HEALTHY MOMS. STRONG BABIES.

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MATERNITY CARE DESERTS AND LEVEL OF ACCESS TO MATERNITY CARE

DATA SOURCES AND VARIABLES USED

The descriptive analysis utilized county level data from the Area Health Resource File 2021-22 (AHRF)[1] which includes data from the 2020 American Hospital Association (AHA) Annual Survey and 2019 Small Area Health Insurance Estimates (SAHIE). Data on births from 2021 National Center for Health Statistics (NCHS) natality file was linked to the AHRF. Key variables from the AHRF include hospitals (short-term general hospitals with obstetric care), providers (certified nurse midwives, obstetrician, general, providing patient care), social determinants of health (Rural-Urban Continuum, 2013) and health insurance (females 18-64 without health insurance). Rural was defined as a county with an urban population of 2,500 to 19,999, 20,000 or more, not adjacent to a metro area, or completely rural ('four' on the Rural-Urban Continuum). Data on population of women ages 15-44 years was obtained directly from 2020 U.S. Census data. Information on birthing centers was obtained from the American Association of Birth Centers (AABC)[2] and reflects all operating birthing centers across the U.S. for 2021.

March of Dimes 2023 state level Maternity Care Desert reports introduce an updated definition of maternity care deserts and level of access to maternity care. The new definition includes an additional data point provided by the American Board of Family Medicine (ABFM)[3] that enables the inclusion of family physicians who reported that they provided obstetric care*. The data is reflective of the survey of medicine physicians from 2017-2020. Family physicians were included to more accurately reflect the availability of maternity care access at the county level. Family physicians are considered an important part of the maternity care workforce and increase access to care in rural, small or isolated communities.

Level of maternity care access was classified by the following criterion:

Maternity care desert: no hospitals providing obstetric care, no birth centers, no obstetricians, no certified nurse midwives and no family practice physicians.

Low access: less than 2 hospitals or birthing centers offering obstetric service and fewer than 60 obstetric providers per 10,000 births, and the proportion of women without health insurance was 10 percent or greater.

Moderate access: less than 2 hospitals or birthing centers offering obstetric service and fewer than 60 obstetric providers per 10,000 births, and the proportion of women without health insurance was less than 10 percent.

Full access: two or more hospitals or birthing centers offering obstetric services or more than 60 obstetric providers per 10,000 births.

For Puerto Rico, due to the unavailability of insurance data, low and moderate access categories were combined as "limited access" and defined as less than 2 hospitals or birthing centers offering obstetric service and fewer than 60 obstetric providers per 10,000 births.

CALCULATIONS

All analyses were done using SAS Software version 9.4 (SAS Institute Inc)[4]. Percent change in the number of hospitals and/or obstetric providers was calculated by comparing the number of hospitals and/or providers in the 2021-22 AHRF to the number of birthing hospitals and/or obstetric providers in the 2020-21 AHRF. The percent of babies born in maternity care deserts and rural counties are presented by race/ethnicity and at the state level, respectively. The percent of obstetric providers working in rural counties within each state was calculated using 2021-22 AHRF data and 2013 urban rural continuum codes.[2]

LIMITATIONS

The AHRF was a primary data source for this section of the report. Estimates in the AHRF come from a variety of other data sources and are all reported by county. Suppression criteria, other analytic decisions and data source limitations were not known for every data source represented in the AHRF and may skew estimates when data are aggregated across counties. The use of obstetric care hospitals and birth centers did not account for the provision of prenatal care in other clinical care settings (i.e., federally qualified health care centers, hospital satellite clinics). Our analysis does not account for the quality of the health care received, nor the appropriateness of the level of care a woman might receive. Designations of access are made at the county level, and therefore may generalize the availability of care in large or diverse counties.

*This material is based upon data provided by the American Board of Family Medicine. The views expressed herein are those of the authors and do not necessarily reflect the position or policy of the ABFM.

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DISTANCE TO CARE

DATA SOURCES AND VARIABLES USED

This analysis relied on zip code level data from two primary data sets depending on the availability for each state. The most recent Healthcare Cost and Utilization Project – State Inpatient Database (HCUP-SID)[5] was utilized for all states with available data (Appendix A).
This dataset consists of patient-level records for all inpatient hospitalizations and includes information allowing for the identification of all births occurring within the state and the number of weeks gestation at the time of birth using International Classification of Diseases, Tenth Revision (ICD-10) codes.[6] We identified all births by zip code of patient residence. We excluded records with non-viable births and missing gestational age or missing outcome of delivery (Appendix B). When HCUP data was unavailable for a particular state, we utilized the U.S. Census Bureau's American Community Survey (ACS) 5-year fertility data, 2017-2021,[7] which estimates the number of women who gave birth in the last 12 months for each zip code across all states. The Puerto Rico Department of Health provided data for all resident births in 2021 by zip code.

To minimize overestimation of travel distance at the zip code level, population weighted centroid locations for each zip code were matched to residential zip codes for all births.[8] Point location data for spatial analyses were obtained from the Department of Housing and Urban Development (HUD), Office of Policy Development and Research (PD&R) and reflects zip code centroid locations weighted by population density as of September 2022.[9]

Rural-Urban Continuum codes, developed by the U.S. Department of Agriculture, Economic Research Service, was used to classify counties as urban/rural or metro/non-metro.[10] Rural was defined as a county with an urban population of 2,500 to 19,999, 20,000 or more, not adjacent to a metro area, or completely rural. Non-metro was defined as an urban population of 20,000 or more adjacent or non-adjacent to a metropolitan area, an urban population of 2,500 to 19,999 adjacent or non-adjacent to a metropolitan area, or completely rural.

Data for Washington, D.C. is presented by wards to show nuances that cannot be seen at the county level. The District is divided into eight wards, based on population and administrative boundaries, and represents redistricting lines as of 2022. Data for Hawaii is presented by islands and limited to islands with more than 10 reported census births; there was no birth data for the islands of Lana'i or Kaho'olawe.

Birthing hospital point locations were ascertained from the 2021 aha file.11 birthing hospitals were classified if they met any of the following criteria:

- A "yes" response to whether they provide obstetric services
- Reported having one or more obstetric care beds

CALCULATIONS

ArcGIS Pro, version 3.0 was utilized for all geospatial analyses.[12] AHA data included hospital latitude and longitude point locations for geocoding. Driving distance and drive time was calculated using ArcGIS Pro Network Analyst Extension.[13] The Network Analysis (also referred to as Transport Network Analysis), includes data for streets, railroads, ferries and pedestrian walkways. Distance to obstetric care was defined as the shortest driving distance, in miles, by car from the population weighted centroid of women's residential zip code to the nearest AHA obstetric hospital location. Driving distance, along a road route, is the recommended method to estimate geographic accessibility instead of using straight-line Euclidian distance.[14-17] To approximate real world phenomena in road travel we did not specify a time of day to account for variability in traffic conditions in our network analysis.

Statistical analyses were done using SAS Software, version 9.4.[4] Average distance traveled overall by state, in miles and minutes, was calculated using the mean distance for all births by zip code to their closest AHA facility. To limit extreme values in reporting of average travel, state distance data were winsorized at the 99th percentile. Travel time cutoffs of 30-minutes and 60-minutes are used to describe the percentage of birthing people living far from obstetric care. We aggregated zip code data to the county level to compare distances traveled for birthing people living in urban and rural areas, by maternity care designation and for mapping purposes. The "Distance to Birthing Hospital" map is displayed by county level quantiles and distributions vary state by state. Counties with 10 births or fewer are suppressed (grayed on map).

LIMITATIONS

The AHA survey relies on hospital self-reporting and the potential for missing data due to the underreporting of obstetric care is high. AHA uses the most currently available information, however hospitals added since the 2021 survey was completed may not have complete data and hospitals that closed after the reporting period are still included.

Distance data is limited to hospitals included in the AHA that properly reported providing obstetric care and only includes hospitals that responded within the reporting period for 2021. Overall, hospitals included in the analysis accounted for 86% of births, however, this varied significantly by state. Verification of birthing hospitals was completed for the following states via contact with representatives from the State or Territorial health departments: Hawaii, Alaska and Puerto Rico.

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AVAILABILITY OF FAMILY PLANNING SERVICES

DATA SOURCES AND VARIABLES USED

This analysis utilized Title X point location data obtained from the Office of Population Affairs (OPA) [18] and reflects all funded locations as of March 1, 2023. All unduplicated Title X sites listed as sub recipients and/or service sites were included in the analysis. The Title X service grant is under the authority of the federal U.S. Department of Health and Human Services (HHS), in the OPA. Title X clinics are federally funded healthcare sites that provide low-cost reproductive healthcare services which includes all FDA-approved contraceptive products and natural family planning methods such as: pregnancy prevention and birth spacing, pregnancy testing and counseling, assistance to achieve pregnancy, basic infertility services, sexually transmitted infection services, and other preconception health services.[18]

Estimates for reproductive age women by zip code were obtained from ACS 5-year Data Release, 2017-2021, using average population estimates for women ages 15-50.[7]

County level maternity risk data related to reproductive health care was obtained from the Reproductive Healthcare theme of the Maternal Vulnerability Index (MVI) created by Surgo Ventures.[19] This reproductive healthcare theme include indicators measuring the availability of family planning and reproductive services, abortion policies, and the availability of skilled attendants. The MVI is the first county level, national-scale, open-source tool to identify where and why mothers in the United States are vulnerable to poor pregnancy outcomes and pregnancy-related deaths. The MVI includes not only widely-known clinical risk factors, but also key social, contextual, and environmental factors that are essential influencers of outcomes. Differences in counties are measured using numerous factors broken into six themes: reproductive healthcare, physical health, mental health and substance abuse, general healthcare, socioeconomic determinants and physical environment. The MVI assigns a score of 0-100 to each geography, where a higher score indicates greater vulnerability to adverse maternal outcomes. Learn more about the MVI methodology by visiting Surgo Ventures website: https://mvi.surgoventures.org/.

CALCULATIONS

Geospatial analyses for drive time and drive distance was calculated in ArcGIS Pro-Network Analyst Extension as previously described (see Distance to Care). [12,13] Title X address locations were geocoded, to obtain locational data, with a match score of 98.6% (a score of 100% indicates a perfect match for address locating). Addresses that failed automatic geocoding were manually located using Google Maps.

Average driving distance to Title X site in each state was calculated using the weighted mean for all women of reproductive age from their residential zip code to the nearest Title X service site. We aggregated zip code data for reproductive age women to the county level to compared distances traveled by maternity care access designation. We determined the proportion of counties in each state with low/very low or high/very high vulnerability based on an MVI score of less than 40 or greater than 60, respectively. The number of Title X clinics per 100,000 reproductive age women was calculated by dividing the number of Title X clinics in the state by the number of reproductive age women in the state and multiplying by 100,000.

LIMITATIONS

Title X grantees are required to report any deletions, additions or changes to the name, location, and services provided for service sites within 30 days, therefore some information may be outdated. Locations presented in this report were up to date as of March 1st, 2023.

Limitations of the MVI can be found in the following publication: found here.[20]

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DISPARITIES IN PRENATAL CARE

DATA SOURCES AND VARIABLES USED

This analysis utilized several data sources and varied for each state. The main outcomes, inadequate prenatal care and no prenatal care, were derived using variables from the 2019-2021 NCHS natality files.[21] Birth data for 2019-2021 for Puerto Rico was obtained from the Puerto Rico Department of Health. Adequacy of prenatal care is measured using the Adequacy of Prenatal Care Utilization Index, which classifies prenatal care received into 1 of 4 categories (inadequate, intermediate, adequate and adequate plus) by combining information about the timing of prenatal care, the number of visits and the infant's gestational age.[22] Inadequate prenatal care is defined as a woman who received care beginning in the fifth month or later or less than 50% of the appropriate number of visits for the infant's gestational age. No prenatal care is defined as having no prenatal care visits. Race/Ethnicity was categorized using bridged race categories provided by NCHS. Expanded groups were provided for Hawaii and Alaska.

Each state report includes an examination of the proportion of women who received inadequate prenatal care by race/ethnicity and stratified by a single county level community factor. Data for community level factors were derived from either the 2021 ACS estimates for reproductive age women in poverty[23] or two themes from the MVI: physical environment and socioeconomic determinants.[19] Note: the overall MVI is explained in more detail in the "Availability of Family Planning" Section. MVI's physical environment theme is an index based on violent crime rates, housing conditions, pollution and access to transportation. The socioeconomic determinants theme is an index based on educational attainment, poverty, food insecurity and social support. Community level factors chosen for each state are presented in Appendix C.

CALCULATIONS

All analyses were done using SAS Software, version 9.4.[4] For each state, a community level factor was selected which had the overall greatest association with a woman's reception of inadequate prenatal care. Counties were categorized as high/low exposure to each county level factor. For poverty, low exposure was determined if the county had a poverty rate less than the state average poverty rate and high exposure was equal to or above the state average. For MVI themes, counties were classified as higher or lower exposure based on index scores ranging from 0-100. Cut-off points between high and low were determined for each theme by analyzing the distribution of scores nationally and selecting a cut-off with a more even proportion of counties in both the higher and lower exposure groups. The socioeconomic determinants factor classified counties as lower vulnerability if their index score was low or very low, and higher vulnerability counties were those with index scores of moderate, high, or very high. The physical environment factor classified counties as lower vulnerability if their index score was moderate, low, or very low, and higher vulnerability counties were those with index scores of high or very high.

Percent of inadequate prenatal care by race/ethnicity and at the state level were provided, stratified by higher or lower county level exposure. Odds ratios were calculated to examine the association between living within a high factor county and inadequate prenatal care, among selected race/ethnicity groups as well as BIPOC. Race/ethnicity groups with less than 10 births in a high or low exposure group were excluded. Adequacy of prenatal care could not be determined due to missing data and were excluded from analysis in 2.8% of U.S. natality data and 2.1% of Puerto Rico natality data.

LIMITATIONS

The poor validity of data related to prenatal care utilization from natality records has been well documented.[24] In recent years, data collection improvements have been made which have increased the reliability of this data, however, improvements may vary across hospitals and within states. Despite improvement, misclassification of adequacy of prenatal care may occur. Community level factors included in this analysis reflect county level data and may not adequately capture variation within large or diverse counties. Limitations of the MVI can be found in the following publication: found here.[20]

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CHRONIC HEALTH AND PRETERM BIRTH

DATA SOURCES AND VARIABLES USED

This analysis utilized data from the 2017-2021 NCHS natality files.[21] Birth data for 2019-2021 for Puerto Rico was obtained from the Puerto Rico Department of Health. The preterm birth outcome is defined as a birth with less than 37 weeks gestation based on the obstetric estimate of gestational age. The following chronic health conditions were included based on their association with preterm birth and availability within natality data: smoking before pregnancy, being obese or underweight before pregnancy (defined as a body mass index (BMI) greater than or equal to 30 or less than 18.5, respectively), or having diabetes or hypertension before pregnancy. Preterm birth by ward was calculated using HCUP data for D.C.[5] The ICD-10 diagnosis codes used to classify a birth as preterm are shown in Appendix D.

CALCULATIONS

All analyses were done using SAS Software, version 9.4.[4] The preterm birth rate was calculated by state, county and by the number of chronic health conditions (none, 1, 2 or more). The chronic health burden for each county was calculated by determining the percent of women with 1 or more chronic health condition. The cut off for high/low chronic health burden was based on the overall prevalence of 1 or more chronic health conditions at the state level. For example, if the overall prevalence of 1 or more chronic health conditions was 30% in a state, any county with a prevalence greater than or equal to 30% was considered a high burdened county. The cut off for high/low rate of preterm birth was determined based on the Healthy People 2030 target for preterm birth of 9.4%. Therefore, any county with a rate of preterm birth greater than or equal to 9.4% was considered a high prevalence county. Records without complete information on gestational age at birth (1.4%) or any of the chronic health conditions were excluded from the analysis (2.7% of all births). Counties with less than 10 preterm births or women with chronic health conditions were suppressed on state maps (118 total counties in U.S. and Puerto Rico).

LIMITATIONS

The poor validity of data from natality records has been well documented.[24] In recent years, data collection improvements have been made which have increased the reliability of this data, however, improvements may vary across hospitals and within states. Despite improvement, misclassification of pre-pregnancy health conditions and BMI may occur. Smoking before pregnancy is self-report and may be underreported.

Data on 2.2% of all births were missing information related to BMI. This often happens when women receive inadequate or no prenatal care. Having inadequate or no prenatal care is a risk factor for poor birth outcomes including preterm birth. By excluding births without complete information on chronic health conditions, the preterm birth rate is underreported. The preterm birth rate in the excluded population was 15.0% which results in a preterm birth rate in the analytical population that is lower than the preterm birth rate before exclusion of those with missing data. Preterm birth rates presented in the main text for this analysis reflect the rate prior to the exclusion of women without complete data on chronic health conditions.

TELEHEALTH

Telehealth is defined as healthcare delivered remotely using communication technologies to expand and enhance access to health care services. Utilizing data provided by Center for Connected Health Policy,[25] this report measures telehealth policies in states and whether they allow for reimbursement of multiple telehealth modalities: live video, remote patient monitoring and/or audio only.

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APPENDIX A: DISTANCE DATA SOURCE AND YEAR

State	Year	Source
Alabama	2017-2021	Census
Alaska	2017-2021	Census
Arizona	2021	HCUP
Arkansas	2017-2021	Census
California	2017-2021	Census
Colorado	2019	HCUP
Connecticut	2017-2021	Census
Delaware	2020	HCUP
Dist. of Columbia	2020	HCUP
Florida	2020	HCUP
Georgia	2019	HCUP
Hawaii	2017-2021	Census
Idaho	2017-2021	Census
Illinois	2017-2021	Census
Indiana	2020	HCUP
Iowa	2021	HCUP
Kansas	2017-2021	Census
Kentucky	2021	HCUP
Louisiana	2017-2021	Census
Maine	2017-2021	Census
Maryland	2020	HCUP
Massachusetts	2017-2021	Census
Michigan	2020	HCUP
Minnesota	2020	HCUP
Mississippi	2021	HCUP
Missouri	2019	HCUP
Montana	2017-2021	Census
Nebraska	2019	HCUP
Nevada	2017-2021	Census
New Hampshire	2017-2021	Census
New Jersey	2020	HCUP
New Mexico	2017-2021	Census
New York	2019	HCUP
North Carolina	2020	HCUP
North Dakota	2017-2021	Census
Ohio	2017-2021	Census
Oklahoma	2017-2021	Census
Oregon	2020	HCUP
Pennsylvania	2017-2021	Census
Puerto Rico	2021	Puerto Rico Department of Health
Rhode Island	2019	HCUP
South Carolina	2017-2021	Census
South Dakota	2020	HCUP
Tennessee	2017-2021	Census
Texas	2017-2021	Census
Utah	2020	HCUP
Vermont	2020	HCUP
Virginia	2017-2021	Census
Washington	2020	HCUP
West Virginia	2017-2021	Census
Wisconsin	2020	HCUP
Wyoming	2017-2021	Census

APPENDIX B: ICD-10 EXCLUSION CODES

Exclusions	Code Type	Exclusion Codes
Non-viable births	ICD-10-CM	Z3A01: Less than 8 weeks gestation of pregnancy
		Z3A08: 8 weeks gestation of pregnancy
		Z3A09: 9 weeks gestation of pregnancy
		Z3A10: 10 weeks gestation of pregnancy
		Z3A11: 11 weeks gestation of pregnancy
		Z3A12: 12 weeks gestation of pregnancy
		Z3A13: 13 weeks gestation of pregnancy
		Z3A14: 14 weeks gestation of pregnancy
		Z3A15: 15 weeks gestation of pregnancy
		Z3A16: 16 weeks gestation of pregnancy
		Z3A17: 17 weeks gestation of pregnancy
Missing gestational age	ICD-10-CM	Z3A00: Weeks of gestation of pregnancy not specified
Missing outcome of delivery	ICD-10-CM	Z379: Outcome of delivery, unspecified

APPENDIX C: COMMUNITY LEVEL FACTOR BY STATE

State	Community Level Factor
Alabama	Socioeconomic Vulnerability
Alaska	Socioeconomic Vulnerability
Arizona	Poverty
Arkansas	Socioeconomic Vulnerability
California	Socioeconomic Vulnerability
Colorado	Poverty
Connecticut	Environmental Vulnerability
Delaware	Poverty
Florida	Environmental Vulnerability
Georgia	Socioeconomic Vulnerability
Hawaii	Socioeconomic Vulnerability
Idaho	Socioeconomic Vulnerability
Illinois	Environmental Vulnerability
Indiana	Socioeconomic Vulnerability
Iowa	Environmental Vulnerability
Kansas	Socioeconomic Vulnerability
Kentucky	Poverty
Louisiana	Poverty
Maine	Poverty
Maryland	Poverty
Massachusetts	Socioeconomic Vulnerability
Michigan	Environmental Vulnerability
Minnesota	Socioeconomic Vulnerability
Mississippi	Poverty
Missouri	Socioeconomic Vulnerability
Montana	Socioeconomic Vulnerability
Nebraska	Poverty
Nevada	Socioeconomic Vulnerability
New Hampshire	Poverty
New Jersey	Poverty
New Mexico	Environmental Vulnerability
New York	Socioeconomic Vulnerability
North Carolina	Poverty
North Dakota	Environmental Vulnerability
Ohio	Environmental Vulnerability
Oklahoma	Socioeconomic Vulnerability
Oregon	Socioeconomic Vulnerability
Pennsylvania	Socioeconomic Vulnerability
Puerto Rico	Poverty
Rhode Island	Poverty
South Carolina	Environmental Vulnerability
South Dakota	Socioeconomic Vulnerability
Tennessee	Poverty
Texas	Socioeconomic Vulnerability
Utah	Environmental Vulnerability
Vermont	Poverty
Virginia	Socioeconomic Vulnerability
Washington	Socioeconomic Vulnerability
West Virginia	Poverty
Wisconsin	Poverty
Wyoming	Socioeconomic Vulnerability

APPENDIX D: ICD-10 PRETERM BIRTH CODES

Outcome	Code Type	Inclusion Codes
Preterm Birth	ICD-10-CM	Z3A17-Z3A36: gestational age between 17 weeks (Z3A17) and 36 weeks (Z3A36)
		O601, O6010, O6010X0, O6012, O6012X0, O6013, O6013X0, O6014, O6014X0