



**COLORADO CHILD
FATALITY
PREVENTION
SYSTEM**

Sudden Unexpected Infant Death Data,
2013 - 2017



COLORADO
Department of Public
Health & Environment

SUDDEN UNEXPECTED INFANT DEATH DATA, 2013 - 2017

INTRODUCTION

The Child Fatality Prevention Act (Article 20.5 of Title 25, Colorado Revised Statutes) established the Child Fatality Prevention System (CFPS), a statewide, multidisciplinary, multi-agency effort to prevent child deaths. Although not codified in Colorado Revised Statutes (C.R.S.) until 2005, CFPS has been conducting retrospective reviews of child deaths in Colorado since 1989. CFPS applies a public health approach to prevent child deaths by aggregating data from individual child deaths, describing trends and patterns of the deaths and recommending prevention strategies. Child fatality prevention review teams and their partners implement and evaluate the identified strategies at the state and local levels with the goal of preventing similar deaths in the future.

The data presented within this data summary come from comprehensive, statutorily-mandated reviews of deaths among those under 18 years of age occurring in Colorado between 2013 and 2017. Local child fatality prevention review teams are responsible for conducting individual, case-specific reviews of deaths of children meeting the statutory criteria. Reviewable child deaths result from

one or more of the following causes: undetermined causes, unintentional injury, violence, motor vehicle and other transportation-related, child maltreatment, sudden unexpected infant death (SUID) and suicide. During the 2018 fiscal year, local teams reviewed deaths that occurred in 2017.

The CFPS review process includes deaths of Colorado residents occurring in Colorado, as well as deaths of out-of-state residents who died in Colorado or were transported to a Colorado hospital and died. CFPS does not review deaths of Colorado residents that occur outside Colorado. These criteria are different from other reports of child fatality data and many other Colorado government data sources. As a result, the data presented in this topic-specific data brief may not match other statistics reported at both the state and national levels. This data brief provides an overview of SUID data from CFPS. Additional CFPS data is available in a state-level overview, cause-specific data briefs and an interactive data dashboard at:

www.cochildfatalityprevention.com/p/reports.html.

STRUCTURAL INEQUITY

CDPHE acknowledges that generations-long social, economic and environmental inequities result in adverse health outcomes. They affect communities differently and have a greater influence on health outcomes than either individual choices or one's ability to access health care. Reducing health disparities through policies, practices and organizational systems can help improve opportunities for all Coloradans.¹

Some families lose infants, children and youth to the types of deaths reviewed by CFPS not as the result of the actions or behaviors of those who died,

or their parents or caregivers. Social factors such as where they live, how much money or education they have and how they are treated because of their racial or ethnic backgrounds can also contribute to a child's death.² In the United States, most residents grew up and continue to live in racially and economically segregated neighborhoods, which can lead to marginalization.^{3,4} This marginalization of groups into segregated neighborhoods further impacts access to high-quality education,⁵ employment opportunities,⁶ healthy foods⁷ and health care.⁸ Combined, the economic injustices associated with residential, educational and

occupational segregation have lasting health impacts that include adverse birth outcomes, infant mortality,⁹ high rates of homicide and gun violence¹⁰ and increased motor vehicle deaths.¹¹

When interpreting the data, it is critical not to lose sight of these systemic, avoidable and unjust factors. These factors perpetuate the inequities that we observe in child deaths across populations in Colorado. Research is making progress in understanding how race and ethnicity, economic status, sexual orientation and gender identity correlate with health. It is critical that data systems like CFPS identify and understand the life-long inequities that persist across groups in order to eradicate them.

A note about terminology: While “Latinx” is becoming the preferred way to identify people of Latin descent, this report uses “Hispanic” throughout the data section to reflect how CFPS data is collected and to align with terminology used in cited literature and research.¹³

OVERVIEW OF SUID

Sudden unexpected infant death (SUID) describes deaths of infants under age 1 that occur suddenly and unexpectedly, whether explained or unexplained.¹² SUID

includes sudden infant death syndrome (SIDS), accidental suffocation and strangulation in bed (ASSB) and death occurring in infants due to undetermined causes.

Definition of Common Terms Included Under SUID:

- Accidental suffocation and strangulation in bed (ASSB): ASSB is assigned to infant deaths when terms related to asphyxiation, strangulation or suffocation are reported on the death certificate along with sleep terms such as bed or crib.¹⁴ ASSB includes suffocation by (1) soft bedding, pillow or waterbed mattress, (2) overlaying or rolling on top of or against infant while sleeping, or (3) wedging and entrapment of an infant between two objects such as a mattress and wall, bed frame, or furniture. ASSB also includes strangulation by asphyxiation, such as when an infant’s head and neck become caught between crib railings.¹⁵
- Sleep-related infant death: A death that occurs during an observed or unobserved sleep period.¹⁶
- Sudden infant death syndrome (SIDS): SIDS is assigned to infant deaths that cannot be explained after a thorough case investigation, including a death scene investigation, autopsy and review of the clinical history.¹⁷ SIDS is sometimes known as “crib death” or “cot death.”
- Undetermined causes: An undetermined cause is assigned to infant deaths when the cause of death is unknown. This may occur when the requirements for a SIDS classification are not met, such as having not conducted a death scene investigation or autopsy.¹⁸

From 2013-2017, CFPS identified and reviewed 228 SUID. This represents 12.4 percent of all infant deaths (under age 1) in Colorado for the period. The annual crude rate of SUID occurring in Colorado

among residents remained stable over this period (Table 1). Consistent with national trends, the majority of SUID occurred among those under five months of age.¹⁹

Table 1. Crude rate of sudden unexpected infant death (SUID) occurring in Colorado among Colorado residents by year, 2013-2017

Year of Death	n	Live Births	Rate*	95% Confidence Interval	
				Lower Limit	Upper Limit
2013-2017	216	328,389	65.8	57.0	74.5
2013	40	65,004	61.5	42.5	80.6
2014	51	65,817	77.5	56.2	98.7
2015	35	66,567	52.6	35.2	70.0
2016	47	66,613	70.6	50.4	90.7
2017	43	64,388	66.8	46.8	86.7

*Per 100,000 live births among residents in Colorado, 2013-2017.
 Data sources: Colorado Child Fatality Prevention System and Vital Statistics Program,
 Colorado Department of Public Health and Environment.

SUID RISK AND PROTECTIVE FACTORS

In 2011, the American Academy of Pediatrics (AAP) developed recommendations for a safe infant sleeping environment to help reduce the risk of SUID. Recommendations include on the back sleep positioning, using a firm sleep surface, room-sharing without bed-sharing, and avoiding soft bedding and overheating.²⁰ With a quickly expanding body of SUID prevention research, the AAP expanded upon these recommendations in 2016.²¹ The 2016 A-level recommendations, listed below, were used for this report.

Level A Recommendations:

- Back to sleep for every sleep.
- Use a firm sleep surface.
- Room-sharing (to age 6 months) with the infant on a separate sleep surface (to 1 year).
- Keep soft objects and loose bedding away from the infant’s sleep area.
- Pregnant women should seek and obtain regular prenatal care.
- Avoid smoke exposure during pregnancy and after birth.
- Avoid alcohol and illicit drug use during pregnancy and after birth.
- Breastfeeding.

- Consider offering a pacifier at nap time and bedtime.
- Avoid overheating.
- Caregivers should immunize infants in accordance with AAP and CDC recommendations.
- Do not use home cardiorespiratory monitors as a strategy for reducing the risk of SIDS.
- Health care providers, staff in newborn nurseries and NICUs, and child care providers should endorse and model the SIDS risk-reduction recommendations from birth.
- Media and manufacturers should follow safe sleep guidelines in their messaging and advertising.
- Continue the “Safe to Sleep” campaign, focusing on ways to reduce the risk of all sleep-related infant deaths, including SIDS, suffocation, and other unintentional deaths. Pediatricians and other primary care providers should actively participate in this campaign.

Although the availability of sleep environment data varies by investigation, Table 2 indicates that none of the 228 infants who died between 2013 and 2017 were sleeping in a space that met all of the AAP’s Level A Recommendations for a safe infant sleeping environment.

Table 2. Adherence to American Academy of Pediatrics 2016 Safe Infant Sleeping Environment Recommendations for SUID occurring in Colorado, 2013-2017.**

American Academy of Pediatrics 2016 Recommendation	Satisfied recommendation		Did not satisfy recommendation		Missing or unknown	
	n	Percent	n	Percent	n	Percent
All AAP recommendations satisfied	0	0.0	228	100.0	0	0.0
Infant and sleep environment recommendations						
Back to sleep for every sleep	123	53.9	53	23.3	40	17.5
Use a firm sleep surface	49	21.5	166	72.8	*	*
Room-sharing without bed-sharing is recommended	45	19.7	160	70.2	12	5.3
Keep soft objects and loose bedding out of the sleep environment	45	19.7	171	75.0	12	5.3
Consider offering a pacifier at nap time and bedtime	19	8.3	158	69.3	40	17.5
Caregiver-related recommendations						
Pregnant women should receive regular prenatal care (9 or more visits)	109	47.8	82	35.9	37	16.2
Breastfeeding is recommended	176	77.2	28	12.3	24	10.5
Avoid smoke exposure during pregnancy and after birth	77	33.8	91	39.9	60	26.3
Avoid alcohol or illicit drug use during pregnancy and after birth	128	56.1	67	29.4	33	14.5

*Data points with fewer than 3 observations are suppressed.

**Task force on Sudden Infant Death Syndrome (2016). *Pediatrics* 138(5).

Data source: Child Fatality Prevention System, Colorado Department of Public Health and Environment.

RACIAL AND ETHNIC INEQUITIES

Colorado observed a significant inequity in the rate of SUID by race and ethnicity. The rate of SUID among non-Hispanic black infants was 3.2 times higher (188.9 per 100,000 live births) than for non-Hispanic white infants (59.7 per 100,000 live births). This is consistent with national data (data not shown).²²

This inequity also exists for other leading causes of infant mortality, such as congenital malformations.²³ Researchers believe that factors that may contribute to these racial differences include low educational attainment, low income, inadequate prenatal care access and utilization, and paternal involvement in child-rearing.²⁴ However, studies examining these individual-level factors have failed to fully explain the racial differences in infant mortality.²⁵ Instead, research highlights the role that social determinants and contextual factors, particularly community and environmental inequities, play in infant mortality prevention.²⁶

Black women have historically been disproportionately exposed to neighborhood poverty, a well-established risk factor for infant mortality. This factor is completely independent of individual measures of socioeconomic status.²⁷ Data from the American Community Survey from 2013-2017 shows that 19.9 percent of black Coloradans live below the poverty level, compared to 8.5 percent of non-Hispanic white Coloradans.²⁸

In addition to neighborhood poverty, racial residential segregation can determine infant mortality. It is largely driven by discriminatory federal, state and local policies, such as redlining, that create unjust geographic divisions among racial and ethnic groups.^{29,30} Racial segregation leads to neighborhood disadvantage

by concentrating neighborhood poverty, increasing exposure to environmental stressors such as air pollutants, creating barriers to and fewer opportunities for a healthy lifestyle, limiting access to health services and increasing housing and food insecurity.³¹ The consequences of residential segregation resulting from historical practices like redlining are still reverberating throughout communities of color today. The Colorado Behavioral Risk Factor Surveillance System (BRFSS) shows that 36.2 percent of black Coloradans are food insecure, compared to 19.2 percent of non-Hispanic white Coloradans.³² Such community inequities are associated with increased infant mortality among black populations.^{33,34}

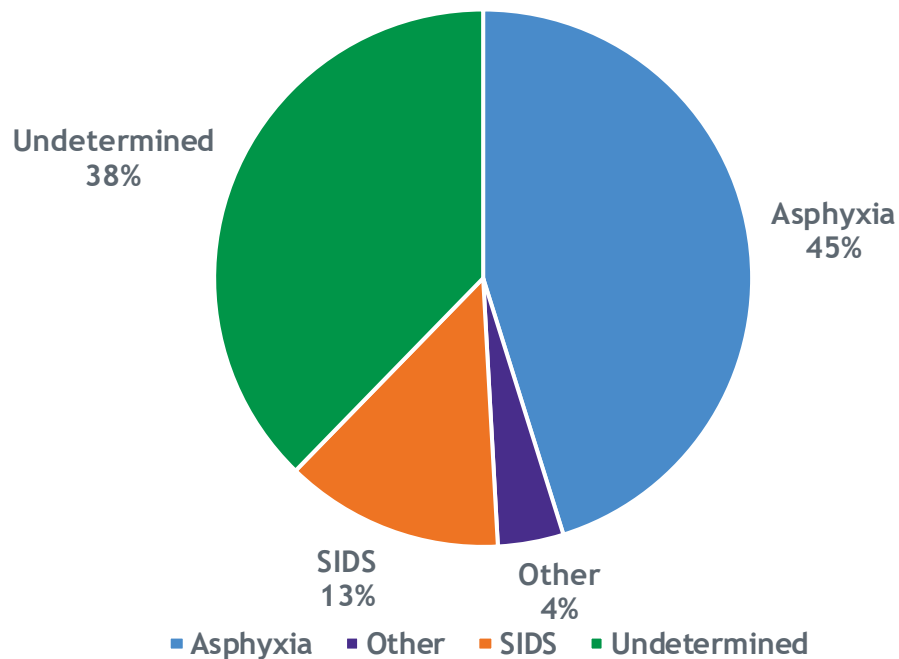
Differences in the prevalence of on-the-back sleep positioning and other sleep environment factors across racial and ethnic populations may also contribute to inequities. The Pregnancy Risk Assessment Monitoring System (PRAMS) tracks several aspects of infant sleep position and environments among families in Colorado. From 2016-2017, 86.7 percent of mothers in Colorado reported that they most often lay their infants down to sleep on their backs, with 88.6 percent of non-Hispanic white mothers and 82.6 percent of black mothers reporting on-the-back placement for sleeping. The regular use of a safe sleep location is more common among non-Hispanic white families. From 2016 to 2017, 88.1 percent of mothers in Colorado reported usually placing their infant to sleep in a crib, bassinet or portable play yard in the last two weeks, with 91.3 percent of non-Hispanic white mothers and 77.2 percent of black mothers reporting use of these sleep locations.³⁵ The use of soft bedding is also more common among black families in Colorado, which is consistent with national trends.^{36,37}

SUID INVESTIGATIVE CIRCUMSTANCES

Figure 1 demonstrates the proportion of SUID occurring in Colorado by mechanism of death. Among the 228 SUID identified from 2013-2017, 45.2 percent (n=103) were attributed to asphyxia. This category includes ASSB, overlays and wedging. Of the remaining mechanisms, 37.7 percent (n=86) were attributed to undetermined causes and 13.2 percent (n=30) fell under the criteria

for SIDS. The rate of SIDS has been decreasing since the early 1990s nationally and in Colorado, while the rates of SUID attributed to undetermined causes and ASSB have increased.³⁸ These changes are driven by improvements in investigations, a more thorough understanding of case definitions and collecting more detailed information about safe sleep circumstances.

Figure 1. SUID occurring in Colorado by cause category, 2013-2017 (n=228)



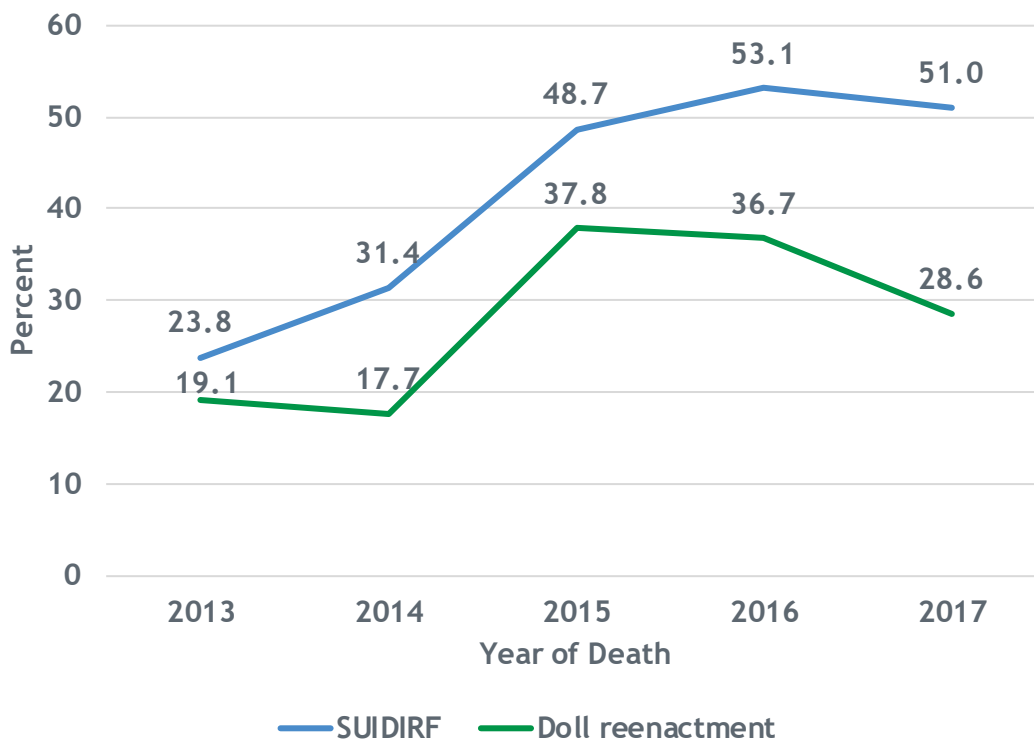
CFPS has limited ability to determine the circumstances related to infant deaths when death scene investigators do not conduct a full investigation. Infant death scene investigations are critical to a comprehensive understanding of the circumstances and factors contributing to unexplained infant deaths. In 1996, the CDC developed the Sudden Unexplained Infant Death Investigation Reporting Form (SUIDIRF) (www.cdc.gov/sids/SUIDIRF.htm) to aid in the investigation and understanding of SUID.³⁹

From 2013 to 2017, 93.9 percent (n=214) of all SUID in Colorado had a death scene investigation. The SUIDIRF was used in 41.7 percent (n=95) of the investigations and 27.6 percent (n=63) of investigations included a

scene reenactment with a doll. Figure 2 demonstrates an increasing use of the SUIDIRF and doll reenactments as part of death scene investigations for SUID in Colorado. This suggests that scene investigators have an increased awareness of the importance of these tools in understanding the circumstances of these deaths.

The [CFPS 2019 Legislative Report](#) includes a recommendation to encourage and incentivize law enforcement agencies and coroner offices to use the SUIDIRF during infant death scene investigations. This will ensure that law enforcement officers and coroner investigators consistently collect circumstance data when investigating a suspected SUID.

Figure 2. Proportion of SUID occurring in Colorado by selected investigative methods and year, 2013-2017 (n=228)



For more information and CFPS data, please contact the CFPS Support Team at the Colorado Department of Public Health and Environment:

Sasha Mintz, Child Fatality Prevention System Epidemiologist | sasha.mintz@state.co.us

REFERENCES

1. Office of Health Equity, Colorado Department of Public Health and Environment, Statement on structural inequity. Retrieved from www.colorado.gov/pacific/cdphe/statement-on-structural-inequity.
2. Bailey, Z. D., Krieger, N., Agénor, M., Graves, J., Linos, N., & Bassett, M. T. (2017). Structural racism and health inequities in the USA: evidence and interventions. *The Lancet*, *389*(10077), 1453-1463.
3. Pager, D., & Shepherd, H. (2008). The Sociology of Discrimination: Racial Discrimination in Employment, Housing, Credit, and Consumer Markets. *Annual Review of Sociology*, *34*, 181-209.
4. Williams, D. R., & Collins, C. (2016). Racial residential segregation: a fundamental cause of racial disparities in health. *Public Health Reports*, *116*(5), 404-16.
5. Williams, D. R., & Collins, C. (2016). Racial residential segregation: a fundamental cause of racial disparities in health. *Public Health Reports*, *116*(5), 404-16.
6. Collins, C. A., & Williams, D. R. (1999). Segregation and mortality: the deadly effects of racism?. In *Sociological Forum*, *14*(3), 495-523. Kluwer Academic Publishers-Plenum Publishers.
7. Larson, N. I., Story, M. T., & Nelson, M. C. (2009). Neighborhood environments: disparities in access to healthy foods in the US. *American journal of preventive medicine*, *36*(1), 74-81.
8. White, K., Haas, J. S., & Williams, D. R. (2012). Elucidating the role of place in health care disparities: the example of racial/ethnic residential segregation. *Health Services Research*, *47*(3pt2), 1278-1299.
9. Acevedo-Garcia, D., Lochner, K. A., Osypuk, T. L., & Subramanian, S. V. (2003). Future directions in residential segregation and health research: a multilevel approach. *American journal of public health*, *93*(2), 215-221.
10. Collins, C. A., & Williams, D. R. (1999, September). Segregation and mortality: the deadly effects of racism?. In *Sociological Forum* (Vol. 14, No. 3, pp. 495-523). Kluwer Academic Publishers-Plenum Publishers.
11. King, M. (2017). Under The Hood: Revealing Patterns Of Motor Vehicle Fatalities In The United States. *Publicly Accessible Penn Dissertations*. 2396. Retrieved on June 19, 2019 from: repository.upenn.edu/edissertations/2396.
12. Moon, R. Y., & Task Force on Sudden Infant Death Syndrome. (2016). SIDS and other sleep-related infant deaths: evidence base for 2016 updated recommendations for a safe infant sleeping environment. *Pediatrics*, *138*(5), e2-e34.
13. Office of Health Equity, Colorado Department of Public Health and Environment, Health Inequities Fact Sheet 2019: Latinx Coloradans Fact Sheet. Retrieved from: drive.google.com/file/d/1z1b15A9hGaRxxv4XTTa9BiPnz5lwjvfr/view.
14. Moon, R. Y., & Task Force on Sudden Infant Death Syndrome. (2016). SIDS and other sleep-related infant deaths: evidence base for 2016 updated recommendations for a safe infant sleeping environment. *Pediatrics*, *138*(5), e2-e34.
15. Shapiro-Mendoza, C. K., Kimball, M., Tomashek, K. M., Anderson, R. N., & Blanding, S. (2009). US infant mortality trends attributable to accidental suffocation and strangulation in bed from 1984 through 2004: are rates increasing?. *Pediatrics*, *123*(2), 533-539.
16. Moon, R. Y., & Task Force on Sudden Infant Death Syndrome. (2016). SIDS and other sleep-related infant deaths: evidence base for 2016 updated recommendations for a safe infant sleeping environment. *Pediatrics*, *138*(5), e2-e34.
17. Willinger, M., James, L. S., & Catz, C. (1991). Defining the sudden infant death syndrome (SIDS): deliberations of an expert panel convened by the National Institute of Child Health and Human Development. *Pediatric Pathology*, *11*(5), 677- 684.
18. Schnitzer, P. G., Covington, T. M., & Dykstra, H. K. (2012). Sudden unexpected infant deaths: sleep environment and circumstances. *American Journal of Public Health*, *102*(6), 1204-1212.
19. Centers for Disease Control and Prevention. Data and Statistics. (2019). Retrieved from www.cdc.gov/sids/data.htm.
20. Task Force on Sudden Infant Death Syndrome. (2011). SIDS and other sleep-related infant deaths: expansion of recommendations for a safe infant sleeping environment. *Pediatrics*, *128*, 1030-1039.
21. Task Force on Sudden Infant Death Syndrome. (2016). SIDS and other sleep-related infant deaths: Updated 2016 recommendations for a safe infant sleeping environment. *Pediatrics*, *138*(5), 1-12.
22. Parks, S. E., Lambert, A. B. E., & Shapiro-Mendoza, C. K. (2017). Racial and ethnic trends in sudden unexpected infant deaths: United States, 1995-2013. *Pediatrics*, *139*(6).
23. Mathews, T. J., MacDorman, M. F., & Thoma, M. E. (2015). Infant mortality statistics from the 2013 period linked birth/infant death data set. *National Vital Statistics Reports*, *64*(9), 1-29.

-
24. Matoba, N., & Collins Jr, J. W. (2017). Racial disparity in infant mortality. In *Seminars in Perinatology*, 41(6), 354-359. WB Saunders.
 25. Collins Jr, J. W., & David, R. J. (1990). The differential effect of traditional risk factors on infant birthweight among blacks and whites in Chicago. *American Journal of Public Health*, 80(6), 679-681.
 26. Pickett, K. E., Collins Jr, J. W., Masi, C. M., & Wilkinson, R. G. (2005). The effects of racial density and income incongruity on pregnancy outcomes. *Social Science & Medicine*, 60(10), 2229-2238.
 27. O'campo, P., Burke, J. G., Culhane, J., Elo, I. T., Eyster, J., Holzman, C., ...Laraia, B. A. (2007). Neighborhood deprivation and preterm birth among non-Hispanic Black and White women in eight geographic areas in the United States. *American Journal of Epidemiology*, 167(2), 155-163.
 28. Office of Health Equity, Colorado Department of Public Health and Environment, Health Inequities Fact Sheet 2019: Black/African American Coloradans Fact Sheet. Retrieved from drive.google.com/file/d/1s0dh56JHqKpbduwjh0_9MU-VY_EfBysrg/view.
 29. Polednak, A. P. (1996). Trends in US urban black infant mortality, by degree of residential segregation. *American Journal of Public Health*, 86(5), 723-726.
 30. Brown, K. S., Kijakazi, K., Runes, C., & Turner, M. A. (2019). *Confronting Structural Racism in Research and Policy Analysis*. Urban Institute. Retrieved from www.urban.org/sites/default/files/publication/99852/confronting_structural_racism_in_research_and_policy_analysis_0.pdf.
 31. Bailey, Z. D., Krieger, N., Agénor, M., Graves, J., Linos, N., & Bassett, M. T. (2017). Structural racism and health inequities in the USA: evidence and interventions. *The Lancet*, 389(10077), 1453-1463.
 32. Office of Health Equity, Colorado Department of Public Health and Environment, Health Inequities Fact Sheet 2019: Black/African American Coloradans Fact Sheet. Retrieved from drive.google.com/file/d/1s0dh56JHqKpbduwjh0_9MU-VY_EfBysrg/view.
 33. Anthopolos, R., James, S. A., Gelfand, A. E., & Miranda, M. L. (2011). A spatial measure of neighborhood level racial isolation applied to low birthweight, preterm birth, and birthweight in North Carolina. *Spatial and Spatio-Temporal Epidemiology*, 2(4), 235-246.
 34. Holzman, C., Eyster, J., Kleyn, M., Messer, L. C., Kaufman, J. S., Laraia, B. A., ...Elo, I. T. (2009). Maternal weathering and risk of preterm delivery. *American Journal of Public Health*, 99(10), 1864-1871.
 35. Pregnancy Risk Assessment Monitoring System Data: 2016-2017. Center for Health and Environmental Data, Colorado Department of Public Health and Environment.
 36. Pregnancy Risk Assessment Monitoring System Data: 2016-2017. Center for Health and Environmental Data, Colorado Department of Public Health and Environment.
 37. Shapiro-Mendoza, C. K., Colson, E. R., Willinger, M., Rybin, D. V., Camperlengo, L., & Corwin, M. J. (2015). Trends in infant bedding use: National Infant Sleep Position study, 1993-2010. *Pediatrics*, 135(1), 10.
 38. Malloy, M. H., & MacDorman, M. (2005). Changes in the classification of sudden unexpected infant deaths: United States, 1992-2001. *Pediatrics*, 115(5), 1247-1253.
 39. Iyasu, S., Rowley, D. L., & Hanzlick, R. L. (1996). Guidelines for death scene investigation of sudden, unexplained infant deaths: recommendations of the Interagency Panel on Sudden Infant Death Syndrome. *Morbidity and Mortality Weekly Report: Recommendations and Reports*, i-22.