infant deaths (N)	Crude Odds Ratio Ever/Never breastfeeding (95% CI, p-value)	Adjusted Odds Ratio ^a Ever/Never Breastfeeding (95% CI, p-value)
Total population				
Infection	3,027,904	802	0.44(0.38-0.51, <.001)	0.81(0.69-0.94, 0.007)
Sudden Unexpected Infant Death	3,029,916	2,814	0.38(0.35-0.41, <.001)	0.85(0.78-0.92, <.001)
Sudden Infant Death Syndrome (R95)	3,028,145	1,043	0.40(0.35-0.46, <.001)	0.89(0.78-1.03, 0.11)
Accidental Suffocation and Strangulation in Bed (W75)	3,027,863	761	0.39(0.33-0.45, <.001)	0.90(0.77-1.05, 0.191)
Unknown (R99)	3,028,112	1,010	0.34(0.30-0.39, <.001)	0.76(0.67-0.87, <.001)
Necrotizing Enterocolitis	3,027,308	206	0.43(0.32-0.57, <.001)	0.67(0.49-0.90, 0.009)
Injuries	3,027,555	453	0.44(0.36-0.54, <.001)	0.88(0.71-1.08, 0.223)
Other	3,029,109	2,007	0.37(0.34-0.41, <.001)	0.62(0.56-0.69, <.001)

Table 4: Logistic regression analyses for the associations of ever breastfeeding with each cause of post-perinatal infant death among 2017 birth cohort, United States

^aAll models were adjusted for maternal race, maternal age, maternal education, WIC participation, marital status, prenatal care, smoking during pregnancy, maternal prepregnancy BMI, type of delivery, birth plurality, insurance, maternal diabetes, maternal hypertension, birth order, sex, and birth weight (except for the modeling on Necrotizing Enterocolitis).

Summary

- Birth-death linked data for >3,000,000 US infants born in 2017
- 26% reduction in post-perinatal death for initiation of any breastfeeding
- 40% reduction in late neonatal deaths
- 19% reduction in post-neonatal deaths

- These results align with results from previous US studies, and are much larger, and more compelling.

Associations Between Breastfeeding and Post-perinatal Infant Death in the U.S.

ARTICLE IN PRESS

American Journal of
Preventive Medicine

RESEARCH ARTICLE

Associations Between Breastfeeding and Post-perinatal Infant Deaths in the U.S.

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Jennifer M. Kmet, MPH,⁷ Sharyn E. Parks, PhD,^{6,8} Ardythe L. Morrow, PhD,^{9,10} Jian Chen, MS,³
Cria G. Perrine, PhD^{3,6}

Methods

- Prospective cohort analysis linking US birth and post-perinatal infant death for nearly 10 million infants
- Births in 2016-2018 and followed for 1 year after birth
- Exclusions
 - < 500 grams
 - Deaths < 7 days
 - Deaths due to malignant neoplasms or congenital anomalies



Exposure and Outcomes

- Exposure
 - Initiation of breastfeeding as noted on birth certificate
 - “is the infant being breastfed at discharge”
- Outcome Variables
 - Total post-perinatal death (days 7-364)
 - Early post-perinatal death (days 7-182)

Covariates include: Maternal age, maternal education, race/ethnicity, WIC participation, smoking during pregnancy, delivery method, plurality, gestational age, infant sex

Results - Characteristics



- Live births
 - 20.6% Hispanic
 - 54.9% non-Hispanic White
 - 15.5% non-Hispanic Black
 - 5.3% non-Hispanic Asian
 - 0.2% non-Hispanic Hawaiian/Pacific Islander
 - 0.9% non-Hispanic AI/AN
 - Characteristic Highlights
 - 92.2% non-smoking
 - 31.9% Cesarean delivery
 - 11.6% preterm
- Overall Post-perinatal IMR
- Non-Hispanic Black 4.07
 - Non-Hispanic White 1.79

Table 1. National Prevalence of Breastfeeding Initiation and Infant Death Among Live Births in 2016–2018, U.S.

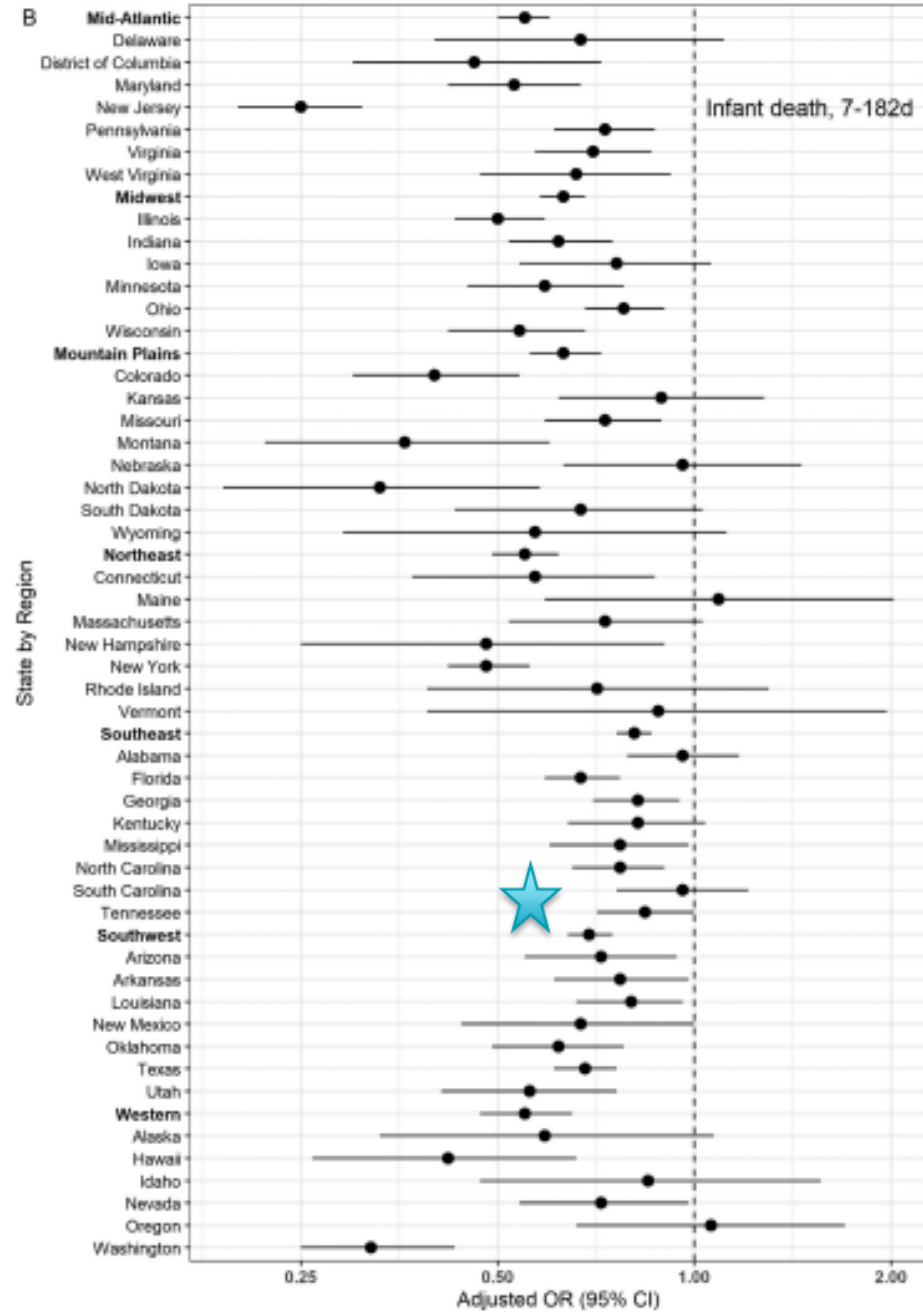
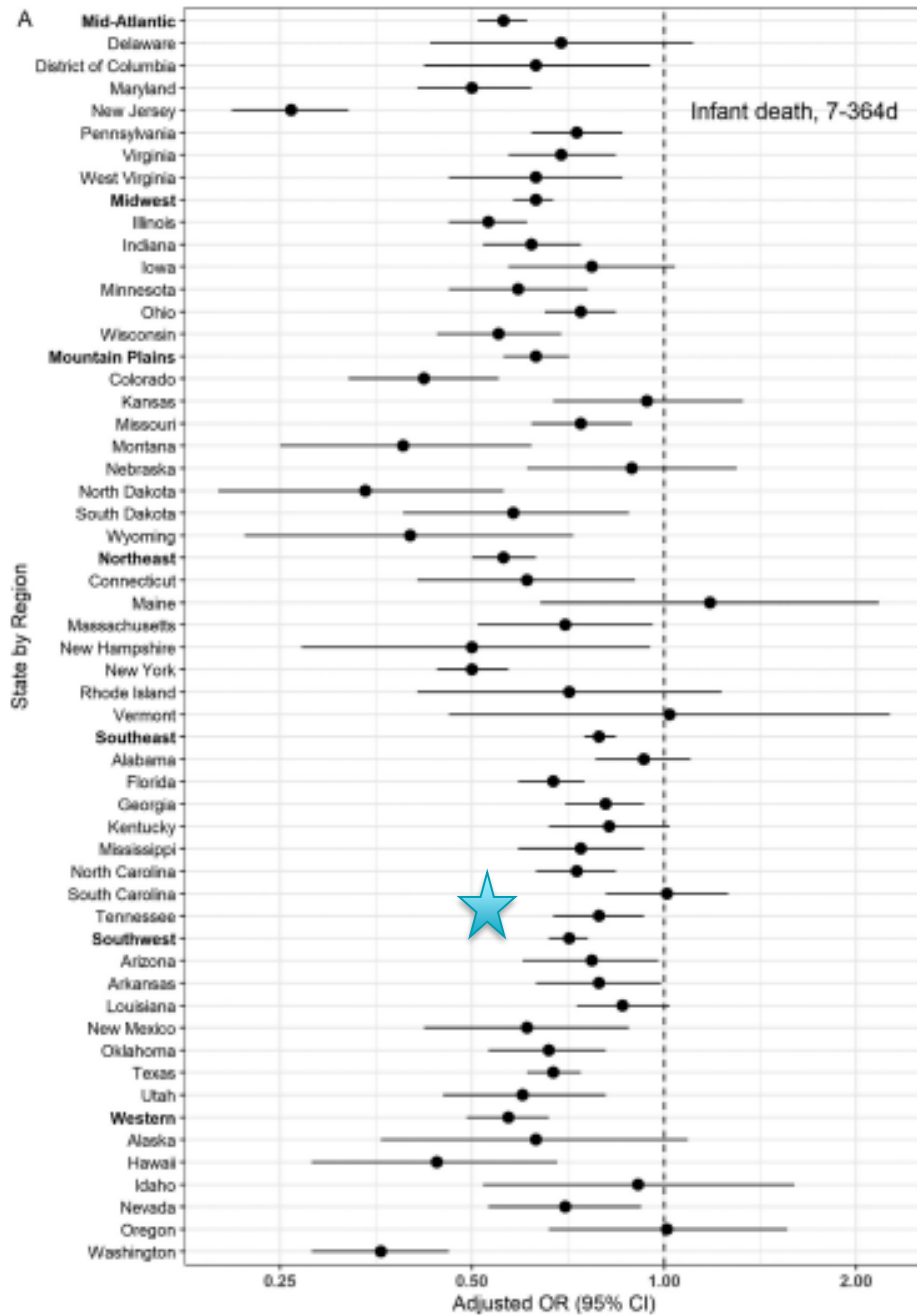
Characteristics	Total live births n (%)	Total post- perinatal infant death (7–364 days) n (%)	Breastfeeding initiation rate %	Total post- perinatal death rate per 1,000 birth (7–364 days)	Early infancy death rate per 1,000 birth (7–182 days)
Overall	9,711,567 (100)	20,632 (100)	83.6	2.12	1.78
Maternal characteristics					
Age					
<20 years	507,437 (5.2)	1,966 (9.5)	72.7	3.87	3.21
20–24 years	1,965,749 (20.2)	5,995 (29.1)	78.2	3.05	2.51
25–29 years	2,853,821 (29.4)	5,902 (28.6)	83.5	2.07	1.73
30–34 years	2,737,146 (28.2)	4,196 (20.3)	87.4	1.53	1.31
≥35 years	1,647,414 (17.0)	2,573 (12.5)	87.1	1.56	1.32
p-value			<0.0001	<0.0001	<0.0001
Education					
Lower than high school	1,277,447 (13.2)	4,388 (21.3)	72.5	3.43	2.84
High school	2,459,089 (25.3)	7,305 (35.4)	75.4	2.97	2.46
Some college	2,776,543 (28.6)	5,854 (28.4)	84.7	2.11	1.79
College graduates	3,131,297 (32.2)	2,863 (13.9)	93.6	0.91	0.77
Missing	67,191 (0.7)	222 (1.1)	76.7	3.30	2.78
p-value			<0.0001	<0.0001	<0.0001
Race/ethnicity					
Hispanic	1,997,844 (20.6)	3,153 (15.3)	87.5	1.58	1.31
Non-Hispanic White	5,329,100 (54.9)	9,529 (46.2)	84.8	1.79	1.51
Non-Hispanic Black	1,509,627 (15.5)	6,145 (29.8)	72.0	4.07	3.39
Non-Hispanic Asian	511,460 (5.3)	569 (2.8)	91.1	1.11	0.90
Non-Hispanic Hawaiian/Pacific Islander	22,200 (0.2)	94 (0.5)	81.5	4.23	3.42
Non-Hispanic American Indian/Alaska Native	83,861 (0.9)	365 (1.8)	75.3	4.35	3.40
2 or more races	201,922 (2.1)	645 (3.1)	82.8	3.19	2.64
Missing	55,553 (0.6)	132 (0.6)	82.6	2.38	2.03
p-value			<0.0001	<0.0001	<0.0001

Breastfeeding Initiation And Infant Deaths

Breastfeeding and Death Rates by Region and State

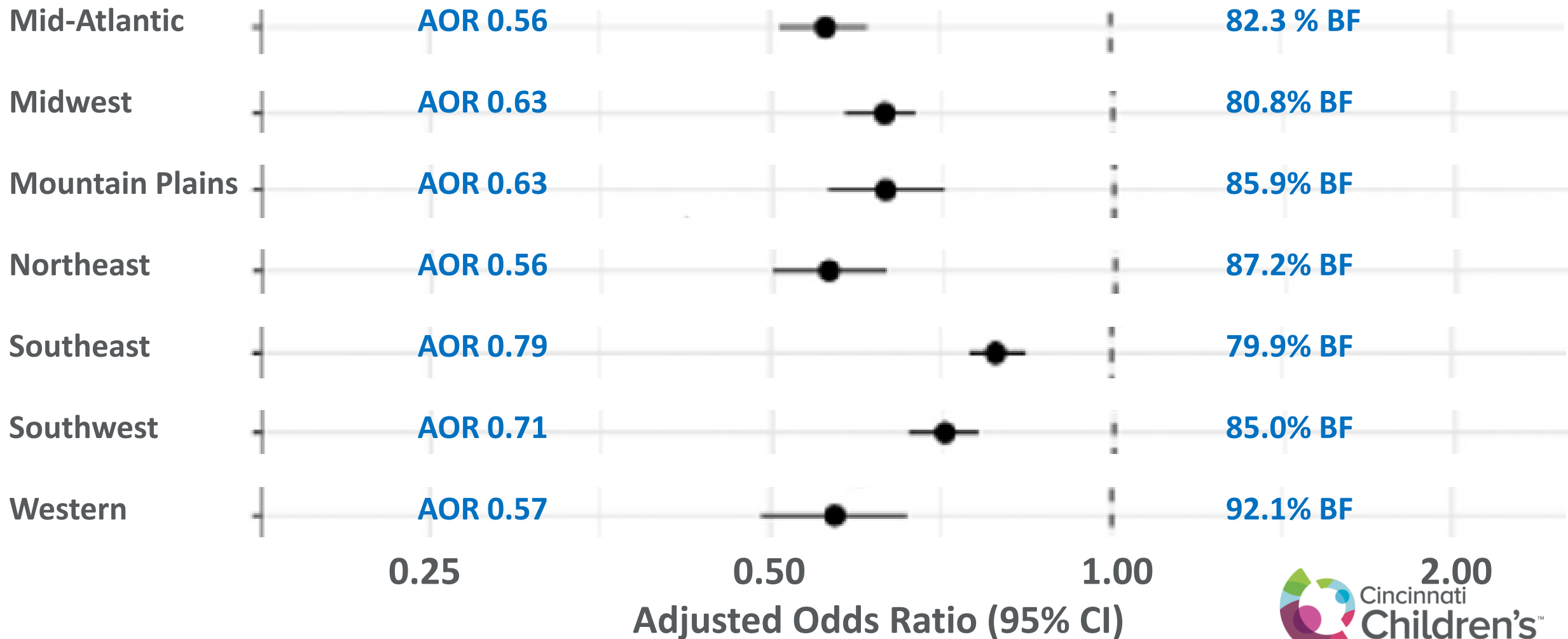
Table 2. State Prevalence of Breastfeeding Initiation and Infant Death Among Live Births in 2016–2018, U.S.

Regions and states	Total live births n (%)	Total post- perinatal infant death (7–364 days) n (%)	Breastfeeding initiation rate %	Total post- perinatal death rate per 1,000 birth (7–364 days)	Early infancy death rate per 1,000 birth (7–182 days)
Southeast	2,251,231 (23.18)	5,814 (28.18)	79.9	2.58	2.18
Alabama	170,335 (1.75)	573 (2.78)	68.1	3.36	2.79
Florida	663,389 (6.83)	1,450 (7.03)	86.9	2.19	1.83
Georgia	383,014 (3.94)	1,011 (4.90)	82.6	2.64	2.24
Kentucky	155,637 (1.60)	357 (1.73)	70.9	2.29	1.91
Mississippi	109,146 (1.12)	349 (1.69)	56.1	3.20	2.74
North Carolina	363,700 (3.75)	907 (4.40)	81.6	2.49	2.11
South Carolina	159,428 (1.64)	401 (1.94)	77.4	2.52	2.11
Tennessee	246,582 (2.54)	766 (3.71)	80.5	3.11	2.66



AOR

Infant Deaths 7-364 Days by Region



Logistic Regression by State and Region

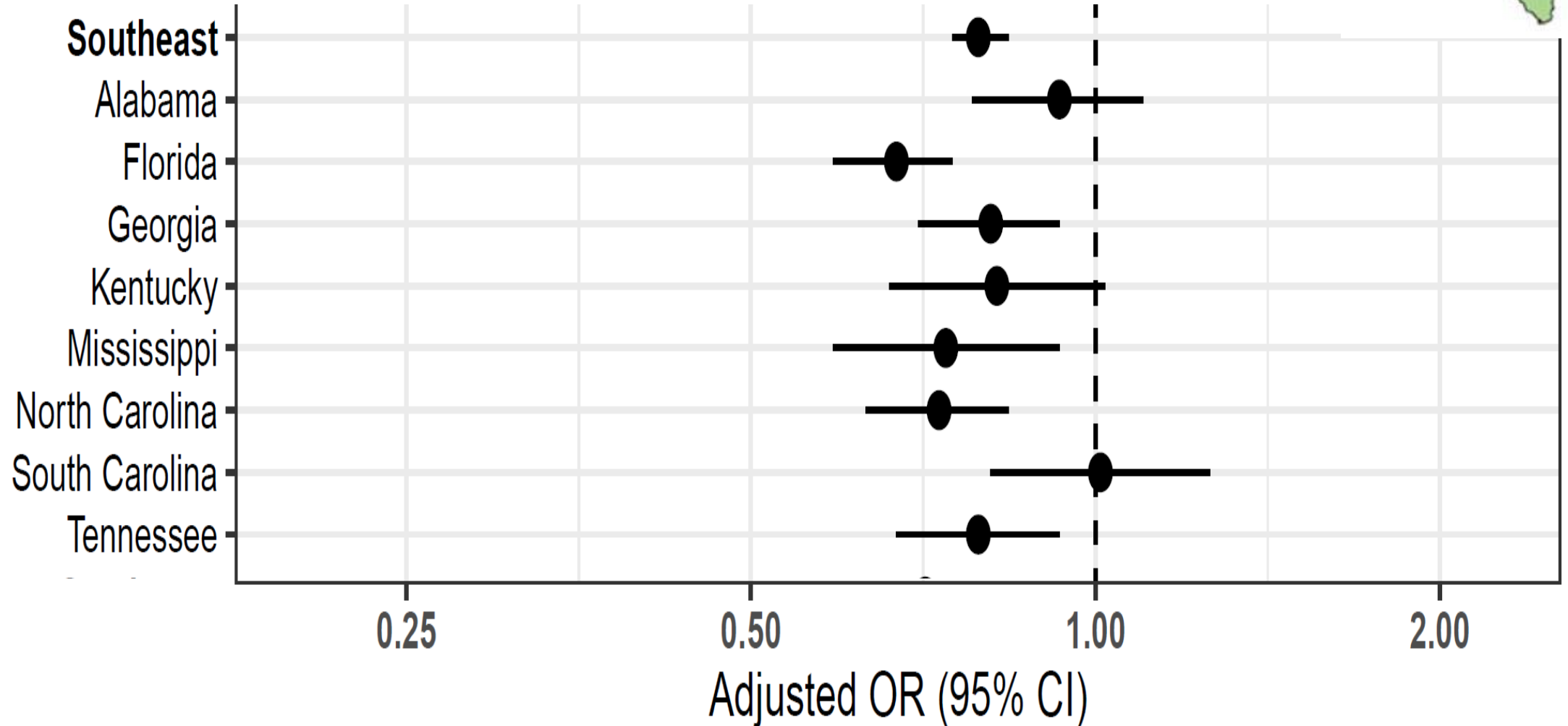
Appendix

Associations Between Breastfeeding and Post-Perinatal Infant Mortality in the U.S. Ware J, Li R, Chen A, Nelson J, Kmet J, Parks S, Morrow A, Chen J, Perrine C. American Journal of Preventive Medicine

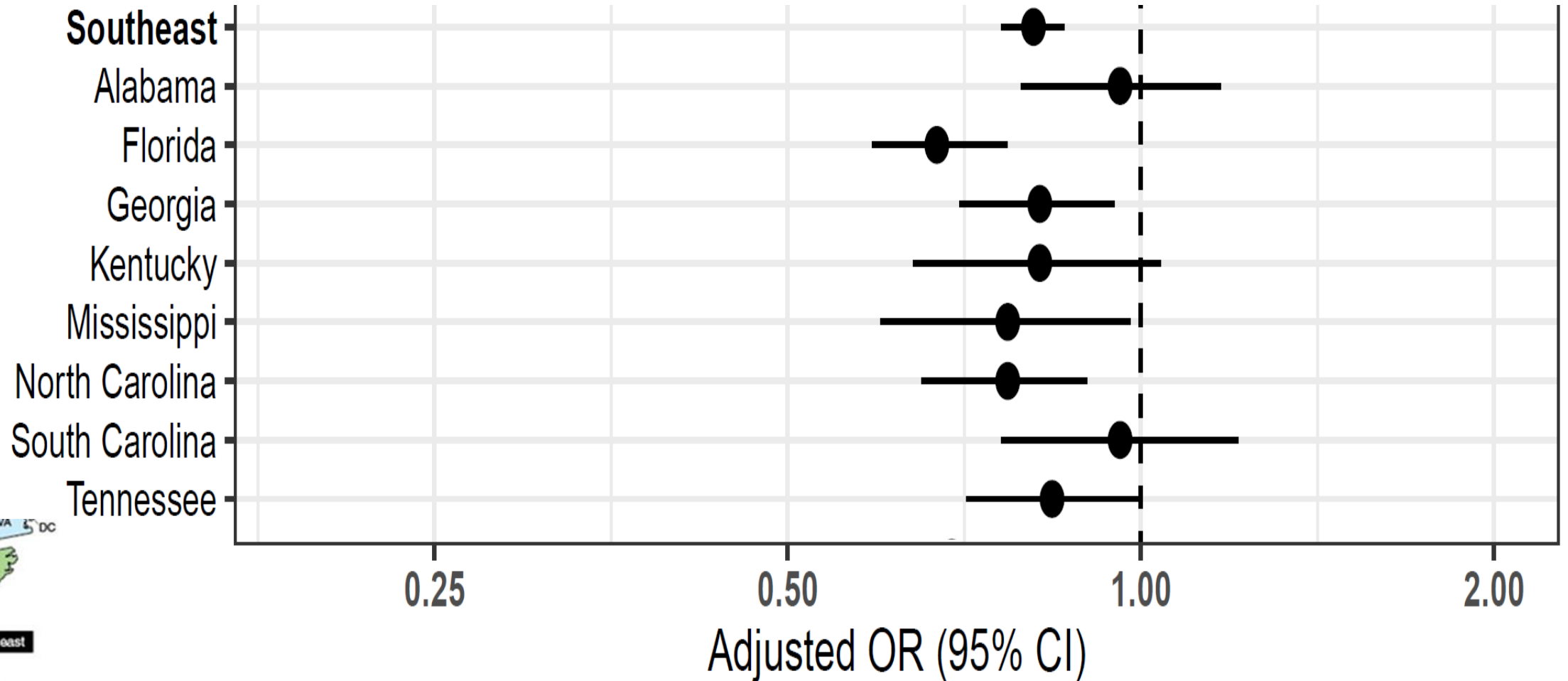
Table 1. Logistic regression for the association of ever breastfeeding with infant death among 2016–2018 live births

States and Regions	Post-perinatal Death (7-364 days)			Early Infancy Death (7-182 days)		
	n	COR ^a (95% CI, p value)	AOR ^b (95% CI, p value)	n	COR ^a (95% CI, p value)	AOR ^b (95% CI, p value)
Southeast	5814	0.47(0.45-0.50, <.001)	0.79(0.75-0.84, <.001)	4908	0.48(0.45-0.51, <.001)	0.81(0.76-0.86, <.001)
Alabama	573	0.59(0.50-0.69, <.001)	0.93(0.78-1.10,0.394)	476	0.60(0.5-0.72, <.001)	0.96(0.79-1.17,0.699)
Florida	1450	0.37(0.33-0.42, <.001)	0.67(0.59-0.75,<.001)	1217	0.37(0.33-0.42, <.001)	0.67(0.59-0.77,<.001)
Georgia	1011	0.50(0.44-0.57, <.001)	0.81(0.70-0.93,0.003)	857	0.51(0.44-0.59, <.001)	0.82(0.70-0.95,0.010)
Kentucky	357	0.55(0.44-0.67, <.001)	0.82(0.66-1.02,0.076)	298	0.56(0.44-0.7, <.001)	0.82(0.64-1.04,0.100)
Mississippi	349	0.56(0.46-0.70, <.001)	0.74(0.59-0.93,0.008)	299	0.57(0.45-0.72, <.001)	0.77(0.60-0.98,0.032)
North Carolina	907	0.41(0.36-0.47, <.001)	0.73(0.63-0.84,<.001)	768	0.44(0.38-0.51, <.001)	0.77(0.65-0.90,0.001)
South Carolina	401	0.63(0.51-0.77, <.001)	1.01(0.81-1.26,0.899)	337	0.58(0.47-0.73, <.001)	0.96(0.76-1.21,0.715)
Tennessee	766	0.50(0.43-0.58, <.001)	0.79(0.67-0.93,0.004)	656	0.53(0.45-0.62, <.001)	0.84(0.71-1.00,0.050)
Mid-Atlantic	2546	0.30(0.28-0.33, <.001)	0.56(0.51-0.61, <.001)	2160	0.30(0.27-0.33, <.001)	0.55(0.50-0.60, <.001)
Virginia	612	0.39(0.33-0.47, <.001)	0.69(0.57-0.84,<.001)	511	0.40(0.33-0.48, <.001)	0.70(0.57-0.86,0.001)

Southeast Infant Death 7-364 Days



Southeast Early Infant Death 7-182 Days



Summary of Results


- Total of 9,711,567 live births
- 20,634 post-perinatal infant deaths (days 7-364)
- 48 states and District of Columbia

- Overall adjusted Odds Ratio = 0.67 (CI 0.65,0.69, $p < 0.0001$)
- All 7 US Geographic regions had significant reductions in post-perinatal infant death with variation

More research needed...

- Perinatal deaths not included in our study
 - Attempt to reduce possibility of reverse causality
- California and Michigan births/deaths not included
- Exclusivity, duration, and intensity of breastfeeding not available
- Causal pathway may include racism and other social determinants of health not available

Summary of US Studies

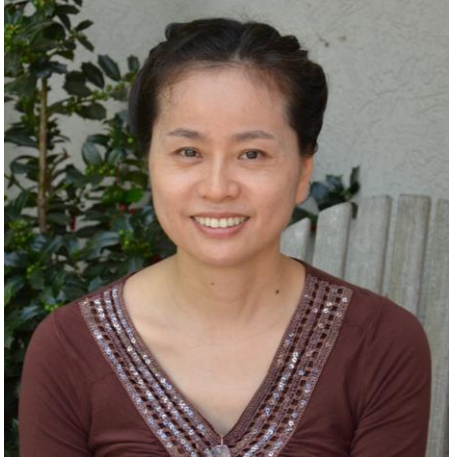
Year	Design	Births	%BF of Total	Deaths	Age of Death (days)	AOR (95% CI)
1988	Survey Case Control	7740 (alive at 1 year)	40.0	1240	≥28 < 365	0.80 (0.70-0.90)
2004-2014	County Cohort	148,679	59.6	598	>7 < 365	0.81 (0.68-0.97)
				153	>7 < 28	0.49 (0.34-0.72)
				445	≥28 <365	0.95 (0.78-1.17)
2017	US Cohort	3,230,500	83.6	6969	>7 < 365	0.74 (0.70-0.79)
				1722	> 7 < 28	0.60 (0.54-0.67)
				5247	≥28 < 365	0.81 (0.76-0.87)
2016-2018	US Cohort	9,711,567	83.6	20,632	>7 < 365	0.67 (0.65-0.69)
				17,240	>7 - 182 	0.67 (0.65-0.69)

Implications

- Breastfeeding Saves Lives
- Breastfeeding Promotion, Protection, and Support are key to infant mortality reduction initiatives
- Eliminating disparities in breastfeeding may help to reduce disparities in infant mortality

- 823,000 lives of children < 5 could be saved if breastfeeding “scaled up” to universal levels.

Acknowledgments



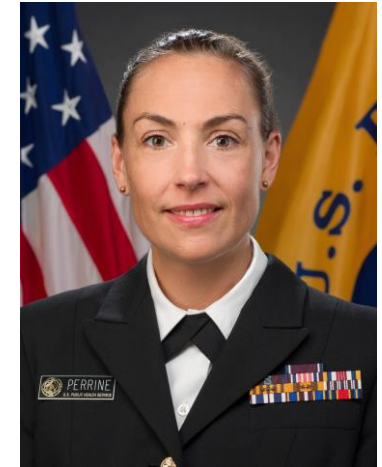
Ruowei Li, MD, PhD



Jennifer Nelson, MD, MPH



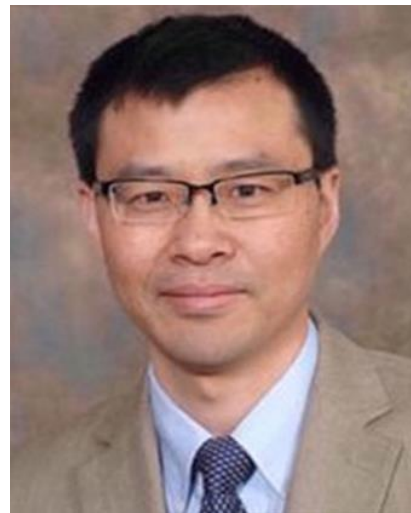
Jennifer Kmet, MPH



Cria Perrine, PhD



Ardythe Morrow, PhD



Aimin Chen, MD, PhD



Sharyn Parks, PhD, MPH

Not pictured:
Jian Chen

Acknowledgements



What Can You Do?



Join Infant Mortality Efforts in Your State



Take a Seat at Their Table and Invite Them to Yours



Work with Your State and Local Health Departments



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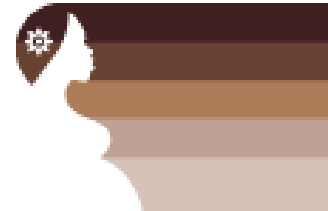


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Learn about the benefits of breastfeeding and how to get started with these video resources.



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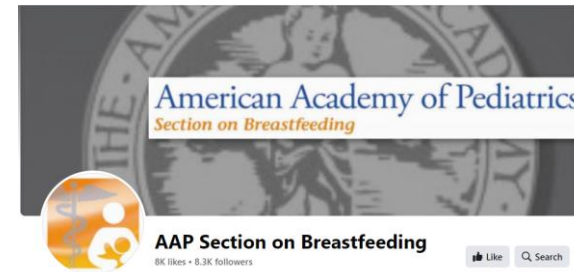
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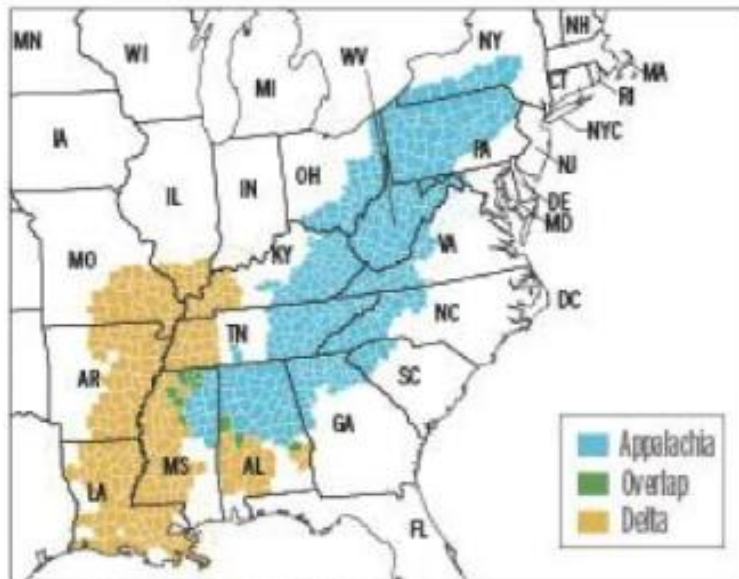
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Let's Fix This Together!

Breastfeeding Initiation by County

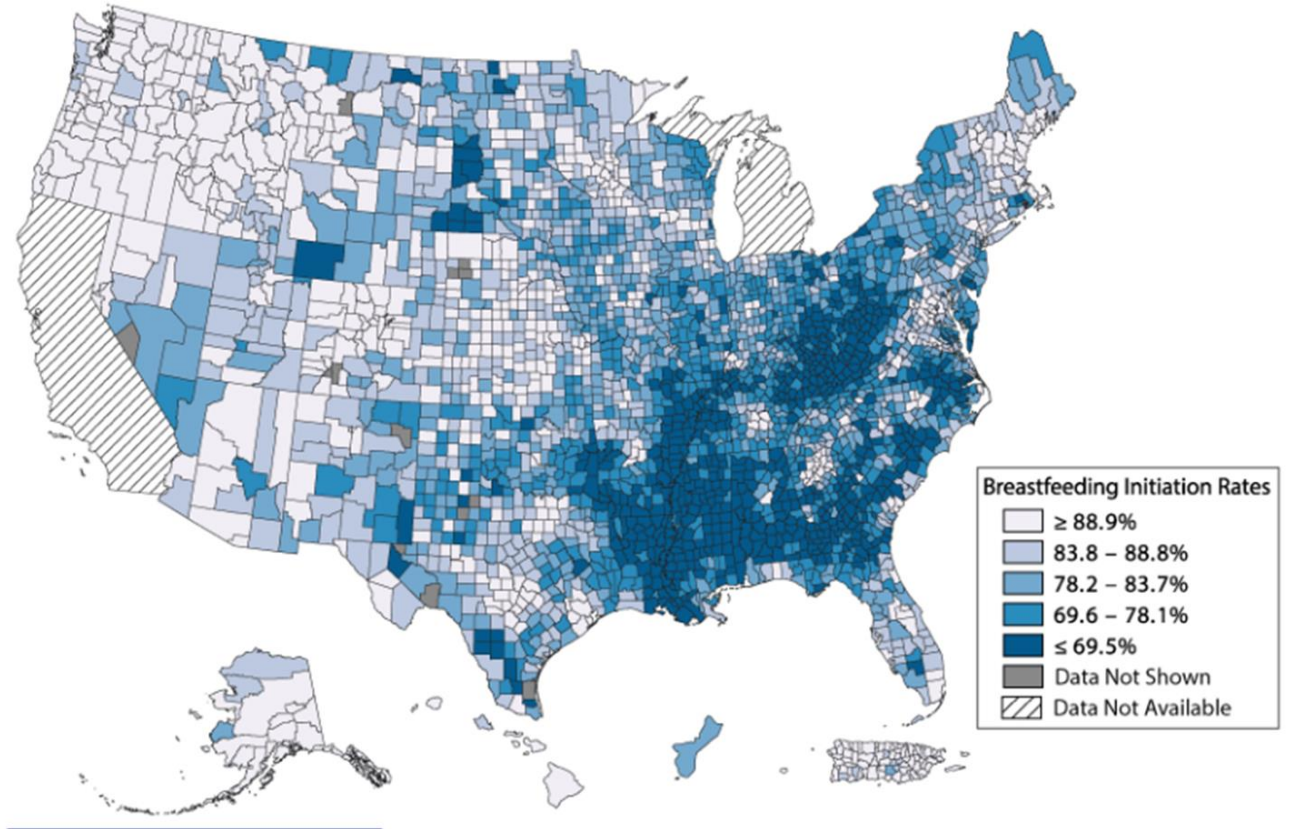
Appalachia and Delta regions



NOTES: The Appalachia region includes 420 counties in 13 states. The Delta region includes 252 counties and parishes in eight states.

SOURCE: CDC National Vital Statistics Report

Deseret News





WABA | WORLD BREASTFEEDING WEEK 2024



Breastfeeding is a universal solution that levels the playing field, giving everyone a fair start in life.



In a world filled with inequality, crises and poverty, breastfeeding is the foundation of lifelong good health for babies and mothers.

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