2024 MATERNITY CARE DESERTS REPORT
TECHNICAL NOTES

MATERNITY CARE DESERTS

DATA SOURCES AND VARIABLES USED

The maternity care designation analysis used various county level data sources, many of which were updated from previous reports. Hospitals with obstetric units were identified using the 2022 American Hospital Association (AHA) survey. Information on birthing centers was obtained from the American Association of Birth Centers (AABC) and reflects all operating birthing centers across the US for 2023. Obstetric clinicians (those that are trained and licensed to deliver babies) include the following: certified nurse-midwives (CNMs), certified midwives (CMs), obstetrician-gynecologists (OB-GYNs), and family physicians who reported delivering babies. CNMs and CMs counts were estimated using the November 2023 National Provider Identifier (NPI) file from the Centers for Medicaid and Medicare Services (CMS) using methods described here. OB-GYNs, both MDs and DOs, were obtained from the 2022-2023 Area Health Resource File (AHRF), provided by the Health Resources and Services Administration (HRSA). Counts of family physicians that reported delivering babies were provided by the American Board of Family Medicine (ABFM) and included responses between 2019 and 2022.

Rurality categories were identified from the Economic Research Service's Rural Urban Continuum codes, where 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. Data on population of women aged 15-44 years was obtained directly from 2022 US Census estimates. Estimates of the percentage of uninsured women aged 19-54 years were from the US Census' American Community Survey (ACS) 5-year estimates.

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

Maternity care desert: no hospitals providing obstetric care, no birth centers, no obstetric clinicians.

Low access: less than 2 hospitals or birthing centers offering obstetric services, fewer than 60 obstetric clinicians per 10,000 births, and the proportion of women aged 19-54 without health insurance was 10 percent or greater.

Moderate access: less than 2 hospitals or birthing centers offering obstetric services, fewer than 60 obstetric clinicians 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 clinicians per 10,000 births.

CALCULATIONS

All analyses were done using SAS Software version 9.4 (SAS Institute Inc). Percentages of counties, women, and babies were calculated for maternity care deserts. Proportions of total births to maternity care residents were calculated by race/ethnicity, and sociodemographic characteristics (median household income, uninsured rates, and rurality) were evaluated as county-level averages.

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LIMITATIONS

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) or for other clinicians who may deliver care (i.e. nurse practitioners, certified professional midwives). 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, especially in metropolitan areas. Additionally, care designations do not take individual contributors to access, such as vehicle/transportation availability or other barriers to receiving care.

INADEQUATE PRENATAL CARE AND PRETERM BIRTH

DATA SOURCES AND VARIABLES USED

Inadequate prenatal care, no prenatal care, and preterm birth were derived using variables from the 2020-2022 NCHS natality files. 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. 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. Births that received no prenatal care are also included in overall inadequate care estimates. Preterm births are identified by the obstetric estimate of gestational age in the birth certificate and include all births before the 37th week of gestation. Race/ethnicity was categorized using bridged race categories provided by NCHS.

CALCULATIONS

Inadequate prenatal care, no prenatal care, and preterm births are calculated as a percentage of total live births. Increased likelihood of an outcome was calculated using an unadjusted logistic regression model with maternity access designation as the exposure.

LIMITATIONS

Adequacy of prenatal care and preterm birth could not be determined due to missing data and were excluded from analysis in 2.62% and 0.07%, respectively, of US natality data. The poor validity of data related to prenatal care utilization from natality records has been well documented. 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. Regarding preterm birth, obstetric estimates have been shown to vary in precision and agreement with medical record by jurisdiction. Other potential errors have also been documented, such as rounding gestational age to the nearest whole number rather than rounding down to the nearest completed week.

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MATERNITY CARE ACCESS SCORE

DATA SOURCES AND VARIABLES USED

In 2022, HRSA developed maternity care target areas (MCTAs) to identify existing primary care shortage areas that also have limited access to maternity care. The methodology of HRSAs MCTA scoring can be found in detail here. Because HRSAs MCTA scores are only available for primary care shortage areas, this analysis calculated scores for all US counties with an adjusted definition based on the original HRSA methodology. Maternity care access score calculations required a variety of data sources. The table below outlines the factors related to maternity care access scores and how they are defined.

Factor	Definition
Population to maternity care clinician ratio	The number of reproductive-aged women compared to the number of maternity care clinicians.
Income level	The percentage of people at or below 200% of the Federal Poverty Level (FPL).
Travel time and distance to care	The time/distance a person would travel by car to the closest maternity care hospital.
Fertility rate	The number of births per 1,000 reproductive-aged women.
Maternal Vulnerability Index (MVI)	Maternal vulnerability to poor maternal and infant health outcomes.
Maternal health indicators	The proportions of birthing people with pre-pregnancy diabetes, obesity, and cigarette smoking, and that initiated prenatal care in the first trimester.
Population to behavioral health professional ratio	The number of reproductive-aged women compared to the number of mental health professionals.

To estimate the population to maternity care clinician ratio, OB-GYN counts were derived from HRSA's 2022-2023 AHRF, family provider counts were from the ABFM survey (2019-2022), and CNM/CM counts were from CMS National Plan and Provider Enumeration System (NPPES), November NPI 2023 file. Counts of women were from US Census Bureau, 2022 ACS 5-Year Estimates. County level poverty rates were from US Census Bureau, 2022 ACS 5-Year Estimates. Travel time and distance to care data sources and calculations are explained in detail on page 8. Fertility rates were estimated from the previously mentioned census data source for women and live birth counts were from 2022 NCHS natality data. Maternal Vulnerability Index scores were from Surgo Health's Maternal Vulnerability Index. Maternal health indicators, including pre-pregnancy hypertension, pre-pregnancy obesity, pre-pregnancy hypertension, and prenatal care initiation in the first trimester were derived from NCHS natality data. Behavioral health professional counts were from HRSA's 2022-2023 AHRF.

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MATERNITY CARE ACCESS SCORE

CALCULATIONS

The table below outlines the scoring methodology for maternity care access scores. Factors with an asterisk (*) indicate that the scoring method or data source differs from the published HRSA methodology.

Factor	Score distribution	Points associated
Maternal health: Pre-pregnancy hypertension	Prevalence of pre-pregnancy hypertension ≥75th percentile	1
	Prevalence of pre-pregnancy hypertension <75th percentile	0
Maternal health: Pre-pregnancy diabetes	Prevalence of pre-pregnancy diabetes ≥75th percentile	1
	Prevalence of pre-pregnancy diabetes <75th percentile	0
Maternal health: Pre-pregnancy obesity	Prevalence of pre-pregnancy obesity ≥75th percentile	1
	Prevalence of pre-pregnancy obesity <75th percentile	0
Maternal health: Prenatal Care Initiation in the 1st Trimester	Prevalence of No Prenatal Care in First Trimester ≥75th percentile	1
	Prevalence of No Prenatal Care in First Trimester <75th percentile	0
Maternal Vulnerability Index*	Maternal Vulnerability ≥ 75th percentile	2
	75th Percentile > Maternal Vulnerability ≥50th Percentile	1
	Maternal Vulnerability <50th Percentile	0
Fertility Rate	Fertility Rate ≥90th Percentile	2
	90th Percentile >Fertility Rate ≥50th Percentile	1
	Fertility Rate <50th Percentile	0
Travel time and distance*	Time ≥ 90 min or Distance ≥ 90 miles	5
	90 min > Time ≥ 75 min or 90 miles > Distance ≥ 75 miles	4
	75 min > Time ≥ 60 min or 75 miles > Distance ≥ 60 miles	3
	60 min > Time ≥ 45 min or 60 miles > Distance ≥ 45 miles	2
	45 min > Time ≥ 30 min or 45 miles > Distance ≥ 30 miles	1
	Time < 30 min and Distance < 30 miles	0

TABLE CONTINUED

Factor	Score distribution	Points associated
Income level	Percentage of population with income at or below 200% FPL ≥ 50%	5
	50% > Percentage of population with income at or below 200% FPL ≥ 45%	4
	45% > Percentage of population with income at or below 200% FPL ≥ 40%	3
	40% > Percentage of population with income at or below 200% FPL ≥ 35%	2
	35% > Percentage of population with income at or below 200% FPL ≥ 30%	1
	Percentage of population with income at or below 200% FPL < 30%	0
Population to maternity care clinician ratio	Ratio ≥ 6,000:1, or No CNMs or OB-GYNs and Population (Pop) ≥ 500	5
	6,000:1 > Ratio ≥ 5,000:1, or No CNMs or OB-GYNs and Pop ≥ 400	4
	5,000:1 > Ratio ≥ 3,000:1, or No CNMs or OB-GYNs and Pop ≥ 300	3
	3,000:1 > Ratio ≥ 2,000:1, or No CNMs or OB-GYNs and Pop ≥ 200	2
	2,000:1 > Ratio ≥ 1,500:1, or No CNMs or OB-GYNs and Pop ≥ 100	1
	Ratio < 1,500:1, or No CNMs or OB-GYNs and Pop < 100	0
Population to behavioral health professional ratio	Portion or all of MCTA service area is designated as a Mental Health HPSA meeting the following population-to-provider ratio thresholds based on its mental health provider type • Psychiatrist ONLY: Psychiatrist population-to provider ratio ≥ 45,000:1 • Core Mental Health: Core mental health population-to provider ratio ≥ 18,000:1 • Psychiatrist and Core Mental Health: Psychiatrist population-to-provider ratio ≥ 35,000:1 and Core mental health population-to-provider ratio ≥ 6,000:1 • No Psychiatrists or Core Mental Health Providers: ≥ 7,500: 0	1
	Portion or all of MCTA service area is designated as a Mental Health HPSA and does not meet the population-to-provider ratio thresholds above, OR is not designated as a Mental Health HPSA	0

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HOSPITALS AND BIRTH CENTERS

DATA SOURCES AND VARIABLES USED

Individual hospital-level data were provided by the AHA. The AHA Annual Survey includes Indian Health Service (IHS) hospitals and address locations for geographic analyses. Due to the nature of self-reported obstetric care services from the AHA annual survey, we performed a secondary validation of AHA hospital locations using the CMS Provider of Service (POS) files for 2020-2022 following methods of obstetric hospital identification described by prior research here. Obstetric hospitals were selected if they met the following criteria:

AHA selection: hospital reported obstetric care [OBHOSP=1] and hospital had at least 1 obstetric care bed [OBBD >= 1] ***OR*** hospital had at least 10 births in the reporting year [BIRTHS >= 10] and hospital did not report the status of obstetric care.

CMS POS selection: provider of services end of year (Q4) 2022 file indicated obstetric services are provided [OB_SRVC_CD >= 1].

Accredited birth center locations by county were provided by the AABC. Birth facility data from NCHS natality records were used to assess infant place of birth and demographics of birthing people (race/ethnicity, insurance, and education). Historic datasets were used for obstetric unit and birth center comparisons over time.

CALCULATIONS

Obstetric hospital and birth center counts were aggregated at the county and state level. Natality data were used to calculate percentages of infants born in hospitals and birth centers, including the respective demographic distribution of each birth population. Hospital obstetric unit closures were identified using validated datasets from 2020 to 2022, with the absence of obstetric services in 2021 or 2022, after being present in 2020. Counts of birth centers were compared between 2017 and 2023.

LIMITATIONS

Response rates of the AHA hospital data vary across states and health systems; however, validation using CMS data allowed for additional identification of hospitals with obstetric care available across the nation. Additionally, NCHS natality data does not delineate between infants born at accredited and non-accredited birth centers, and therefore infant outcomes must be presented for all birth center born infants.

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OBSTETRIC CLINICIANS

DATA SOURCES AND VARIABLES USED

Obstetric clinician data were gathered from a variety of sources. CNM and CM counts were estimated using the November 2023 NPI file from CMS. OB-GYNs, both MDs and DOs, were obtained from the 2022-2023 AHRF, provided by HRSA. Counts of family physicians that reported delivering babies were provided by the ABFM and included responses between 2019 and 2022. 2022 NCHS natality data was used to assess attending clinicians at time of birth and number of births by county.

CALCULATIONS

Counts of OB-GYNs, CNM/CMs, and family physicians were aggregated at the county and state level and were used to create overall obstetric clinician ratios per 10,000 live birth. Historical data were used to estimate OB-GYN specific, state-level ratios, stratified by rurality to explore trends over time. OB-GYN ratios were also stratified by state level policies associated with obstetric practices. Counts of overall family physicians surveyed were used to estimate the proportion of family physicians that reported delivering babies. Percentages of births attended by CNM/CMs were calculated and presented at the state level.

LIMITATIONS

Regarding CNM/CMs, with limited data from the NPI, certification and education of providers lacking credential information could not be verified. Additionally, though each provider has a single NPI throughout their career, there is no data to confirm the location information was up to date. State licensure variations may also cause misclassification of some midwives. For family physicians, the AAFP data relies on survey responses. Because of this, there is the potential that not all eligible family physicians were captured. This report includes clinicians that are licensed to deliver babies, which doesn't not include other clinicians that may deliver prenatal care, including nurse practitioners.

INSURANCE

DATA SOURCES AND VARIABLES USED

Percentages of women 19-54 years who were uninsured were estimated using ACS 5-year estimates of the counts of women within that age group and the counts of uninsured women from B27001: Health Insurance Coverage Status by Sex by Age tables. Insurance information for birth data came from NCHS natality records, which identifies the insurance payment sourced used at time of birth.

CALCULATIONS

Percentages of uninsured women were calculated at the county and state level. Uninsured rates were also stratified by state level Medicaid expansion. State's policy was determined using the following source: expansion and extension.

LIMITATIONS

While the ACS is a largely utilized and methodologically advanced data source, it has several potential limitations. As a survey, response bias, missingness, and imputation decisions may all impact data accuracy.

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TRAVEL TIME TO CARE AND HOT SPOT ANALYSIS

DATA SOURCES AND VARIABLES USED

The main variable of interest was travel time, measured in minutes, from residential locations to the nearest birthing hospital. Additionally, travel distance, in miles, to the nearest birthing hospital and areas with hot and cold spots for travel time were calculated. This data was aggregated to represent county-level averages, offering a comprehensive view of accessibility across different regions.

The initial analysis was completed at the census tract- level, utilizing census tract-level birth data from the US Census Bureau's ACS 5-year fertility estimates for 2017-2021. Point location data for spatial analyses was obtained from the Department of Housing and Urban Development (HUD), Office of Policy Development and Research (PD&R), reflecting census tract centroid locations weighted by population density. These centroids were merged with residential census tracts ACS data to weight distances by the total births. Birthing hospitals were classified based on criteria from the AHA annual survey and the CMS POS files as previously described.

CALCULATIONS

All geospatial analyses were conducted using ArcGIS Pro, version 3.0. AHA data provided hospital latitude and longitude point locations for geocoding. Driving distance and drive time were calculated using the ArcGIS Pro Network Analyst Extension. This extension includes data for streets, railroads, ferries, and pedestrian walkways. Travel time to birthing hospitals was defined as the shortest drive time, in minutes, from the population-weighted centroid of each residential census tract to the nearest AHA obstetric hospital. Distance was defined as the shortest drive -time, in miles, from the population-weighted centroid of each residential census tract to the nearest AHA obstetric hospital. To approximate real-world travel along a road network, we did not specify a time of day to account for traffic variability.

Statistical analyses were performed using SAS Software, version 9.4. Average travel distance and times, both in miles and minutes, were calculated based on the mean travel for all births by census-tract to the nearest AHA facility. Census tract data were aggregated at the county level to compare travel distances for birthing people by maternity care designation and urban and rural classifications. Travel time cutoffs of 15, 30, and 60 minutes were used to describe the percentage of birthing people living far from obstetric care. Counties with 10 or fewer births were suppressed (grayed out on the map).

HOT SPOT ANALYSIS

For the hot spot analysis, the Optimized Hot Spot Analysis tool in ArcGIS Pro 3.0 was employed to identify statistically significant spatial clusters of high and low values. The Optimized Hot Spot Analysis calculated the degree to which travel times to obstetric hospitals were clustered spatially. Areas with significantly high travel times were identified as "hot spots," while areas with significantly low travel times were identified as "cold spots." The tool applied the Getis-Ord Gi* statistical test to determine the significance of clusters, considering factors such as the spatial distribution of travel times and the underlying data distribution. For interpretability, hot and cold spot results were classified using categories of "high confidence" to "extremely high confidence" based on the confidence interval cutoffs of 90%, 95% and 99%.

TRAVEL TIME TO CARE AND HOT SPOT ANALYSIS - CONTINUED

LIMITATIONS

Aggregating data at the county level can minimize variations within counties. Some areas within a county may have different travel times to the nearest obstetric hospital, which can be lost in the aggregation process. Additionally, travel times used in the analysis are estimates and may not capture real-world variations due to traffic conditions, road quality, seasonality, and other factors that can impact travel time.

FERTILITY

DATA SOURCES AND VARIABLES USED

Fertility rates were estimated using US Census 2017-2022 population data for counts of women aged 14-44 years and NCHS 2017-2022 natality data for counts of live births.

CALCULATIONS

Fertility rates were calculated by maternity care access designation across all years that maternity care desert reports have been released and reflect the designations determined at the time of the report. For example, the current report (2024 designations) reflects data on women and babies from 2022, therefore the 2022 fertility rates presented were associated with 2024 maternity care designations. The same is true for each year presented, such as 2017 women and baby datafrom the 2018 report and is reflective of 2018 designations. Fertility rates were also presented by rurality over time.

LIMITATIONS

As it is a survey, US Census data has the potential for estimation errors from non-response and sampling biases.

CHRONIC CONDITIONS

DATA SOURCES AND VARIABLES USED

This analysis utilized data from the 2015-2022 NCHS natality files. The following pre-pregnancy chronic health conditions were included based on their availability within natality data: smoking, obesity (as defined by a body mass index of over 30), diabetes, and hypertension. Additionally, births were identified that had any one of the conditions listed previously. Rurality information was taken from the urban-rural continuum as previously described. Birthing person race/ethnicity was from natality data.

CALCULATIONS

Percentages of each chronic condition among all live births were calculated per year from 2015 to 2022. Percent change was calculated to compare changes in the prevalence of conditions during 2015 and 2022. Percentages of chronic conditions were also calculated by rurality and birthing person race/ethnicity.

CHRONIC CONDITIONS - CONTINUED

LIMITATIONS

The poor validity of chronic health data from natality records has been well documented. In recent years, data collection improvements have been made which have increased this data's reliability; 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-reported and may be underreported.

Data on 2.39% of all births were missing information related to BMI, 0.52% were missing for smoking, 0.11% were missing for hypertension, and 0.11% were missing for diabetes. 35 counties were suppressed and could not be displayed on the county level map due to cell counts less than 10.

SOCIAL DRIVERS OF HEALTH

DATA SOURCES AND VARIABLES USED

County level socioeconomic determinants of health risk data was obtained from the Maternal Vulnerability Index (MVI) Social Determinants of Health theme created by Surgo Health. The MVI is the first national-scale, open-source tool to identify where and why mothers in the US 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 within the 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 Health's website.

LIMITATIONS

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