American Indian/Alaska Native Birth and Maternal Health Outcomes in Louisiana: Investigating Regional Disparities

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Abstract

Objectives To report regional maternal and infant health characteristics in the Louisiana American Indian/Alaska Native (AIAN) population.

Methods This was a cross-sectional descriptive analysis using 2016–2019 Louisiana birth certificate data (N = 242,359; 3205 AIAN births). Prevalence of health characteristics and disparities from population averages were calculated. Health characteristics included low birth weight, preterm birth, very low birth weight, very preterm birth, high birth weight, NICU admission, breastfeeding at discharge, rurality, cesarean section, inadequate prenatal care, and maternal smoking.

Results Low birth weight prevalence ranged from 5.7% in central Louisiana to 20.7% in northeast Louisiana. Most other infant outcomes followed a similar pattern. Disparities from regional averages also varied. AIAN infants had 8% higher risk of LBW than the northeast Louisiana average and 4% lower risk in central Louisiana. Maternal smoking was most prevalent in northern and western Louisiana. Across Louisiana, maternal smoking was as or more prevalent in mothers of AIAN infants compared to regional averages.

Conclusions for Practice There is substantial regional variability in maternal and infant health characteristics in Louisiana AIAN populations, motivating emphasis on locally focused epidemiology to better serve Indigenous communities.

Keywords American Indian and Alaska Native · Indigenous · Perinatal · Maternal and infant health · Epidemiology

Significance Statement

What is already known on this subject? National studies in the United States have identified American Indians and Alaska Natives (AIAN) as being at high risk of adverse maternal and infant health outcomes. Analyses disaggregated at the state level have found considerable variability in prevalence of outcomes and disparities in the AIAN population.

What does this study add? There are no published analyses investigating variability in AIAN maternal and infant health outcomes within a state. This study provides precise prevalence and disparity estimates at the regional level for the Louisiana AIAN population and provides a framework for other states, organizations, and investigators to examine health characteristics in the AIAN populations they serve.

Introduction

National vital records reports in the United States (US) have identified the American Indian/Alaska Native (AIAN) population as having high risk of adverse maternal and infant health outcomes (Baldwin et al., 2002; Grossman et al., 1994; Martin et al., 2019; Sugarman et al., 1994). Based on nationwide data from 2018, compared to non-Hispanic white (NHW) infants, AIAN infants were more likely to be born preterm (11.5% vs. 9.1%) and at low birth weight (8.0% vs. 6.9%) and less likely to be breastfeeding at discharge from the birth facility (75.2% vs. 84.9%) (Martin et al., 2019). Compared to NHW biological mothers (henceforth referred to as mothers), AIAN mothers were more likely to be overweight or obese (67.5% vs. 51.1%) and to report

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pre-pregnancy diabetes (2.4% vs. 0.8%), gestational diabetes (9.9% vs. 6.0%), smoking during pregnancy (15.5% vs. 9.5%), and late prenatal care initiation or no prenatal care (13.1% vs. 4.5%) (Martin et al., 2019). AIAN women are also at higher risk of receiving inadequate prenatal care, and AIAN infants are at increased risk of mortality and high birth weight compared to NHW women and infants, respectively (Baldwin et al., 2002; Dennis, 2018; Tomashek et al., 2006). These disparities are present in both urban and rural areas despite improvements in health outcomes over time (Baldwin et al., 2009; Grossman et al., 2002). Additionally, a multistate analysis of states continuously using the 2003 birth certificate format found that, while AIAN perinatal health outcomes improved between 2006 and 2012, they improved less compared to other racial groups (Margerison-Zilko et al., 2017).

While national studies are essential to inform public health professionals of large scale trends in the US population, results may not reflect the perinatal health landscape in all AIAN communities. Important regional differences exist in AIAN risk factor and health outcome distributions (Dorfman et al., 2015; Grossman et al., 2002; Johnson et al., 2010; U.S. Department of Health and Human Services, Indian Health Service, 2012). While different AIAN populations around the US have been found to be at higher risk of low birth weight, preterm birth, smoking during pregnancy, inadequate prenatal care, infant mortality, high birth weight, and gestational diabetes compared to the NHW population, specific risk ratio estimates have varied by location (Danielson et al., 2018; Grossman et al., 2002; Halvorson et al., 2017; Hwang et al., 2013; Ratnasiri et al., 2018; Scott et al., 2005; Wilson, 2007). An eight-state analysis of the 2004–2011 Pregnancy Risk Assessment Monitoring System (PRAMS) found an association between maternal diabetes and the risk of preterm birth; however, effect estimates varied substantially when the analysis was disaggregated by state (Dorfman et al., 2015).

There are several major gaps in the literature on perinatal health outcomes in AIAN populations in the US. First, national estimates are strongly influenced by the largest AIAN communities in the US such as the Cherokee and Navajo Nations. These estimates may therefore not be reflective of smaller AIAN groups located in other parts of the US. The state-level analyses we identified were done in a handful of states with large AIAN populations. Therefore, these results are not generalizable to other states. We also did not find any studies that examined health outcomes at an intrastate level. Reported state-level statistics may still obscure intra-state regional patterns in risk factors and health outcomes. In Louisiana, regional disparities in perinatal health outcomes have been observed consistently in the general population (Louisiana Bureau of Family Health, 2021). Finally, in all previously published studies we identified,

the AIAN population was compared to other racial groups instead of the population average. While race-focused comparisons are useful for identifying specific racial disparities, comparisons to population averages may be more informative to policy makers and program leadership. Regional public health investments are frequently made based on overall regional outcomes. Comparing race-specific outcomes to these population-level averages can help identify groups in need of additional investment within regions.

The purpose of this analysis was to describe the distribution of maternal and infant health outcomes in the AIAN population in Louisiana by region and to assess disparities compared to regional general population averages. Collectively, the AIAN population makes up approximately 1% of the overall Louisiana population (US Census Bureau, 2020). There are four federally recognized tribes and 11 state recognized tribes in Louisiana, located across the state, in addition to urban AIAN communities and members of tribes from outside the state (Saenz, 2020). Our primary goal is to inform investigators, clinicians, policy makers, and public health professionals working with AIAN communities on maternal and infant health in this population. This project also proposes and demonstrates a simple descriptive analysis strategy that can help state, tribal, and national health organizations assess regional health outcomes to better serve AIAN populations.

Methods

Analytic Design and Data Source

This project was a cross-sectional descriptive analysis using Louisiana vital records data on births occurring to Louisiana residents in Louisiana from January 2016 to December 2019. Data were collected in real time at birth through birth certificates. All individuals with a valid Louisiana birth certificate were included in this analysis, representing a near-census of Louisiana live births (hereafter referred to as births) that occurred during this period (N = 242,359). Data used in this analysis are secondary data that were collected as part of routine public health surveillance; therefore, this project was exempt from IRB review. Vital records data are available by request to the National Center for Health Statistics (Centers for Disease Control and Prevention, 2022).

Representation is important for ensuring that published manuscripts accurately reflect the populations described therein and do not cause harm or stigma. We contacted and made efforts to include the tribal medical directors of the federally recognized and state-recognized tribes in Louisiana during the conceptualization, development, and pre-submission review process for this manuscript. The second

author on this manuscript is a Tribal Liaison for the Louisiana Department of Health.

Variables

Louisiana regions were defined according to the Louisiana Department of Health (LDH) region definitions. A geographic layout of the regions, including the parishes comprising each region, can be seen in Fig. 1.

The variable selection process was conducted in four steps. First, all variables in the birth certificate file were evaluated for relevance. Variables that were not relevant to this project, such as parental and infant identifiers, were immediately excluded from the analysis. In the next stage, variables with substantial amounts of missing data were excluded. The remaining variables were evaluated for accuracy. Where possible, each variable was validated against

other internal data sources known to be of high quality. If inaccuracies were identified, the variable was excluded from the analysis to avoid presenting biased data. Two key variables that were eliminated during this stage were the diabetes and hypertension indicators in the birth certificate files, which provided severe underestimates of diabetes and hypertension prevalence, respectively. Finally, the remaining variables were checked for sufficient counts. Variables that met other quality criteria but had low counts for all Louisiana regions were excluded.

The variables selected for analysis were organized into categories for presentation. Infant outcomes included low birth weight (< 2500 g; LBW), preterm birth (< 37 completed weeks gestation; PTB), very low birth weight (< 1500 g; VLBW), very preterm birth (< 32 completed weeks gestation; VPTB), high birth weight (> 4000 g; HBW), neonatal intensive care unit (NICU) admission (yes/
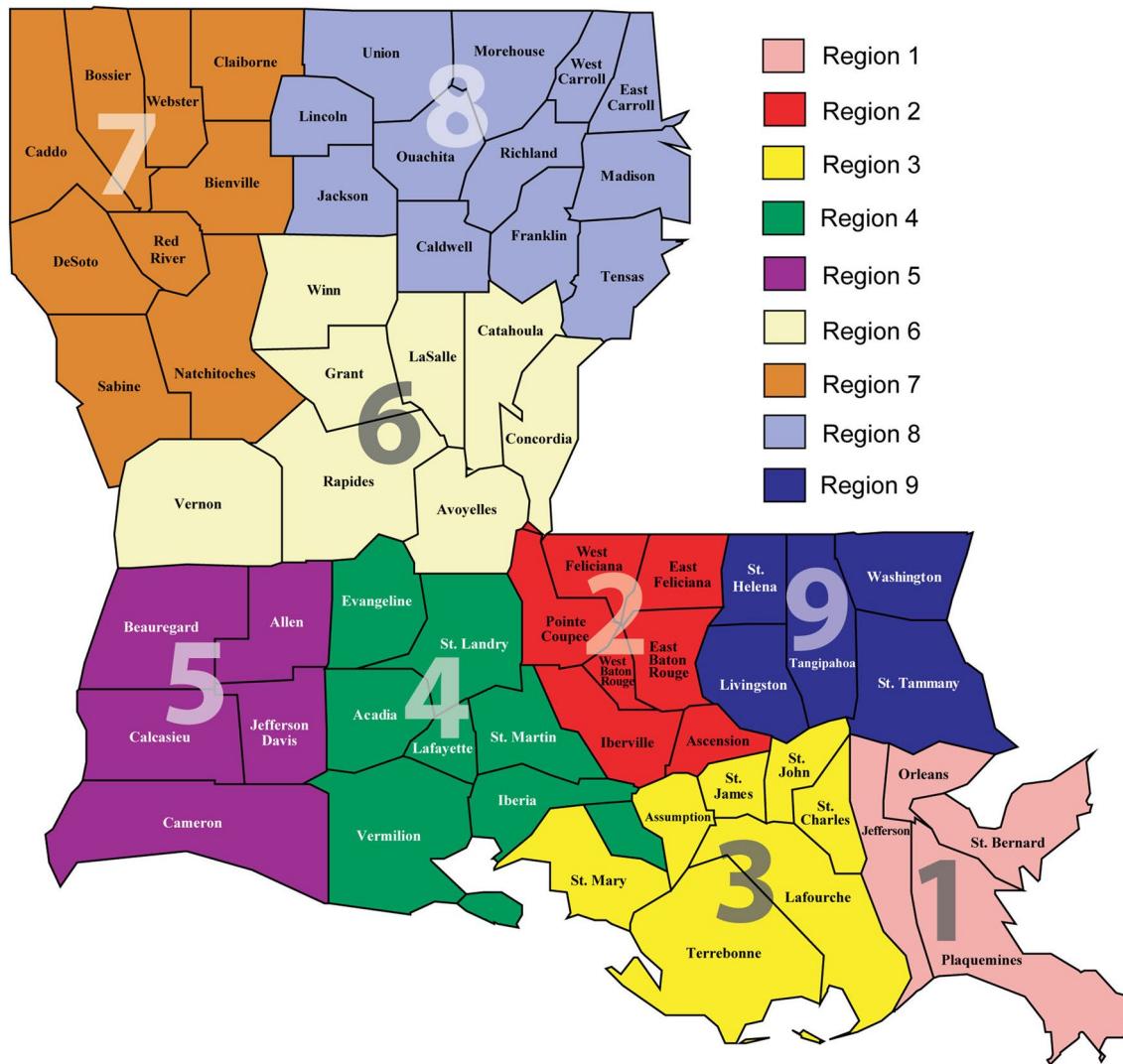

Fig. 1 Louisiana Department of Health regions

no), and breastfeeding at discharge (yes/no). Maternal characteristics included rural residence (yes/no), cesarean delivery (yes/no), inadequate prenatal care (yes/no; assessed via the Kotelchuck index) (Kotelchuck, 1994), and smoking during pregnancy (yes/no). Additional maternal demographic variables included maternal age, high school diploma (yes/no), Medicaid (yes/no), and pre-pregnancy obesity (yes/no). AIAN birth was defined as a birth for which at least one parent was identified as AIAN on the birth certificate, whether alone or in combination with another race or ethnicity.

Statistical Analysis

AIAN births during 2016–2019 by LDH region are presented in a map overlaid with the locations of the government headquarters of Louisiana's state and federally recognized tribes and in a summary table. Demographic data for mothers of AIAN infants are presented by region in a table. Confidence intervals and statistical testing were conducted according to National Center for Health Statistics guidance, assuming a binomial distribution for percentages (Martin et al., 2007). Categorical variables were summarized using frequencies and percentages, and regional differences were tested using z tests for differences in proportions and Fisher's exact tests in cases with small expected cell sizes. Continuous variables were summarized using medians and interquartile ranges, and regional differences were tested using Kruskal-Wallis tests. Variables of interest were aggregated at the region level and presented as percentages. For each variable, percentage was defined as the number of births having the characteristic divided by the total number of births multiplied by 100. Percentages were calculated for all births and AIAN births. Percent disparity was defined as the percent of the variable of interest in all births subtracted from the percent of the variable of interest in AIAN births for each region. Percentages and percent disparities are presented in maps for each selected variable.

Statistical significance was defined a priori as $\alpha = 0.05$. Data management and calculation of percentages and percent disparity were completed using SAS 9.4. Figures were produced using R version 4.0.4.

Results

Total Births

Between January 2016 and December 2019, there were 3205 AIAN births in Louisiana. LDH region 3, where the federally recognized Chitimacha Tribe of Louisiana and four state-recognized tribal communities including the United Houma Nation are headquartered, had the most AIAN births with 1239, followed by region 7 in northwest Louisiana with

548. The regions with the fewest AIAN births were Region 8 with 111 and region 6 with 158 (Supplementary Table 1). Figure 2 shows the distribution of the tribal headquarters of Louisiana's federally recognized and state-recognized tribes. While there is a correlation between the location of the headquarters and where many members of these tribes live, there may be tribal members living outside the region. Conversely, there may be members of other tribes not headquartered in a region who live in that region. The figure is intended as an aid to show the distribution of Louisiana's largest AIAN communities (Fig. 2).

Maternal Demographics

All maternal demographic variables were found to vary significantly by region. Median maternal age ranged from 24 years old in region 6 to 29 years old in region 9. The percentage who achieved at least a high school diploma ranges from 77.0% in region 3 to 91.8% in region 9. Percent on Medicaid ranged from 54.4% in region 6 to 76.0% in region 3. There was also considerable spread in obesity rates by region, ranging from 24.7% in region 6 to 42.2% in region 3 (Supplementary Table 1).

Birth and Infant Outcomes

Figure 3 shows the distribution of birth outcomes of interest by LDH region. Prevalence of LBW in AIAN births varied widely by region, ranging from 5.7% (95% CI: 2.1, 9.3) in region 6 in central Louisiana to 20.7% (95% CI: 13.2, 28.3) in region 8 in northeast Louisiana. Disparities from regional population averages also varied widely for LBW. AIAN infants had about 8% (95% CI: 0.8, 15.9) higher prevalence of LBW than the regional average in region 8. AIAN infants in region 6, however, had about 4% (95% CI: – 8.5, – 1.2) lower prevalence of LBW compared to the region's overall prevalence. Similar regional patterns in prevalence and disparities were observed for PTB. In most of Louisiana, AIAN infants had lower or slightly elevated prevalence of VLBW and VPTB compared to the overall prevalence in the region. HBW prevalence ranged from 3.8% (95% CI: 1.8, 5.9) in region 1 to 7.9% (95% CI: 3.9, 11.9) in region 2, the Baton Rouge capital region. The greatest disparity was found in region 2, the prevalence of HBW in AIAN infants was 2.8% (95% CI: – 1.2, 6.8) greater than the general population prevalence. NICU admission rates were highest in regions 8 (17.1%; 95% CI: 10.1, 24.1) and 9 (15.2%; 95% CI: 10.8, 19.6). In other regions of the state, AIAN infants had somewhat lower prevalence of NICU admission compared to the general population. For example, in region 3, infants had 2.8% (95% CI: – 4.1, – 1.5) lower prevalence of NICU admission. Prevalence of breastfeeding at discharge was highest in region 9 in southeast Louisiana and lowest

Fig. 2 Total number of AIAN births by LDH region, 2016–2019. Numbers mark the headquarters of state and federally recognized tribes in Louisiana. Key - 1: Louisiana Band of Choctaw Indians; 2: United Houma Nation; 3: Isle de Jean Charles Band; 4: Point au Chien Tribe; 5: Grand Caillou/Dulac Band; 6: Chitimacha Tribe of Louisiana; 7: Coushatta Tribe of Louisiana; 8: Four Winds Cherokee Tribe; 9: Clifton Choctaw Tribe of Louisiana; 10: Jena Band of Choctaw Indians; 11: Tunica-Biloxi Tribe of Louisiana; 12: Adai Caddo Indians of Louisiana; 13: Natchitoches Tribe of Louisiana; 14: Choctaw-Apache Tribe of Ebarb; 15: Biloxi Chitimacha Confederation/Bayou Lafourche Band
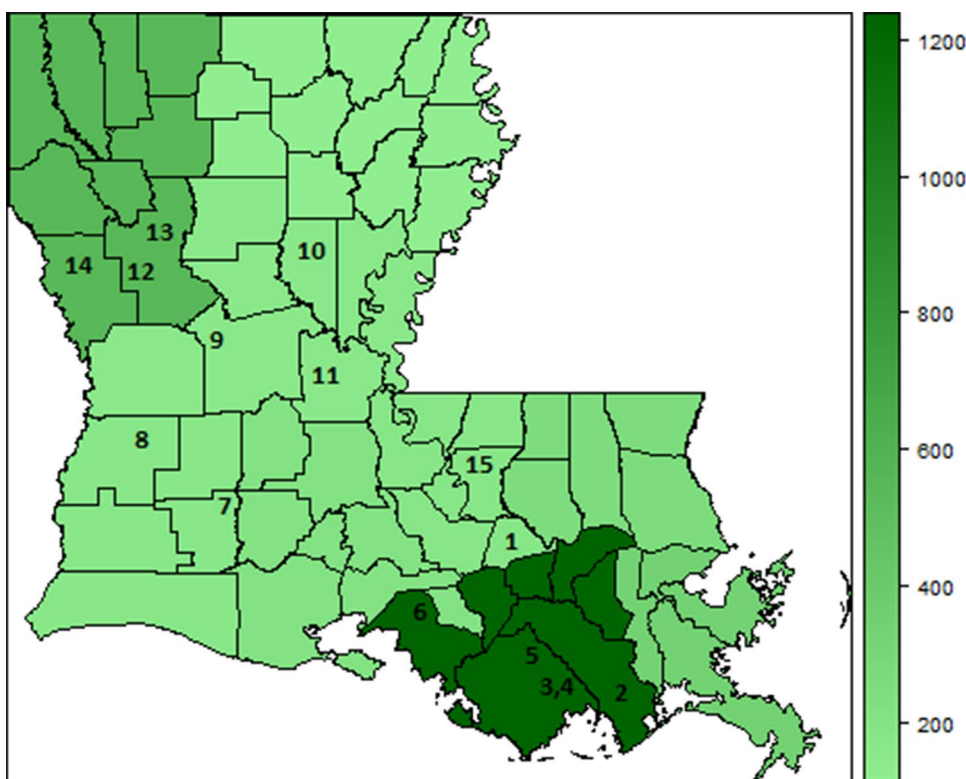
in regions 3 and 8. However, breastfeeding at discharge among mothers of AIAN infants across all Louisiana regions was similar to or exceeded general population rates. AIAN infants in region 8 had about 15% (95% CI: 6.4, 24.6) higher probability to be breastfeeding at discharge from the birthing facility compared to the general population of region 8 (Supplementary Table 2).

Maternal Characteristics

The distribution of maternal characteristics by LDH region can be seen in Fig. 4. Rural residence for mothers of AIAN infants ranged from 0% in region 1, Louisiana's most urbanized region comprising much of the New Orleans metropolitan statistical area, to 70.9% in region 6 in central Louisiana. The largest disparity from the general population was found in region 7. The major population centers in region 7 are Shreveport and Bossier City in the northern portion of the region, while the AIAN population in this region is centered on Sabine and Natchitoches Parishes in the southern part of the region. Cesarean delivery prevalence was higher in the northern and western regions of the state, and mothers of AIAN infants in Louisiana's central regions had lower prevalence of cesarean delivery compared to the population average. Prenatal care inadequacy was most prevalent in region 2, where 24.9% (95% CI: 18.5–31.2) of mothers of AIAN infants received inadequate prenatal care. Mothers of AIAN infants in region 4 had 6% (95% CI: 0.8, 11.4)

greater prevalence of inadequate prenatal care compared to the population average. Prevalence of smoking during pregnancy was highest in the northern and western regions of Louisiana. Across the state, smoking during pregnancy was as or more prevalent in mothers of AIAN infants compared to mothers overall. The largest disparity was found in region 8, where mothers of AIAN infants had 7.9% (95% CI: 1.2, 14.6) greater prevalence of smoking during pregnancy compared to the general population of the region (Supplementary Table 2).

Comparisons with Statewide Prevalence

Statewide comparisons of AIAN infants and the general population of infants are presented in Supplementary Table 2. Of all statewide comparisons, AIAN infants were found to differ significantly from general population prevalence for only four variables (NICU admission, rurality, inadequate prenatal care, and maternal smoking). At a regional level, significant differences in prevalence were found for all but one variable (high birth weight). Statewide comparisons therefore did not capture important disparities such as the disparity in low birth weight in region 8 and the greater proportion breastfeeding at discharge in six of Louisiana's nine regions.
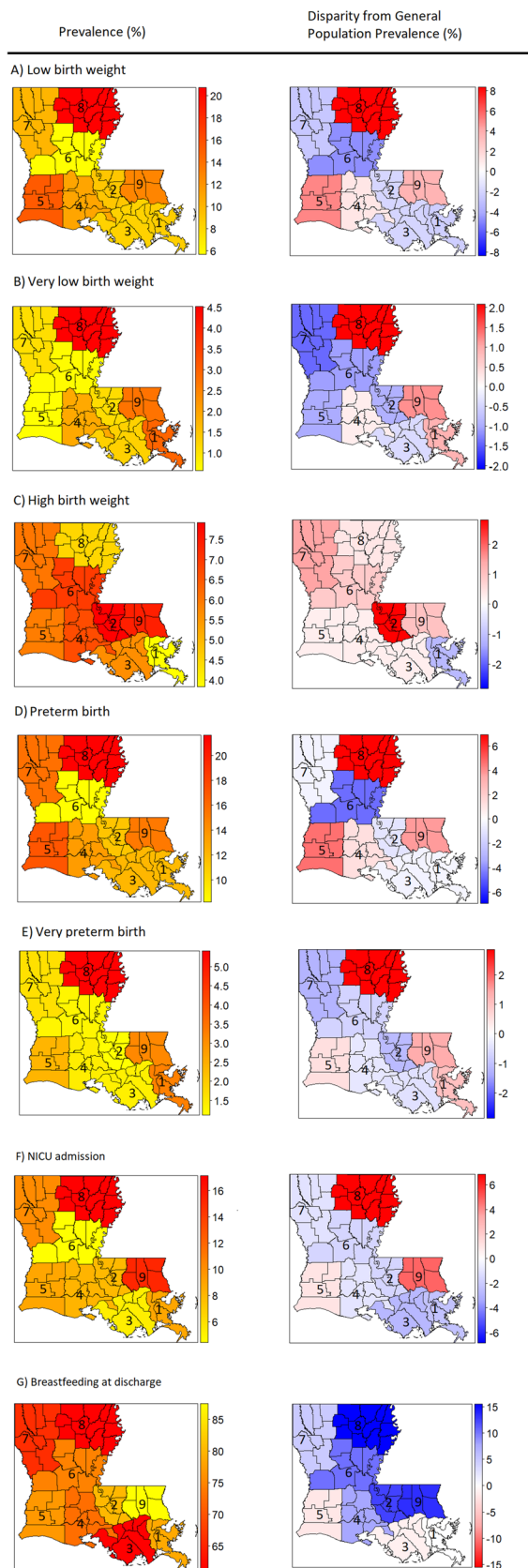
Fig. 3 Prevalence and disparities in adverse infant birth outcomes by LDH region

Regional Summary

At least one significant disparity from regional averages was detected in each region. Region 1 had significantly higher prevalence of maternal smoking in mothers of AIAN infants compared to the region as a whole (7.4% vs. 2.6%); no other significant differences were detected. Region 2 had significantly lower prevalence of cesarean delivery in mothers of AIAN infants compared to the regional population (26.6% vs. 33.7%) and significantly higher prevalence of maternal smoking (6.8% vs. 2.6%) and breastfeeding (80.2% vs. 67.7%). Region 3 had significantly lower prevalence of LBW (8.3% vs. 10.4%) and NICU admission (5.2% vs. 8.1%) in AIAN infants despite having significantly higher prevalence of maternal smoking (9.7% vs. 6.2%). We found a significantly higher prevalence of inadequate prenatal care in mothers of AIAN infants in region 4 (17.7% vs. 11.6%); despite this disparity, breastfeeding at discharge was more common in AIAN infants compared to the general population (72.7% vs. 64.8%). More mothers of AIAN infants in region 5 lived in rural areas (51.5% vs. 30.2%) and smoked during pregnancy (14.8% vs. 8.0%) compared to the general population. AIAN infants in region 6 had significantly lower prevalence of LBW (5.7% vs. 10.5%) and PTB (8.2% vs. 12.9%) and a greater proportion were breastfeeding at discharge (74.7% vs. 64.3%) compared to the general population. We found the greatest number of significant differences between AIAN infants and the general population in region 7. In this region, AIAN infants had lower prevalence of LBW (10.0% vs. 12.7%), VLBW (1.1% vs. 2.5%), and VPTB (1.6% vs. 2.9%), and a greater proportion was breastfeeding at discharge (65.9% vs. 61.0%) and delivered via cesarean section (41.4% vs. 37.2%). Their mothers had higher rates of residing in rural areas (45.6% vs. 17.0%) and smoking during pregnancy (15.3% vs. 8.6%). AIAN infants in region 8 had significantly greater prevalence of LBW (20.7% vs. 12.4%) and breastfeeding (61.3% vs. 45.8%), and their mothers had greater prevalence of birth via cesarean section (54.1% vs. 38.1%) and smoking during pregnancy (15.3% vs. 7.4%). Finally, we found a higher prevalence of NICU admission (15.2% vs. 10.4%) and a higher proportion breastfeeding at discharge (87.5% vs. 74.1%) in AIAN infants in region 9 compared to the general population. Compared to other regions, region 8 tended to have the highest prevalence of adverse outcomes, while region 6 had the lowest. Prevalence estimates and disparities by region can be seen in Supplementary Table 2.

Fig. 4 Prevalence and disparities in maternal characteristics
by LDH region
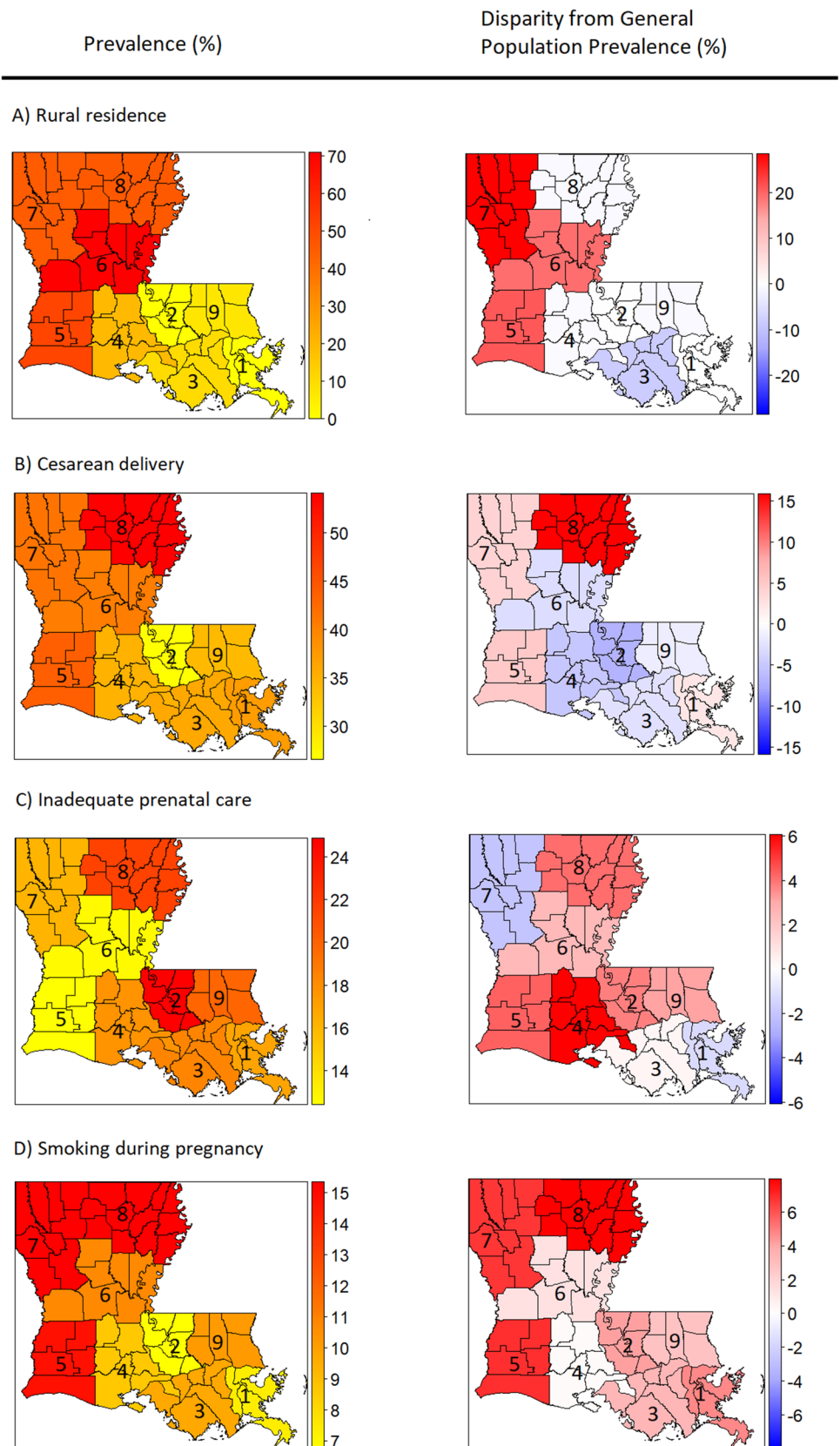
Discussion

This is the first manuscript to examine regional patterns in birth and perinatal characteristics in the AIAN population in Louisiana. Because the analysis is based on a near-census of births, the results presented are precise and subject to limited sources variability. The results illustrate the regional diversity in health characteristics and outcomes within the AIAN population and identify regions with especially disparate perinatal characteristics and outcomes in AIAN infants and their mothers. This analysis identified some patterns consistent with national studies and studies in other states (Baldwin et al., 2002; Dennis, 2018; Scott et al., 2005; Tomashek et al., 2006). Compared to the general population, smoking during pregnancy in mothers of AIAN infants was elevated across Louisiana, and in much of the state, the prevalence of inadequate prenatal care was higher in mothers of AIAN infants. However, other previously reported results were not replicated in the Louisiana AIAN population (Halvorson et al., 2017). The prevalence of high birth weight was only slightly elevated in AIAN infants in most of the state. Since diabetes is a major risk factor for high birth weight, the smaller observed disparity may be due to lower rates of diabetes in the Louisiana AIAN population compared to AIAN populations in other states (Mayo Clinic Staff, 2022). Overall, AIAN infants had the most adverse outcomes in region 8, and adverse outcomes tended to be more common in AIAN infants compared to the region's general population. Region 8 is a largely rural and sparsely populated region of Louisiana, with five of the ten least populated parishes in the state located in the region (US Census Bureau, 2022). Three of the four parishes in Louisiana with the highest poverty rates in the state are also located in region 8, including East Carroll Parish, which has the seventh highest poverty rate in the United States with 37.6% of the population living beneath the federal poverty line (US Census Bureau, 2021). The disparately adverse outcomes in AIAN infants in region 8 highlight this rural and economically disadvantaged region as an area requiring additional focus to improve outcomes and reduce disparities.

This analysis also identified several regions and outcomes for which AIAN infants had better outcomes compared to the general populations of the regions. Throughout Louisiana, AIAN infants were breastfeeding at discharge from birthing facility at similar or higher proportions than the general population. AIAN infants in region 6 (central Louisiana) also had lower prevalence of low birth weight and preterm birth. Regional differences in maternal demographics and health characteristics may partially explain these results. Mothers of AIAN infants in region 6 had the lowest proportion covered by Medicaid and the lowest obesity rate in the state. However, Region 3, which had the highest obesity prevalence, the lowest proportion with a high school diploma, and a high proportion of mothers covered by Medicaid, had lower rates of high birth weight and NICU admission compared to region 6. These results indicate that measured maternal demographics do not fully explain the regional patterns in birth outcomes that we observed in this study. Understanding the individual and community level factors that are associated with these lower risks will be an important tool for developing programs and interventions to improve outcomes and reduce disparities in other regions and communities.

This analysis has some limitations. First, tribal enrollment is not collected on Louisiana birth certificates, so it was not possible to determine the distribution of outcomes and risk factors in specific tribes. This limitation may be addressed with further data sharing and collaboration between state vital records and tribal communities. Developing and expanding mechanisms for sharing these data with tribes would democratize the data and allow tribes to assess maternal and infant health according to their own priorities and local interests. Second, maternal smoking during pregnancy tends to be underestimated on birth certificates. However, the disparity assessment showing elevated maternal smoking in mothers of AIAN infants may be useful to policymakers and smoking cessation programs regardless. We used absolute disparity measures in our analysis. These metrics are useful for summarizing differences in prevalence, but they cannot be used to calculate relative measures such as odds ratios or relative risks. Calculating relative measures requires different methodology and is beyond the scope of this paper; however, relative measures can serve as an important next step to help investigators and public health professionals understand why certain disparities are being observed. Regional population proportions used for comparison in this study are dependent on the demographics in that region, including race distribution, age structure, and income, among other factors. Analyzing how these factors impact overall population outcomes and associated disparities is beyond the scope of this paper; however, future investigations should build on our results by investigating this broader context. Finally, this analysis was not an exhaustive assessment of all perinatal risk factors and outcomes for AIAN infants and their mothers. The scope of the project was limited by the data and variables collected as part of the Louisiana birth certificate. To gain a comprehensive understanding of perinatal health in the AIAN population, other risk factors and outcomes should be considered as well.

Future studies should focus on how demographic factors influence perinatal outcomes in AIAN communities. An analysis of 2004–2013 vital records data found that AIAN women over 30 were at higher risk of adverse obstetric outcomes compared to non-Hispanic white and Asian and Pacific Islander women (Schummers et al., 2019). Another

article also identified significant urban-rural differences within the American Indian infant group. AIAN women residing in rural areas were significantly less likely to receive adequate prenatal care, and AIAN women in urban areas were significantly more likely to have a low-birth-weight infant (Baldwin et al., 2002). A substantial proportion of American Indian mothers report multiple races—a 5-state analysis of birth certificate records in 2003 found that more American Indian women reported multiple races than a single race (Hamilton & Ventura, 2007). Multiracial status was associated with preterm birth in that article, with single race AI mothers experiencing higher rates than multiracial AI mothers (Hamilton & Ventura, 2007). How these variables interact with perinatal outcomes and risk factors in the Louisiana AIAN population is unclear and should be examined further.

Based on our results, policy makers in Louisiana should consider the increased rates of adverse birth outcomes in mothers of AIAN infants in region 8 when making investments to address disparities in the state. Targeted efforts should be made to increase prenatal care visits in mothers of AIAN infants, since the prevalence of inadequate prenatal care is higher than average in most parts of Louisiana. While these results are not tribe-specific, they can help tribal health departments have a fuller picture of AIAN birth outcomes in their area, since this may include other tribal jurisdictions and populations of non-enrolled AIAN people or migrants from other areas. Investigators should also identify the individual- and community-level protective factors that led to fewer adverse birth outcomes in region 6 and better breastfeeding outcomes relative to the general population in most regions in the state. Identifying these factors can help public health professionals design new interventions that may help reduce disparities in mothers of AIAN infants in other regions of the state and improve breastfeeding outcomes in the general population of Louisiana. In a clinical setting, providers should stay informed on the risk profiles for adverse birth outcomes in their region. Clinicians in region 8 especially should be aware that mothers of AIAN infants are at much higher risk of adverse birth outcomes compared to the rest of the population. Increased clinical monitoring during pregnancy may help prevent some adverse events in this high-risk population.

One of the goals of this project was to provide a framework for other state organizations and stewards of large data sets to assess health outcomes and risk factors in small populations. Using this approach, investigators can learn useful information about small populations in their state or jurisdiction that historically may have been overlooked and underserved. Examining health in these populations at a more granular level can help uncover specific areas of need, identify points of intervention for prevention and mitigation efforts, and inform health equity efforts. By comparing health outcomes in small populations to regional averages as opposed to other specific groups, this analytic strategy also avoids framing these populations as purely disadvantaged and allows for richer interpretation of results. Our analysis demonstrates that, in the AIAN population, the risks of adverse perinatal outcomes and disparities relative to population averages are not uniformly distributed across Louisiana. These results underscore the heterogeneity and diversity within the Louisiana AIAN community and motivate more disaggregated analyses in this population and other small populations in the state to effectively identify and address community needs.

Through this analysis, we found substantial regional variability in AIAN maternal and infant health characteristics. Our results highlight the importance of locally focused AIAN epidemiology. Assuming national or state-level metrics apply to individual AIAN communities can lead to incorrect conclusions and inefficient public health interventions. Our project provides valuable data for public health efforts in Louisiana focused on AIAN maternal and infant health, but we also hope it will motivate other states and jurisdictions to conduct regional and local epidemiology that can better serve their AIAN communities.

Declarations

References

Baldwin, L., Grossman, D. C., Murowchick, E., Larson, E. H., Hollow, W. B., Sugarman, J. R., & Hart, L. G. (2009). Trends in perinatal and infant health disparities between rural american Indians and Alaska natives and rural whites. *American Journal of Public Health, 99*(4), 638–646. https://doi.org/10.2105/AJPH.2007.119735

Baldwin, L. M., Grossman, D. C., Casey, S., Hollow, W., Sugarman, J. R., Freeman, W. L., & Hart, L. G. (2002). Perinatal and infant health among rural and urban american Indians/Alaska natives. *American Journal of Public Health, 92*(9), 1491–1497.

Centers for Disease Control and Prevention. (2022). *Restricted-use vital statistics data.* Centers for Disease Control and Prevention. Retrieved June 17, 2022, from https://www.cdc.gov/nchs/nvss/nvss-restricted-data.htm

Danielson, R. A., Wallenborn, J. T., Warne, D. K., & Masho, S. W. (2018). Disparities in risk factors and birth outcomes among american Indians in North Dakota. *Maternal and Child Health Journal, 22*(10), 1519–1525. https://doi.org/10.1007/s10995-018-2551-9

Dennis, J. A. (2018). Birth weight and maternal age among american Indian/Alaska native mothers: A test of the weathering hypothesis. *SSM Population Health, 7*, 4. https://doi.org/10.1016/j.ssmph.2018.10.004

Dorfman, H., Srinath, M., Rockhill, K., & Hogue, C. (2015). The association between diabetes mellitus among american Indian/Alaska native populations with preterm birth in eight US states from 2004–2011. *Maternal and Child Health Journal, 19*(11), 2419–2428. https://doi.org/10.1007/s10995-015-1761-7

Grossman, D. C., Baldwin, L., Casey, S., Nixon, B., Hollow, W., & Hart, L. G. (2002). Disparities in infant health among american Indians and Alaska Natives in US metropolitan areas. *Pediatrics, 109*(4), 627. https://doi.org/10.1542/peds.109.4.627

Grossman, D. C., Krieger, J. W., Sugarman, J. R., & Forquera, R. A. (1994). Health status of urban american Indians and Alaska natives: A population-based study. *Jama, 271*(11), 845–850. https://doi.org/10.1001/jama.1994.03510350055037

Halvorson, K. L., Vogt, H. B., Kightlinger, L., & Stevens, D. (2017). The impact of maternal diabetes, obesity and race on infant birth weights in South Dakota. *South Dakota Medicine: The Journal of the South Dakota State Medical Association, 70*(2), 61–66.

Hamilton, B. E., & Ventura, S. J. (2007). Characteristics of births to single- and multiple-race women: California, Hawaii, Pennsylvania, Utah, and, & Washington 2003. *National Vital Statistics Reports: From the Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics System, 55*(15), 1–20.

Hwang, M., Shrestha, A., Yazzie, S., & Jackson, M. L. (2013). Preterm birth among american Indian/Alaskan natives in Washington and Montana: Comparison with non-hispanic whites. *Maternal and Child Health Journal, 17*(10), 1908–1912. https://doi.org/10.1007/s10995-012-1215-4

Johnson, P. J., Call, K. T., & Blewett, L. A. (2010). The importance of geographic data aggregation in assessing disparities in american indian prenatal care. *American Journal of Public Health, 100*(1), 122–128. https://doi.org/10.2105/AJPH.2008.148908

Kotelchuck, M. (1994). The adequacy of prenatal care utilization index: Its US distribution and association with low birthweight. *American Journal of Public Health, 84*(9), 1486–1489. https://doi.org/10.2105/ajph.84.9.1486

Louisiana Bureau of Family Health. (2021). Maternal and child health data indicators. Retrieved June 18, 2022, from https://ldh.la.gov/page/398

Margerison-Zilko, C., Talge, N. M., & Holzman, C. (2017). Preterm delivery trends by maternal race/ethnicity in the United States, 2006–2012. *Annals of Epidemiology, 27*(11), 689–694. https://doi.org/10.1016/j.annepidem.2017.10.005

Martin, J., Hamilton, B., Sutton, P., Ventura, S., Menacker, F., Kirmeyer, S., & Munson, M. (2007). Births: Final data for 2005. *National Vital Statistics Reports, 56*(6), 1–103.

Martin, J. A., Hamilton, B. E., Osterman, M. J. K., & Driscoll, A. K. (2019). Births: Final data for 2018. *National Vital Statistics Reports: From the Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics System, 68*(13), 1–47.

Mayo Clinic Staff. (2022). Fetal Macrosomia. Mayo Clinic. Retrieved June 18, 2022, from https://www.mayoclinic.org/diseases-conditions/fetal-macrosomia/symptoms-causes/syc-20372579

Ratnasiri, A. W. G., Parry, S. S., Arief, V. N., DeLacy, I. H., Lakshminrusimha, S., Halliday, L. A., & Basford, K. E. (2018). Temporal trends, patterns, and predictors of preterm birth in California from 2007 to 2016, based on the obstetric estimate of gestational age. *Maternal Health, Neonatology and Perinatology, 4*, 25. https://doi.org/10.1186/s40748-018-0094-0

Saenz, M. (2020). Federal and state recognized tribes. List of Federal and State Recognized Tribes. Retrieved June 18, 2022, from https://www.ncsl.org/legislators-staff/legislators/quad-caucus/list-of-federal-and-state-recognized-tribes.aspx

Schummers, L., Hacker, M. R., Williams, P. L., Hutcheon, J. A., Vanderweele, T. J., McElrath, T. F., & Hernandez-Diaz, S. (2019). Variation in relationships between maternal age at first birth and pregnancy outcomes by maternal race: A population-based cohort study in the United States. *British Medical Journal Open, 9*(12), e033697–e033697. https://doi.org/10.1136/bmjopen-2019-033697

Scott, S., Fogarty, C., Day, S., Irving, J., & Oakes, M. (2005). Smoking rates among american indian women giving birth in Minnesota. A call to action. *Minnesota Medicine, 88*(12), 44–49.

Sugarman, J. R., Brenneman, G., LaRoque, W., Warren, C. W., & Goldberg, H. I. (1994). The urban american indian oversample in the 1988 national maternal and Infant Health Survey. *Public Health Reports (Washington D C : 1974), 109*(2), 243–250.

Tomashek, K. M., Qin, C., Hsia, J., Iyasu, S., Barfield, W. D., & Flowers, L. M. (2006). Infant mortality trends and differences between american Indian/Alaska native infants and white infants in the United States, 1989–1991 and 1998–2000. *American Journal of Public Health, 96*(12), 2222–2227.

U.S. Department of Health and Human Services, Indian Health Service. (2012). Regional differences in Indian health 2012 edition. Retrieved June 18, 2022, from https://www.ihs.gov/sites/dps/themes/responsive2017/display_objects/documents/RegionalDifferences2012Edition.pdf

US Census Bureau. (2020). Quick facts Louisiana. Retrieved June 18, 2022, from https://www.census.gov/quickfacts/LA

US Census Bureau. (2021). SAIPE state and county estimates for 2020. Census.gov. Retrieved June 8, 2022, from https://www.census.gov/data/datasets/2020/demo/saipe/2020-state-and-county.html

US Census Bureau (2022). County population totals: 2020–2021. Census.gov. Retrieved June 8, 2022, from https://www.census.gov/data/tables/time-series/demo/popest/2020s-counties-total.html

Wilson, A. L. (2007). The state of South Dakota's child: 2006 *South Dakota Medicine: The Journal of the South Dakota State Medical Association, 60*(1), 7–9.

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