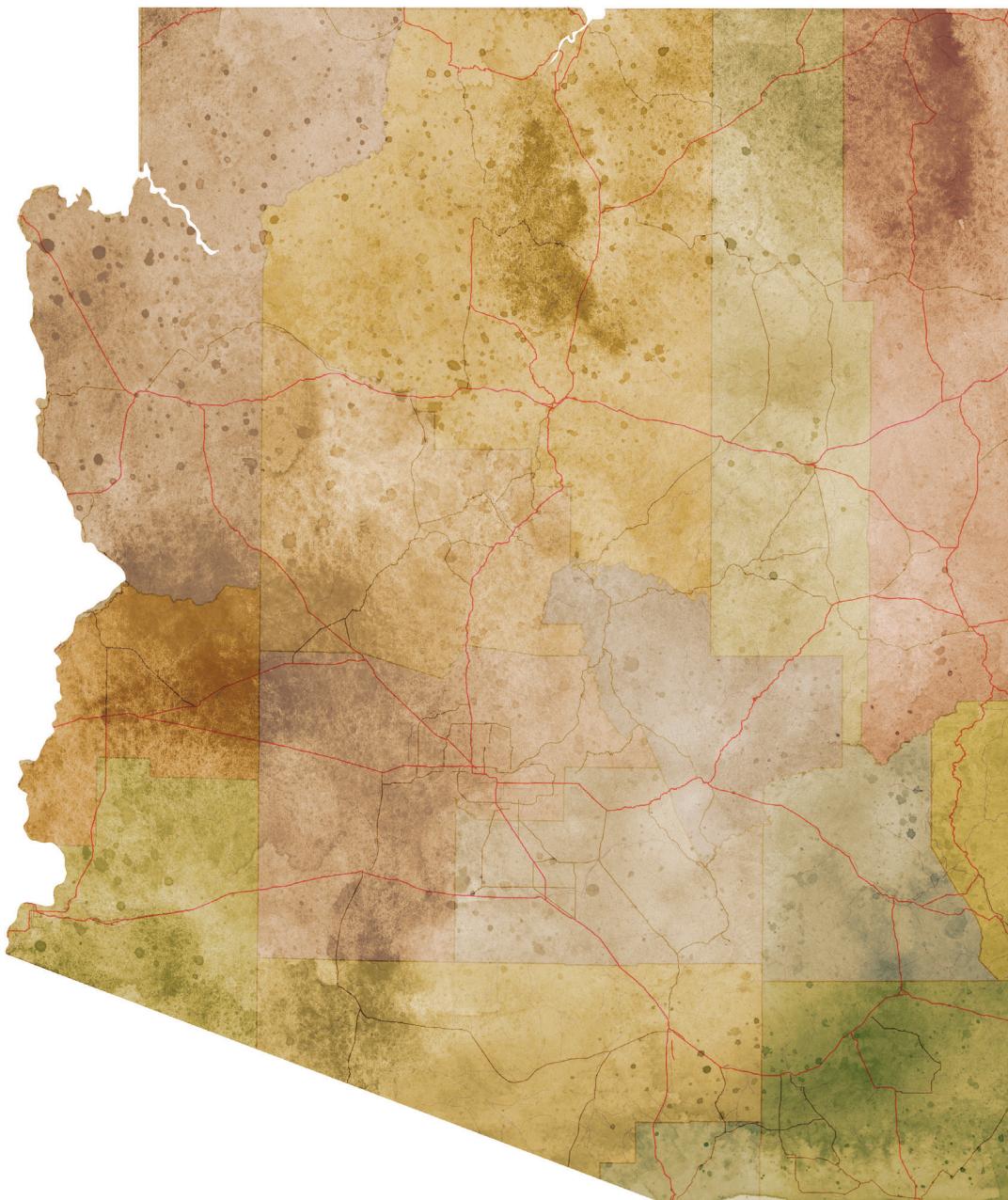


ARIZONA WORKFORCE REPORT

Obstetrician-Gynecologist Physicians and Certified Nurse Midwives



JANUARY 2020



THE UNIVERSITY OF ARIZONA

MEL & ENID ZUCKERMAN COLLEGE OF PUBLIC HEALTH

Center for Rural Health

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Rural Availability of the Obstetrician-Gynecologist Physician and Certified Nurse Midwife Workforce

A high-quality women's health care system depends on the availability and access to well-trained women's health providers

BACKGROUND

- The U.S. has the **highest maternal mortality** rate of developed countries.
- In Arizona from 2012-2015, the maternal mortality rate was **25 per 100 000 live births**.
- The maternal mortality rate for American Indian or Alaska Native women in Arizona was **70.8 per 100 000 live births**, the **highest** compared to other race and ethnicity groups

RURAL ARIZONA MATERNAL HEALTH WORKFORCE

8% of Arizonans live in rural areas.

4.7% of ob-gyn physicians and

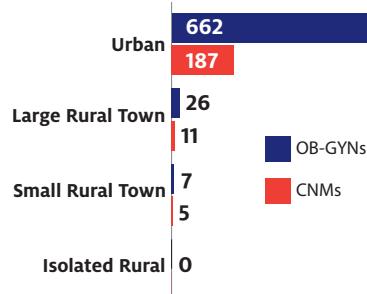
7.9% of CNMs work in rural areas

The Ratio of Ob-gyn Physicians per 10,000 Women is **Lower in Rural Areas**

Arizona	2.03
Urban	2.10
Large Rural Town	1.50
Small Rural Town	1.10
Isolated Rural	0



Urban-Rural Distribution of Ob-Gyns and CNMs



ARIZONA'S HEALTH SYSTEM & WORKFORCE

■ Counties with **NO maternal care**:

La Paz, Greenlee

■ Counties with **limited access** to maternal care: Gila, Graham, Cochise, Santa Cruz

No maternal care = zero hospitals offering obstetric care, zero OB providers & any percentage of women ages 18-64 uninsured. **Limited Access (level 1 or 2)** = Less than 2 hospitals offering obstetrics care, less than 60 OB providers per 10,000 births, and greater or less than 10% women ages 18-64 uninsured. (March of Dimes, 2018)



EDUCATIONAL TRAINING AND BACKGROUND OF OB-GYN PHYSICIANS IN ARIZONA



- 19.4% completed their undergraduate medical education in Arizona
- 34.4% completed their graduate medical education (residency) in Arizona
- 13.3% completed both undergraduate and graduate training in Arizona
- Of ob-gyn physicians who completed their undergraduate education in Arizona, 63.2% completed their graduate training in Arizona



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DEFINITIONS:

Access to Maternal Health Care

Access to hospitals & providers offering women's health and obstetric care.

Barriers to accessing care include lack of health insurance coverage, affordability, and travel time.

Maternal Health Workforce

Obstetrics & Gynecology (Ob-gyn) Physicians, Family Physicians, Nurse Midwives, Women's Health Nurse Practitioners and Physicians Assistants. General Surgeons are sometimes considered part of the maternal health workforce (e.g., for cesarean delivery).

HOW WORKFORCE SHORTAGES AFFECT RURAL MOTHERS:

Rural women have less access to health care, prenatal, obstetric and post-partum services – One in FOUR rural women give birth at a non-local hospital.

Access to prenatal and obstetric services are decreasing in rural areas due to closures of obstetric units and rural and critical access hospitals.

In some areas, almost half of rural women travel over 30 minutes for maternity care.

Travel may delay prenatal care and increase the risk of premature delivery.

Introduction

The Agency for Healthcare Research and Quality (AHRQ) defines access to health care as “the timely use of personal health services to achieve the best health outcomes” (Agency for Healthcare Research and Quality, 2016, p.3). The components of access to health care include coverage, services, timeliness and workforce capacity.

Coverage	Health insurance coverage “facilitates entry into the health care system.” People without coverage are “less likely to receive medical care and more likely to have poor health status.”
Services	Adults with a usual source of care are more likely to receive “recommended screening and prevention services.”
Timeliness	The ability of the health care system (e.g., hospitals, clinics, providers) to provide care when a need is identified.
Workforce	The health workforce should be composed of “capable, qualified, culturally competent providers.”

Source: Agency for Healthcare Research and Quality. (2016). National Healthcare Quality and Disparities Report Chartbook on Access to Health Care.

The Health Resources and Services Administration (HRSA) and the American College of Obstetricians and Gynecologists (ACOG) state that a high-quality women’s health system relies in part on the right number of well-trained women’s health providers in the right locations (Rayburn, 2017; U.S. Department of Health and Human Services, Health Resources and Services Administration, 2016). Obstetrics-Gynecology is a medical specialty that encompasses two fields 1) Obstetrics, “care during conception, pregnancy, child birth, and immediately after delivery”, and 2) Gynecology, “care for all women’s health issues.” Physicians may practice in one or both fields (Kaplan, 2018, para.1).

This report is intended to inform state-level health workforce policies to support a well-distributed, accessible maternal health workforce. This report has two aims: (1) describe the state of maternal health in Arizona and the components of access to maternal healthcare, and (2) analyze current Arizona maternal workforce data to understand if there is a rural and non-rural difference in the availability of maternal healthcare providers and services. For the first aim, we describe the state of maternal health in Arizona and present findings in the literature on maternal health coverage, services, timeliness, and workforce. For the second, we present our detailed workforce analysis. Specifically we focus on obstetrician-gynecologist physicians, and certified nurse midwives. These two professions represent just one part of the maternal health workforce. Women’s health providers include family physicians, physician assistants (PAs), and nurse practitioners (NPs) who focus on women’s health (U.S. Department of Health and Human Services, Health Resources and Services Administration, 2016). In future reports we hope to include these professions in our analysis.

The Arizona Department of Health Services (ADHS) is the state agency with the responsibility for vital statistics (i.e., births and mortality) data. For the official state data on maternal health as well as reports from the Maternal Health Task Force and the Advisory Committee on Maternal Fatalities and Morbidity please visit <https://www.azdhs.gov/prevention/womens-childrens-health/index.php>.

Overview of Women's Health

Women's health is the promotion of well-being by improving the opportunities for health and their social determinants (e.g., education, poverty, housing). It is the preservation of health and prevention of illness via screening and management of conditions that are unique, more common and more serious in women (Karney, 2000). Compared to men, women tend to have more interaction with the health care system partly due to increased health needs during reproductive years and because women often act as the health care coordinator at the family level (Gunga, Collins, Doty, & Beutel, 2017).

Maternal Health and Care

Maternal health and care involve the health of women and services provided before and during pregnancy, child-birth, and post-delivery (March of Dimes, 2018). The Maternal Health Task Force (MHTF) states that "The United States fares worse in preventing pregnancy-related deaths than most other developing nations." This is despite "spending more than any other country on hospital-based maternity care" (Harvard Chan School Center of Excellence in Maternal and Child Health, No Daten.d.) The estimated Maternal Mortality Rate (MMR) in 2013 in the United States was 17 per 100 000 live births whereas it was just 12 in other similarly developed countries (Cabasag, C, Rubio, V, Williams, D., 2019).

Preventing pregnancy-related morbidity and mortality, during and after delivery, is a key focus for U.S. public health and health care systems. Maternal mortality, or pregnancy-related deaths, are defined by the Centers for Disease Control as "the death of a woman while pregnant or within one year of the end of a pregnancy – regardless of the outcome, duration or site of the pregnancy – from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes." (Davis NL, Smootes, AN, Goodman, DA., 2019).

Maternal Health Disparities

There have been clear improvements in the last 30 years in women's health, maternal health, and the quality of maternal health care. However, in recent years U.S. women have begun to experience a leveling off in life expectancy. "This is consistent with reports elsewhere of gender-specific influences on mortality and a growing health disadvantage among US women, including smaller gains in life expectancy than among US men, larger relative increases in mortality from certain causes, and inferior health outcomes in comparison with women in other high-income countries." (Woolf & Schoomaker, 2019, p.2001). As a whole, women in the U.S. experience worse maternal health outcomes compared with women in other developed countries (Harvard Chan School Center of Excellence in Maternal and Child Health, No Daten.d.)

The CDC estimates that 700 women die from pregnancy-related complications each year in U.S.. Of these, approximately 3 in 5 deaths are preventable (Petersen et al., 2019). The risk of pregnancy-related deaths differs significantly between racial groups. Black and American Indian / Alaska Native women are 3.3 and 2.5 times more likely to die from pregnancy-related complications compared to white women (Petersen et al., 2019).

These group disparities are the result of multiple factors. In a review of 13 state Maternal Mortality Review Committees, the CDC found that "contributing factors and prevention strategies can be categorized at the community, health facility, patient, provider, and system levels and include improving access to, and coordination and delivery of, quality care." (Petersen et al., 2019, p.243). Reducing

pregnancy-related mortality requires improving overall women's health and "reducing social inequities across the lifespan." (Petersen et al., 2019 ,p.426).

Data from 2005 to 2014 show that Arizona ranked 19th (1=lowest/best rate, 50=highest/worst rate) of all states based on the state maternal mortality ratio. As with national trends, the rate was much higher for Black and American Indian women, 19.8 and 39 deaths per 100 000 live births, respectively. For American Indian women, Arizona ranked 45th (Moaddab et al., 2016). Nationally, and in Arizona, "these data strongly suggest that racial disparities in health care availability, access, or utilization by underserved populations are important issues faced by states in seeking to decrease maternal mortality." (Moaddab et al., 2016 ,p.6).

The Arizona Maternal Mortality Review Program reported similar racial disparities. Between 2012-15, the maternal mortality rate for women who identified as White non-Hispanic was 17.4 per 100 000 live births, compared to 22.4 for Hispanic or Latina women, and 70.8 for American Indian or Alaska Native women (Cabasag, C, Rubio, V, Williams, D., 2019). From 2013-15, 89% of pregnancy related deaths were preventable.

Social Determinants of Maternal Health Disparities

Addressing maternal health disparities and ensuring high quality labor and delivery care for all women is a public health priority. For most, child birth is a welcome, wonderful event. However, minority mothers and those who face social and economic hardships are at greater risk of delivery complications. Hardships begin long before pregnancy, and occur in family homes, schools, and jobs. Those who struggle financially, live in unsafe areas, or experience violence often experience high levels of chronic, early life stress. These circumstances are pronounced in rural areas, and increase the likelihood of preterm delivery and maternal death. Figure 1 illustrates how social and economic factors, individual hardships, and health care conditions influence maternal mortality in rural areas.

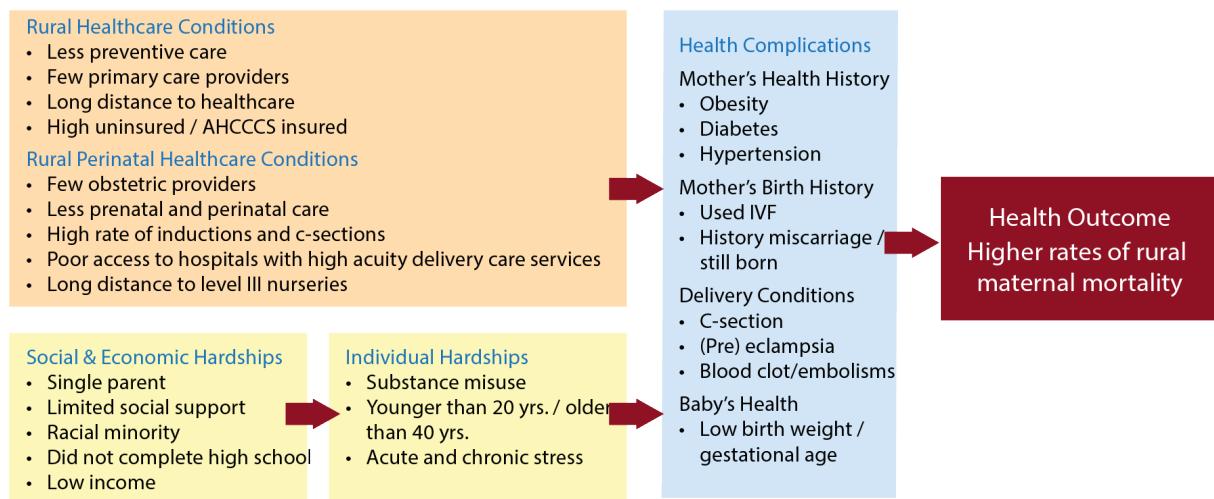


Figure 1. Social Determinants of Health & Rural Maternal Mortality

Access to Maternal Health Care

Maternal Health Insurance Coverage

In 2014, the U.S. Department of Health and Human Services, Office on Women's Health highlighted 30 achievements in women's health since 1984. These include increases in women's longevity and the number of women screened for breast and cervical cancer, decreases in deaths from breast cancer, lung cancer, HIV/AIDS, and heart disease, and enactment of the Patient Protection and Affordable Care Act (ACA) (U.S. Department of Health and Human Services, 2014). The ACA improved affordability and access to preventive and prenatal care for women, ended health insurance coverage denials based on pre-existing conditions like pregnancy, and prohibited charging women higher premiums than men (U.S. Department of Health and Human Services, 2014).

Since ACA implementation, the rate of uninsured women ages 19-64 decreased from 19% in 2013 to 11% in 2017 (Kaiser Family Foundation, 2018). Women without health insurance coverage are less likely than insured women to report having a regular doctor and use fewer preventive health services, like mammograms. Sixty percent of women between the ages of 16-64 have health insurance coverage through Employer-Sponsored Health Insurance (ESHI), 17% are covered by Medicaid, and 9% have direct purchase (non-group) health insurance coverage which includes policies purchased in the ACA state and federally facilitated marketplaces (Kaiser Family Foundation, 2018).

Maternal Health Services and Timely Access

Arizona's prenatal health care system has significantly transformed in the last half of the 20th century and the early 21st century. Advancements include the use of antibiotics and surfactants to treat respiratory failure and the "development of neonatal intensive care units, neonatal transport, maternal tertiary care centers and maternal transport" (Clement, 2005 , p.503). Arizona implemented a regionally coordinated maternal health services system through the Arizona Perinatal Trust (APT). Perinatal Regionalization is "a strategy to improve maternal and perinatal outcomes – particularly the reduction of infant mortality – by establishing systems designating where infants are born or transferred according to the level of care they need at birth."(The Association of State and Territorial Health Officials, 2014). Regionalization works to ensure that relationships are built between facilities with different acuity levels so that pregnant women receive care at the facility best equipped to address their risk. Partner facilities establish risk-appropriate transport systems and higher-level facilities provide education and training to lower-level facilities (Kilpatrick et al., 2019). Currently, there are 36 regionalized hospital facilities that have voluntarily certified in Arizona's APT system (see Table 1). Table 2 shows maternal care designation levels. Appendix A details the profession, specialty type, and availability of health care providers for each level.

Table 1. Levels of Care, Arizona Perinatal Trust

Description	
In-Hospital Birthing Centers (IHBC, Indian Health Services only)	Provide hospital services for uncomplicated obstetrical patients (excluding cesarean delivery) and basic and transitional newborn care. Such centers should not electively deliver infants less than 37 weeks gestation.
Perinatal Care Centers Level I	Provide hospital services for low-risk obstetrical patients, including cesarean delivery and basic and transitional newborn care; such centers should not electively deliver infants less than 36 weeks gestation.
Perinatal Care Centers Level II	Provides hospital services for selected high risk obstetrical patients and newborns requiring selective continuing care; such centers should not electively deliver infants less than 32 weeks gestation.

Perinatal Care Centers Level IIE	Provide hospital services for high-risk obstetrical patients and newborns requiring selective continuing care; such centers should not electively deliver infants less than 28 weeks gestation.
Perinatal Care Centers Level III	Provide hospital services for all obstetrical and newborn patients including those patients requiring subspecialty and intensive care at all gestational ages.
Freestanding Neonatal Care Centers Level III	Provide hospital services for all newborns requiring subspecialty and intensive care at all gestational ages.

Reproduced from: Arizona Perinatal Trust, 2019

Table 2. Levels of Maternal Care & Definitions	
	Definitions
Accredited Birth Center	Care for low-risk women with uncomplicated singleton term vertex pregnancies who are expected to have an uncomplicated birth.
Level I (Basic Care)	Care to low- to moderate-risk pregnancies with ability to detect, stabilize, and initiate management of unanticipated maternal-fetal or neonatal problems that occur during the antepartum, intrapartum, postpartum period until the patient can be transferred to a facility at which specialty maternal care is available.
Level II Specialty Care	Level I facility + care of appropriate moderate-to high-risk antepartum, intrapartum, or postpartum conditions.
Level III Subspecialty Care	Level II facility + care of more complex maternal medical conditions, obstetric complications, and fetal conditions.
Level IV Regional Perinatal Health Care Centers	Level III facility + on-site medical and surgical care of the most complex maternal conditions and critical ill pregnant women and fetuses throughout antepartum, intrapartum, and postpartum care.

Reproduced from: Kilpatrick et al., 2019)

Regionalization and voluntary certification are important to improving maternal care. While higher-level care facilities in Arizona are concentrated in the metropolitan areas of Phoenix and Tucson, the Obstetric Care Consensus No. 9 states “it is equally important to keep women in the care of the birthing facilities in their communities unless risk factors or comorbidities evolve such that the indicated level of care needed is beyond those birthing facilities...Support of perinatal services in level I and level II facilities would help maintain such birthing facilities as opposed to threatening closure.” (Kilpatrick et al., 2019, p.e51). Consensus No. 9 clarifies that “closing hospitals with low-volume obstetric services could have counterproductive adverse health consequences and potentially increase health disparities by limiting access to maternity care.” (Kilpatrick et al., 2019, p.e42). Recommendations highlight the need to ensure access to high-quality services at the right time, in the right place and per the right patient health risks.

Maternal Health Workforce

In their report on the Obstetrician and Gynecologist (ob-gyn) workforce, ACOG states that a “high-quality women’s health care system depends on having the right number of well-trained physicians and other health care providers in the proper locations.” (Rayburn, Strunk, & Petterson, 2015). Ob-gyn physicians are licensed to practice “in the area of medical and surgical care of women during maternity through childbirth, as well as to treat disorders of the female reproductive system.”(U.S. Department of Health and Human Services, Health Resources and Services Administration, 2016, p.7). Not all ob-gyn physicians provide pregnancy-related care to women.

ACOG focuses its research on ob-gyn physicians. Women's health providers include family physicians, certified nurse midwives (CNMs), physician assistants (PAs), and nurse practitioners (NPs) who focus on women's health (U.S. Department of Health and Human Services, Health Resources and Services Administration, 2016). Family physicians are fundamental to a women's and maternal health system, especially in rural areas (Kilpatrick et al., 2019).

HRSA ob-gyn workforce analyses forecast that the total number of full time equivalent (FTE) ob-gyns in clinical care will decrease by 4%, while demand will increase 8%, resulting in a shortage of 4930 ob-gyn FTEs by 2025 (U.S. Department of Health and Human Services, Health Resources and Services Administration, 2016). The increased demand for ob-gyn services may be due to population growth and ACA provisions that expanded Medicaid and ACA marketplace coverage that reduced the number of uninsured women, eliminated co-pays and deductibles for preventive and prenatal services for most commercial insurers, and prohibited insurers from charging women more for coverage. ACOG identified a rising geographic imbalance in the ob-gyn workforce distribution. While national demand for ob-gyn services will increase by 6%, some states like Nevada will experience a 27% increase in demand. Arizona is estimated to experience an increase in demand of 10% or more for ob-gyn services. This regional demand may be due to existing geographic maldistribution of ob-gyn physicians and greater demand partially explained by increases in the female population (Rayburn et al., 2015). .

One study examined the workload for ob-gyns by looking at live births performed by ob-gyns in metropolitan service areas (MSAs) in 2015. For the year studied, Phoenix had the fourth highest workload of metro areas with 135.64 births per ob-gyn, and ranked sixth for metro births covered by Medicaid (59.9%) (Doximity, 2018).

Rural areas experience higher health workforce disparities. The majority of women in rural communities (three of four) give birth in a local hospital (Anderson, B, Gingery, A, McClellan, M, Rose, R, Schmitz, D, Schou, P., 2019). There are growing concerns about rural hospital closures and loss of obstetrics units in rural hospitals that remain open (Hung, Kozhimannil, Casey, & Henning-Smith, 2017). Reducing access to prenatal and obstetric care negatively impacts rural maternal health outcomes, and may have "greater ramifications than closing one in an urban area, where the next closest hospital may still be reasonably accessible." (Kozhimannil, Hardeman, & Henning-Smith, 2017, p.369).

The "Nowhere to Go: Maternity Care Deserts Across the U.S." report defined a county without a hospital offering obstetric care and or an obstetric provider as a "maternity care desert." (March of Dimes, 2018, p.2). Criteria are provided in Table 4. Of women who live in a maternity care desert county, four of every five live outside of an urban or large metropolitan area. Rural counties are less likely to have a hospital that offers obstetric care, compared to urban counties (March of Dimes, 2018). In Arizona, two counties are maternity care deserts (La Paz and Greenlee); four are designated limited access counties (Table 5). Table 6 includes key population health statistics by county related to women's and maternal health. The Figure 2 map provides county-level data including the ob-gyn ratio per 10 000 women, the number of hospitals with obstetric care, total ob-gyns and CNMs, and the percent of births that are covered by Arizona's Medicaid and Children's Health Insurance Program (CHIP) — the Arizona Healthcare Cost Containment System (AHCCCS). It is important to note that hospitals with obstetric care is a specific measure from the HRSA Area Health Resource File (AHRF). It refers to hospitals that report obstetrics beds in the annual facility survey from the American Hospital Association. There are more hospitals in Arizona that report births to ADHS than have obstetrics beds as reported in the HRSA AHRF. For example,

the HRSA AHRF shows that there are zero hospitals with obstetrics beds in Apache County. However, ADHS birth data by hospital show that there are two hospitals (Chinle IHS Hospital and Tséhootsooí Medical Center) in Apache County reporting births in 2018.

Table 3. Defining Maternity Care Deserts, March of Dimes

	Maternity Care Deserts	Limited Access to Maternity Care (LAMC)	
		LAMC Level 1	LAMC Level 2
Hospitals Offering OB Care	Zero	<2 hospitals	<2 hospitals
Ob Providers (OB-GYN, CNM per 10,000)	Zero	<60	<60
Proportion of Women 16-64 Without Health Insurance	Any	10% or greater	Less than 10%

Source: Nowhere to Go: Maternal Care Deserts Across the U.S.

Table 4. Arizona Counties with Limited Access to Maternity Care (LAMC)

Maternity Care Deserts	LAMC Level 1	LAMC Level 2
La Paz	Cochise	Graham
Greenlee	Santa Cruz	
	Gila	

Source: Nowhere to Go: Maternal Care Deserts Across the U.S.

Table 5. Arizona Women's and Maternal Health, Key Statistics by County - 2017

	Women (percent of women in AZ)	Percent Uninsured Women Ages 19-44	Births	Birth Rates (births per 1000 pop.)	Percent Births Covered by AHCCCS
Arizona	3 424 891	16	81 664	11.7	53
Apache	36 247 (1)	29	946	13.0	75
Cochise	62 422 (2)	11	1330	10.4	51
Coconino	70 375 (2)	16	1506	10.5	58
Gila	26 861 (1)	17	541	9.8	58
Graham	17 467 (0.5)	13	530	13.8	47
Greenlee	4371 (0.1)	12	156	14.2	34
La Paz	9947 (0.3)	22	194	9.0	71
Maricopa	2 100 037 (61)	16	52 470	12.4	52
Mohave	101 516 (3)	18	1734	8.3	68
Navajo	53 865 (2)	19	1507	13.5	72
Pima	511 543 (15)	15	10 970	10.7	49
Pinal	193 872 (6)	14	4384	10.3	49
Santa Cruz	24 129 (0.7)	15	633	12.3	73
Yavapai	112 872 (3)	18	1796	8.0	61
Yuma	99 367 (3)	18	2956	13.3	63

Source: Number women and % uninsured women ages 19-44 from the U.S. Census American Community Survey 2017 Births, Birth Rates, and Births covered by AHCCCS from ADHS Vital Statistics

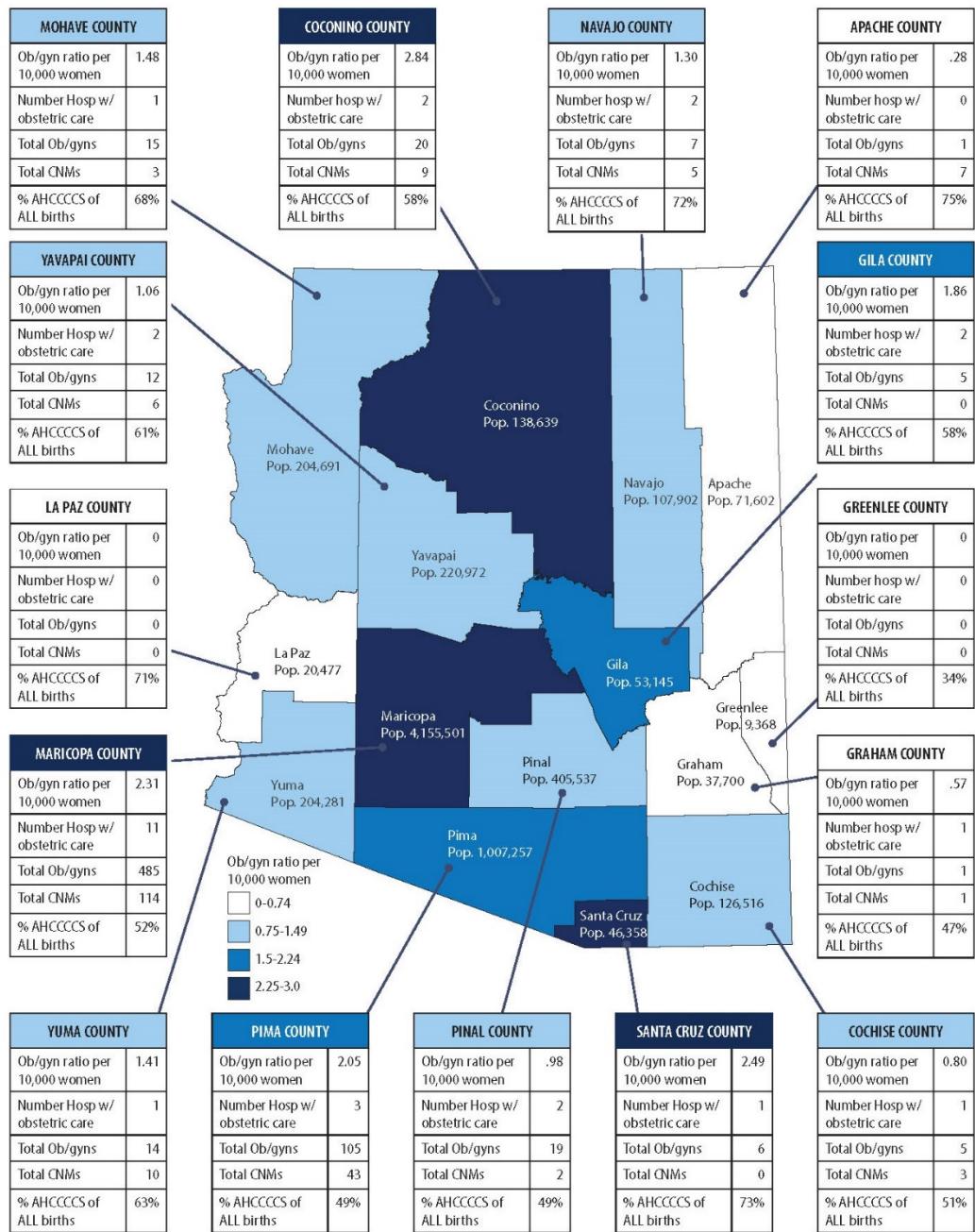


Figure 2. OB-GYN Physicians and CNMs by County

The Medical and Osteopathic Physician Education Pipeline

Arizona's capacity to train and retain health providers who remain in the state to practice is essential to meet current and future health workforce needs. The physician education pipeline is long, from seven to ten years before entering practice. After receiving an undergraduate degree (e.g., bachelor of science), students apply for undergraduate medical education (UME) at a medical or osteopathic school. In their last (fourth) year, medical and osteopathic students apply for residency training, also called Graduate Medical Education (GME), typically another three to five years to qualify for board certification. Arizona is

increasing its training capacity in both UME and GME. Between 2006 and 2017, Arizona MD UME enrollment increased by 33% and GME by 37%, growth rates exceeding the national average. Table 7 shows the annual enrollment for both MD and DO UME programs.

Table 6. MD Undergraduate Medical Education (UME) Enrolled Students, AAMC Physician Workforce Report 2017

	Total UME Enrollment	Ratio per 100 000	Rank	Percent Change in Enrollment	Rank
Arizona	269	32.7	23 rd	110.9	4 th
U.S. overall	na	35.4	na	32.8	na

Table 7. Enrollment (matriculants) in UME Programs in Arizona, total (percent in-state)

	2014-15	2015-16	2016-17	2017-18	2018-19
Allopathic					
University of Arizona – Tucson (est. 1969; public)	115 (65.2)	117 (73.5)	132 (66.7)	120 (77.5)	117 (73.5)
University of Arizona – Phoenix (est. 2006)	80 (68.8)	80 (83.8)	83 (72.3)	80 (81.2)	80 (72.3)
Mayo Clinic Alix School of Medicine – Arizona campus (est. 2015; public)	-	-	-	-	-
Osteopathic					
Midwestern University/Arizona College of Osteopathic Medicine (est. 1996; private)	237 (25)	240 (30)	249 (28)	242 (30)	241 (27)
A.T. Still University School of Osteopathic Medicine in Arizona (est. 2007; private)	101 (10)	103 (15)	92 (10)	103 (12)	100 (15)

Source: Allopathic school data on public schools of medicine is available from the AAMC. The AACOM provides data on the osteopathic schools. No data available for the Mayo Clinic Alix School of Medicine at the Arizona Campus level.

Table 8. Graduate Medical Education (GME) Enrolled Residents & Fellows, AAMC Physician Workforce Report 2017

	Total GME Enrollment	Ratio per 100 000	Rank	Percent Change in Enrollment	Rank
Arizona	1704	34.6	37 th	37.4	7 th
U.S. overall	122 002	37.8	na	14.5	na

Despite workforce pipeline expansion in UME and GME, the number of ob-gyn residency (GME) positions has not substantively increased. Ob-gyn positions make up 5% of all residency positions in the U.S. In 2018, there were a total of 5381 active ob-gyn residents in the US. The number of accredited ob-gyn residency (GME) positions has increased minimally since 1980, while the number of accredited programs has decreased between 1992 and 2016, from 257 to 246 (Rayburn, 2017). There are three accredited ob-gyn GME training programs in Arizona: the Creighton University School of Medicine/Maricopa Medical Center Program (11 year-1 residency positions, 38 residency positions total), the University of Arizona College of Medicine-Phoenix Program (9 year-1 positions, 36 positions total), and the University of Arizona College of Medicine – Tucson (4 year-1 positions, 16 positions total). Total year-1 positions offered by Arizona ob-gyn programs is 24 (American Medical Association, 2020).

Maternal Health Workforce Analysis – Rural and Non-Rural Differences in Availability of Maternal Healthcare Providers.

To further understand Arizona's challenges in addressing ob-gyn provider workforce shortages, we examined licensure databases to identify the state's current maternal health workforce capacity and its distribution across the state. A women's timely ability to access services is a key component of healthcare

access. To measure workforce volume and distribution, we used publicly available and purchased physician (AMA Masterfile) data to examine whether differences exist between **rural** and **non-rural** Arizona in the **availability** of the **maternal health workforce**.

Rural	A geographic area (zip-code) classified as rural in the Rural-Urban Continuum Area (RUCA) coding system
Non-rural	A geographic area (zip-code) classified as non-rural in the RUCA coding system
Availability	The total provider count and ratio of providers per population by RUCA area type
Maternal health workforce	Obstetrician and gynecologist physicians and certified nurse midwives

The following data, analysis, and recommendations are intended to inform policy, program, and education interventions to improve access to high quality health care for all Arizonan women. This report aims to answer four key questions:

- 1) What is the current number and physician to population ratio of obstetrician and gynecologist physicians in Arizona, by county, by rural versus metropolitan areas?
- 2) How many ob-gyn physicians practicing in Arizona completed their undergraduate medical or osteopathic education UME education in Arizona?
- 3) What is the current number of CNMs in Arizona, by county, by rural versus metropolitan areas?
- 4) How many ob-gyn physicians practicing in Arizona completed their graduate medical or osteopathic education GME education in Arizona?

Methods

Ob-Gyn Physicians

Data Source

To count the ob-gyn physician workforce, this report uses data from the Arizona Medical Board and the Arizona Board of Osteopathic Examiners—AMB Data. These boards provide a single-point-in-time, data snapshot of physician licensee information in Arizona. Physicians in Arizona are required to renew their license every two years based on the licensee's birth date or by December 31. Appendix B lists the data elements in the publicly available AMB Data.

Data Cleaning

In this report, “Arizona physicians” means physicians licensed in Arizona as of January 2019, with an active license code, an Arizona state address, a valid zip code, and an estimated age of less than 81 years. To protect personally identifiable information, the publicly available data do not include dates of birth. An age estimate was generated using the licensee’s reported graduation year from their undergraduate medical education program (or license date if the graduation year was missing). The board data do not provide information on how many hours a physician works (i.e., full time equivalents [FTE], part time, or direct patient care FTE).

Identifying Ob-Gyn Physicians

As of January 2019, there are 57 598 total records in the AMB data. To create a dataset that only includes working physicians, we included those who (1) have an active licensee status, (2) report a valid Arizona zip code office location, and (3) have an estimated age of 80 years or younger. After filtering we identified 16 947 physicians.

To further identify ob-gyn physicians, we analyzed the first two “Area of Interest” (AOI) fields submitted by the licensee to identify physicians who listed “obstetrics” or “obstetrics and gynecology” in one of the two AOIs. This led to a sub-group of 754. To account for retirement from clinical practice, we excluded physicians with an estimate age older than 69 years as data show the retirement age for Ob-gyn physicians ranges from 59 to 69 years old (Rayburn et al., 2015). This results in a sample of 695 Ob-gyn physicians representing approximately 4% of the active physician workforce in Arizona.

The AMB datafile does not include information on physician’s board certification, the type of care they provide, their practice setting, or their patient care level (e.g., full-time or part-time). The AMB datafile also excludes physicians working in federal facilities, who are not required to be licensed in the state, like the Veterans Administration (VA), Indian Health Service (IHS), and Public Law 638 Indian Self-Determination sites.

To compare the AMB estimate with other sources, we repeated this process with the American Medical Association (AMA) Masterfile data (reviewing the primary and secondary specialty) and the National Plan and Provider Enumeration System (NPPES), National Provider Identifier (NPI) data. The active ob-gyn physician estimates from these sources are listed in Table 9.

The Masterfile is available via purchase from the AMA. Originally developed as a membership list, this dataset now includes education record data for physicians from their undergraduate and graduate training through accredited institutions. Physicians can also update some of their information directly on the AMA website. The Masterfile is frequently used by the AMA and others for workforce analyses.

The NPPES/NPI data is maintained by the Centers for Medicare and Medicaid Services (CMS). The NPPES was implemented as part of the Health Insurance Portability and Accountability Act of 1996 (HIPAA) which required the adoption of standard unique identifiers for health care providers. This unique number is the NPI; providers in most HIPAA covered entities must apply for an NPI. The NPI data is available as a monthly download. NPI data does not contain physician age, so we were unable to use age as a restriction criterion.

Table 9. Count and Ratio of Arizona Ob-Gyn Physicians by Source

	Total	Ratio per 10 000 women
AMB Data	695	2.0
AMA Masterfile	829	2.4
NPPES	796	2.3

Identifying Certified Nurse Midwives

This report uses the NPPES data from June 2019 to identify the number of Certified Nurse Midwives (CNMs) with an Arizona practice location. CNMs were identified by ‘Advanced Practice Midwife’ or a credential that includes “CNM” in the text field. To identify practice location, we extracted data where the “Provider Business Practice Location Address State Name” was AZ. Only providers with a Clinical Location of Arizona and a Clinical License State of AZ were retained for analysis. In total, we identified 203 individual CNMs with an Arizona practice location.

Ob-Gyn Physicians by Rural-Metro Designation

Physicians seeking an Arizona license to practice must complete a licensure application form with a practice address and zip code. This information is updated at license renewal every two years. Zip-codes are mapped to Rural-Urban Commuting Area (RUCA) codes to estimate the number and ratio of ob-gyn providers by urban-rural geography (Rural Health Research Center, No Date, n.d.). RUCA codes use U.S. Census Tract data and provide a standardized, national rurality classification. RUCA codes are useful in health research since they include measures of density as well as commuting flows, which may indicate where health resources are used (Hall, Kaufman, & Ricketts, 2006). The University of Washington provides a methodology that organizes 33 individual RUCA codes into 10 groups (see Table 10). To further condense these codes, this report uses the University of Washington’s Urban, Large Rural City or Town, Small Rural Town, and Isolated Small Rural Town group nomenclature (see Table 11). Practice location zip codes are mapped to RUCA codes using the zip code to RUCA approximation (Rural Health Research Center, n.d.).

Table 10. Primary Rural-Urban Commuting Area Codes

Code	Classification Description
1	Metropolitan area core: primary flow within an urbanized area (UA)
2	Metropolitan area high commuting: primary flow 30% or more to a UA
3	Metropolitan area low commuting: primary flow 10% to 30% to a UA
4	Micropolitan area core: primary flow within an urban cluster of 10,000 to 49,999 (large UC)
5	Micropolitan high commuting: primary flow 30% or more to a large UC
6	Micropolitan low commuting: primary flow 10% to 30% to a large UC
7	Small town core: primary flow within an urban cluster of 2,500 to 9,999 (small UC)
8	Small town high commuting: primary flow 30% or more to a small UC
9	Small town low commuting: primary flow 10% to 30% to a small UC
10	Rural areas: primary flow to a tract outside a UA or UC

Table 11. Rural-Urban Commuting Area Codes and Example Locations

Description	Codes	Example Location
Urban Focused	1.0, 1.1, 2.0, 2.1, 3.0, 4.1, 5.1, 7.1, 8.1, and 10.1.	Glendale (1.0), Casa Grande (1.1; 2.1), Marana (2.0), Saint David (3.0), Florence (4.1), Tubac (5.1), Page (7.1), Teec Nos Pos (8.1), Williams (10.1)
Large Rural City/Town (Micropolitan) focused	4.0, 4.2, 5.0, 6.0	Show Low (4.0), Ganado (5.0),
Small Rural Town Focused	7.0, 7.2, 8.0, 8.2, 9.0	Sedona (7.0), Morenci (7.2)
Isolated Small Rural Town	10.0, 10.2, 10.3	Ash Fork (10.0), McNeal (10.2), Second Mesa (10.3)

Limitations

There are limitations to these data sources. They do not include information on whether or not an ob-gyn physician is actively employed, if they are full-time or part-time, or how much of their time is devoted to clinical practice. Practice location (i.e., zip code) is also limited as physicians can practice at multiple locations, practice location addresses can change during the two-year license interval, physicians can move out of state or retire, and data are not collected on FTE clinical effort by practice sites. The data sources do not contain information on board certification or whether physicians maintain an active clinical practice. Thus, these counts are estimates of provider volume. For more focused questions such as the availability of the obstetrician workforce who actively provide labor and delivery services, there are other data sources that can provide more accurate, granular data (e.g., birth records). Answering these types of focused questions will be the focus of future research.

Despite these limitations, the ob-gyn physician estimates from each of the three data sources are close to the data from the 2017 American College of Obstetrics and Gynecology 2017 Report which identified 707 direct patient care ob-gyns in Arizona (Rayburn, 2017). Additionally, a 2013 article in the Journal of Women's Health also used AMA Masterfile data from 2010 to estimate an ob-gyn supply in Arizona at 680 (Dall, Chakrabarti, Storm, Elwell, & Rayburn, 2013).

Arizona Demographic Overview

Arizona's population growth outpaced national growth in each of the last two ten-year census periods. Arizona's population increased 25% between 2000 and 2010 (vs. 10% for the U.S.) and another 12.2% between 2010 and 2018 (vs. 6.0%) (Perry, 2001; U.S. Census Bureau, 2018). The female population growth mirrored the rate of growth of the state as a whole, 25% between 2000 and 2010 and 12% between 2010 and 2018 (U.S. Census Bureau, 2017).

Table 12. U.S. and Arizona Population Overview

	1990	2000	2010	2018
U.S.	248 710 000	281 421 906	308 758 105	327 167 434
Arizona	3 665 000	5 130 000	6 392 288	7 171 646
Arizona % of U.S.	1.5	1.8	2.1	2.2

Table 13. U.S. and Arizona Female Population Overview , Total (percent)

	2000	2010	2018
U.S.	143 368 343 (50.9)	156 964 212 (50.8)	166 038 755 (50.8)
Arizona	2 569 575 (50.1)	3 216 194 (50.3)	3 606 307 (50.3)

Maternal Health Workforce Results

Ob-Gyn Physicians by State and County

Based on the AMB January 2019 snapshot, we estimate that there are 16 947 physicians with an active license in Arizona. The total physician to 100 000 population ratio is 236.3. Of these, we estimate that there are 695 active Arizona ob-gyn physicians younger than 69 years old, a ratio of 2.03 ob-gyn physicians to 10 000 women in Arizona. The ratio of ob-gyn physicians to women ages 15 to 44 years old is 5.3 (see Table 14). These are broken down by county in Table 15. Table 16 displays the average (mean) age and gender breakdown (percent male, percent female) for ob-gyn physicians by county and the percent of ob-gyn physicians whose office zip codes are located in a RUCA-classified urban area.

Table 14. Arizona Ob-Gyn Physicians

	Total
Arizona	695
Ratio Per 10 000 women	2.03
Ratio per 10 000 Women Ages 15-44	5.3

Table 15. Arizona Ob-Gyn Physicians by County

	Total (percent)	Ratio per 10 000 Women
Arizona	695	2.03
Apache	1 (0.1)	0.3
Cochise	5 (0.7)	0.8
Coconino	20 (3.0)	2.8
Gila	5 (0.7)	1.9
Graham	1 (0.1)	0.6
Greenlee	0 (0.0)	-
La Paz	0 (0.0)	-
Maricopa	485 (70.0)	2.3
Mohave	15 (2.0)	1.5
Navajo	7 (1.0)	1.3
Pima	105 (15.0)	2.1
Pinal	19 (3.0)	1.0
Santa Cruz	6 (0.9)	2.5
Yavapai	12 (1.7)	1.1
Yuma	14 (2.0)	1.4

Table 16. Arizona Ob-gyn Physicians by Age, Gender, and % Working in an Urban Area

	Mean Age	Percent Male, Female*	Percent Working in an Urban Area
Arizona	48.8	45, 55	95.3
Apache	43	100, 0	100
Cochise	61	80, 20	80
Coconino	48.4	22 ,78	80
Gila	46.0	67, 33	60
Graham	45	100, 0	0
Greenlee	0	0	0
La Paz	0	0	0
Maricopa	48.6	45, 54	100
Mohave	50.1	71, 29	27
Navajo	50.6	100, 0	0

Pima	49.4	28, 72	100
Pinal	42.3	47, 53	100
Santa Cruz	45.5	67, 33	0
Yavapai	55.2	45, 54	92
Yuma	51.1	71, 29	100

*Gender & working in an urban area percentages exclude missing data and therefore do not add up to 100%

Most Arizona physicians are in urban areas: 16 144 of 16 947 (95.3%), slightly larger than the state's overall distribution; 92% of Arizona's population live in urban RUCA code areas (U.S. Census Bureau, 2017). Table 17 shows ob-gyn physician totals by RUCA group. Matching the overall physician distribution, 95.3% ob-gyns are located in urban areas. Urban areas have a ratio of 2.1 ob-gyn physicians per 10 000 women, slightly higher than the state average of 2.03. Table 18 shows the mean age and gender for physicians by RUCA group. Average age is similar for ob-gyn physicians between RUCA areas. The percentage of male and female ob-gyns is similar for urban and small rural towns, where female ob-gyns are in the majority. However this is reversed for large rural city/towns where male ob-gyns are 57.7%.

Table 17. Arizona Ob-gyn Physicians by Rural-Urban Commuting Area

	Total Ob-Gyn	Total Pop.	Female Pop.	Ratio per 10 000 Female Pop.
Arizona (N=695)	695	6 809 946¹	3 424 891	2.03
Urban (n=662)	662	6 284 744	3 165 012	2.1
Large Rural City/Town (micropolitan) (n=26)	26	361 520	178 907	1.5
Small Rural Town (n=7)	7	126 798	62 774	1.1
Isolated Small Rural Town (n=0)	0	39 494	19 654	0.0

Table 18. Arizona Ob-Gyn Physicians Mean Age and Gender by Rural-Urban Commuting Area

	Mean Age (min, max)	Percent Male, Female
Arizona (N=695)	48.8	39, 49
Urban (n=662)	48.7 (28,69)	39, 50
Large Rural City/Town (micropolitan) (n=26)	48.3 (31,68)	58, 19
Small Rural Town (n=7)	51.6 (37,66)	43, 57
Isolated Small Rural Town (n=0)	-	-

Ob-Gyn Physicians by Location and Medical School

Physician training typically involves a bachelor degree (e.g. B.S.) followed by four-years of UME in a medical (allopathic) or an osteopathic school. Following their UME, physicians next complete several years of graduate medical education (GME) - also called residency and fellowship training. GME must be completed for specialty board certification. In Arizona, physicians must complete one year of GME to be licensed in Arizona. Board certification is not required for licensure in Arizona. GME training duration varies by specialty, but typically involves three to four years for primary care specialties (e.g., family medicine, general internal medicine, general pediatrics), and four to seven or more years for subspecialty training and certification (e.g., for ob-gyn, medical, pediatric and surgical subspecialties). Increasingly,

¹ This population data is from the U.S. Census Bureau American Community Survey 2017, 5-year estimate. The total state level population in 2019 is likely higher, estimated at 7 171 646 (U.S. Census, 2018 National and State Population Estimates).

state physician licensing boards and institutional / hospital credentialing committees require board certification as a condition of practice, but this practice may vary in rural areas.

Ob-gyn residency programs are four years, after which additional years of sub-specialized fellowship training may also be completed in “critical care medicine, complex family planning, female pelvic medicine and reconstructive surgery, gynecologic oncology, hospice and palliative medicine, maternal-fetal medicine, and reproductive endocrinology and infertility” (American Board of Medical Specialties, 2019). At the national level, 5.9% of UME graduates match with obstetrics and gynecology residency programs. Of the first-year residents in these programs, 73% graduated from U.S. based allopathic medical schools, 9% from osteopathic schools, and 18% from international programs (Rayburn, 2017). In the US, ACOG warns that while population growth is being matched by an increase in UME graduates, the number of ob-gyn GME residency positions has not kept pace (Rayburn, 2017).

As of July 2019, five accredited institutions provide UME in Arizona: three allopathic (M.D.) schools and two osteopathic (D.O.) schools (Table 19). The two osteopathic schools are private institutions with greater annual enrollment compared to the public allopathic universities. However, the osteopathic schools matriculate a much lower percentage of in-state students. Schools outside of Arizona send students for clinical rotations in Arizona. For example, Creighton University School of Medicine is accredited in Nebraska but has a regional campus in Phoenix where third and fourth year students (42 per year) complete their third and fourth year clinical rotations in Arizona. However there are plans to convert the Creighton program to a full four-year campus in Phoenix.

Table 20 shows 2017-18 UME tuition costs for Arizona medical and osteopathic schools. Private, osteopathic program tuition is higher than in-state tuition for public allopathic programs - but similar to their out-of-state rates. Tuition cost excludes materials (e.g., books) and living expenses (e.g., rent, utilities). Only the public institutions offer a resident/in-state tuition rate.

Table 19. Enrollment (matriculants) in UME Programs in Arizona, total (percent in-state)					
	2014-15	2015-16	2016-17	2017-18	2018-19
Allopathic					
University of Arizona – Tucson (est. 1969; public)	115 (65.2)	117 (73.5)	132 (66.7)	120 (77.5)	117 (73.5)
University of Arizona – Phoenix (est. 2006)	80 (68.8)	80 (83.8)	83 (72.3)	80 (81.2)	80 (72.3)
Mayo Clinic Alix School of Medicine – Arizona campus (est. 2015; public)	-	-	-	-	-
Osteopathic					
Midwestern University/Arizona College of Osteopathic Medicine (est. 1996; private)	237 (25)	240 (30)	249 (28)	242 (30)	241 (27)
A.T. Still University School of Osteopathic Medicine in Arizona (est. 2007; private)	101 (10)	103 (15)	92 (10)	103 (12)	100 (15)

Allopathic school data on public schools of medicine is available from the AAMC. The AACOM provides data on the osteopathic schools. No data available for the Mayo Clinic Alix School of Medicine at the Arizona Campus level.

Table 20. Average Tuition		
	2017-18	
	Resident (in-state)	Nonresident (Out-of-state)
Allopathic		
University of Arizona – Tucson (est. 1969; public)	\$33 931	\$55 803
University of Arizona – Phoenix (est. 2006; public)	\$33 398	\$55 270

Mayo Clinic Alix School of Medicine - Arizona (est. 2015; private)	\$57 170
	2017-2018
Osteopathic	
Midwestern University/Arizona College of Osteopathic Medicine (est. 1996; private)	\$66 494
A.T. Still University School of Osteopathic Medicine in Arizona (est. 2007; private)	\$55 460

Allopathic school data on public schools of medicine is available from the AACM. The AACOM provides data on the osteopathic schools. No data available for the Mayo Clinic Alix School of Medicine at the Arizona Campus level.

Table 21 provides the total number and percent of licensed Arizona ob-gyn physicians by UME location. The UME location is grouped by UME in Arizona (AZ-UME) or UME in any other U.S. state or foreign country (OTHER-UME). Among Arizona ob-gyn physicians (N=695) for whom we have UME information (n=607), 19.4% completed their UME in Arizona and 80.6% received UME training outside of Arizona. Of ob-gyn physicians in large rural city/towns, 16.7% completed their UME training in Arizona. The percentage of ob-gyn physicians located in small rural towns with AZ-UME is 42.9%, however this percentage should be interpreted with caution due to small numbers of total ob-gyn physicians in small rural towns.

Table 21. Arizona Ob-gyn Physician UME Completion by Rural-Urban Commuting Area

	AZ-UME Total (percent)	Other-UME Total (percent)	Missing/Unknown
Arizona (N=607)	118 (19.4)	489 (80.6)	88
Urban (n=576)	111 (19.3)	465 (80.7)	86
Large Rural City/Town (micropolitan) (n=24)	4 (16.7)	20 (83.3)	2
Small Rural Town (n=7)	3 (42.9)	4 (57.1)	0
Isolated Small Rural Town (n=0)	-	-	-

Table 22 includes the total number and percent of licensed Arizona ob-gyn physicians by GME location. As before, the GME location is grouped by GME in Arizona (AZ-GME) or GME in any other U.S. state or foreign country (OTHER-GME). For ob-gyn physicians, for whom we have GME location information (n=573), 34.4% completed GME in Arizona and 65.6% received their GME training outside of Arizona. Of physicians in large rural towns, 18.8% completed their GME in Arizona and 81.3% completed their GME outside of Arizona. Among ob-gyn physicians in small rural towns, 28.6% completed their GME in Arizona and 71.4% completed their GME outside of Arizona however this percentage should be interpreted with caution due to small numbers of total ob-gyn physicians in small rural towns.

Table 22. Arizona Ob-gyn Physician GME Completion by Rural-Urban Commuting Area

	AZ-GME Total (percent)	Other-GME Total (percent)	Missing/Unknown
Arizona (N=573)	197 (34.4)	376 (65.6)	122
Urban (n=550)	192 (34.9)	358 (65.1)	112
Large Rural City/Town (micropolitan) (n=16)	3 (18.8)	13 (81.3)	10
Small Rural Town (n=7)	2 (28.6)	5 (71.4)	0
Isolated Small Rural Town (n=0)	-	-	-

The AAMC 2019 Report on Residents from 2009 to 2018 shows that at the national level, 54.6% of physicians who complete residency training stayed in the state of their training to practice. For ob-gyn

residency programs (including all U.S. DO and MD programs), 52.1% of physicians remained in the state of their residency education to practice (Association of American Medical Colleges, 2019). We do not currently have data on the number and percent of ob-gyn graduates from Arizona GME programs who remain in Arizona.

Table 23 combines UME and GME state location data. Of the 695 active ob-gyn physicians in Arizona, we have UME and GME location data for n=502, reflecting about 70% of the total. Just over half of the licensed ob-gyn physicians in Arizona completed both their UME and GME outside of Arizona (54.2%). This is followed by 24.7% of ob-gyn physicians who completed their UME outside of Arizona and their GME in Arizona. Thirteen percent of Arizona ob-gyn physicians completed both UME and GME in Arizona, and 7.8% completed their UME in Arizona and their GME outside of Arizona. Again, missing data affect these percentages.

Table 23. Arizona Ob-gyn Physicians Total by Rural-Urban Commuting Area total (percent)					
	AZ UME & OTHER GME Total (percent)	Other UME & AZ GME Total (percent)	AZ GME & UME Total (percent)	Other UME & Other GME Total (percent)	Missing
Arizona (n=502)	39 (7.8)	124 (24.7)	67 (13.3)	272 (54.2)	193

May not add to 100% due to missing data on UME or GME location

Certified Nurse Midwife Workforce

According to the American College of Nurse-Midwives (ACNM) Certified Nurse Midwives (CNM) are registered nurses who graduated from an accredited nurse-midwifery educational program and passed the national certification exam (Accreditation Commission for Midwifery Education, 2019). These educational programs range from 2 to 4 years in length depending the program structure (American College of Nurse-Midwives, N.D.). As defined by the Arizona Department of Health Services (ADHS), a Certified Nurse-Midwife is an Advanced Registered Nurse Practitioner with specialized training in nursing and midwifery. In Arizona, CNMs are licensed by the State Board of Nursing (Arizona Department of Health Services, 2020). CNMs “provide primary care; well-woman gynecological care; and care and counseling during preconception, pregnancy, childbirth and the post-partum period either independently or as part of a health care team.” (U.S. Department of Health and Human Services, Health Resources and Services Administration, 2016, p.7)

ACOG states that the “the needs of the U.S. adult female population during the next decade cannot be met by ob-gyns, family physicians and general internists alone” and indicates that at least half of ob-gyn practices are also staffed with other providers like CNMs, Nurse Practitioners (NPs) and Physician Assistants (PAs) (Rayburn, 2017). HRSA workforce projections estimate that the supply of CNMs and women’s health NPs and PAs will exceed demand by 2025. “The supply of CNMs is expected to grow by 27% (from 11 100 FTEs to 14 070 FTEs) while the demand is expected to only grow by 8% (from 11 100 FTEs to 12 010 FTEs), resulting in an oversupply of 2060 FTEs nationwide” (U.S. Department of Health and Human Services, Health Resources and Services Administration, 2016, p.5). A surplus is expected across all regions.

Education, Certification, & Licensing

According to the Accreditation Commission for Midwifery Education, there are 38 midwifery programs in the US. Of those, 35 are housed in schools of nursing and require students to be registered nurses upon

entry or allow students to become registered nurses on an accelerated program. A CNM must have an RN license prior to starting a midwifery program or earn the degree within the program. All CNMs must have an RN license or complete the RN training as part of their CNM training. No new CNM programs have been created since 2009, and since 2014, the number of qualified applications has exceeded the number of students admitted. National enrollment has increased from 1006 in 2014 to 1214 in 2018. There are no CNM or CM educational programs in Arizona (Accreditation Commission for Midwifery Education, 2019). Upon graduation, CNMs must pass the American Midwifery Certification Board (AMCB) exam and be re-certified every five years. Arizona allows autonomous midwifery practice and does not require that CNMs have direct physician supervision or contractual practice agreements.

Workforce

In Arizona there are 203 CNMs (Arizona Department of Health Services, 2020). Birth data from the Centers for Disease Control and Prevention (CDC), Wide-ranging Online Data for Epidemiologic Research (WONDER) birth data show that 10.8% of births in Arizona in 2018 were attended by a CNM (United States Department of Health and Human Services (US DHHS), Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS), Division of Vital Statistics, 2019). Data from 2012 and 2013 show that the majority of CNMs are white females, are on average 35 years old, and most hold a master's degree or higher (Fullerton et al., 2015). The most common employment locations were hospitals/medical centers followed by physician-owned practices and educational institutions. Average salary was \$92 000. The majority of births attended by CNMs/CMs respondents are in hospitals (Fullerton et al., 2015). Table 24 provides the total and per population ratio for CNMs per 10 000 women and per 10 000 women ages 15 to 44 years old.

Table 24. Arizona Certified Nurse Midwives (CNM)	
	Total
Arizona	203
Ratio Per 10 000 women	0.6
Ratio per 10 000 Women Ages 15-44	1.5

CNM Workforce Distribution

The geographic distribution of CNMs is similar to the distribution of ob-gyns—the majority are located in urban areas. However, the distribution of CNMs by RUCA code shows small differences compared to the distribution of ob-gyns (note, two different data sources are being used, ob-gyn data is state level data from the licensing boards and CNM data are extracted from the federal NPPES). Ninety-five percent of ob-gyns practice in an urban RUCA area compared to 92% of CNMs. Seventy percent of ob-gyns are located in Maricopa county compared to 56% of CNMs and 15% of ob-gyns are located in Pima county compared to 21% of CNMs.

Table 25. Arizona Certified Nurse Midwives (CNM) by Rural-Urban Commuting Area (Total, Percent)

	CNM	Total Pop.	Female Pop.
Arizona	203	6 809 946²	3 424 891
Urban	187 (92)	6 284 744	3 165 012
Large Rural City/Town (micropolitan)	11 (5)	361 520	178 907
Small Rural Town	5 (2)	126 798	62 774
Isolated Small Rural Town	0	39 494	19 654

Table 26. Arizona Certified Nurse Midwives (CNM) by County Total (percent)

	Total, Percent
Arizona	203
Apache	7 (3.0)
Cochise	3 (1.0)
Coconino	9 (4.0)
Gila	-
Graham	1 (0.5)
Greenlee	-
La Paz	-
Maricopa	114 (56.0)
Mohave	3 (1.0)
Navajo	5 (2.0)
Pima	43 (21.0)
Pinal	2 (1.0)
Santa Cruz	-
Yavapai	6 (3.0)
Yuma	10 (5.0)

Conclusion

Women's health is enhanced by improving opportunities to be healthy, preventing illness, and promoting maternal health services. Health opportunities are supported by improvements to education and housing, and reducing poverty. Preventing illness involves screening for and managing conditions that are unique, more common, or more serious in women. Likewise, maternal health relates to the health and services provided to women before and during pregnancy, child-birth, and post-delivery. A key public health priority is the prevention and reduction of maternal deaths. In the U.S., maternal mortality rates are too high, and most, three out of five maternal deaths, are preventable (Petersen et al., 2019). Mortality rates are disproportionately higher for women from marginalized social groups. Black, American Indian and Alaska Native women have maternal mortality rates 3.3 to 3.5 times higher than White women. In Arizona, 19.8 Black and 39 American Indian women die per every 100 000 live births, higher than the state average of 13.3 (Moaddab et al., 2016).

A high-quality maternal health care system relies in part on the right number of well-trained women's health providers in the right locations (Rayburn, 2017; U.S. Department of Health and Human Services,

² This population data is from the U.S. Census Bureau American Community Survey 2017, 5-year estimate. The total state level population in 2019 is likely higher, estimated at 7 171 646 (U.S. Census, 2018 National and State Population Estimates).

Health Resources and Services Administration, 2016). According to national estimates, Arizona and other states are anticipated to experience an ob-gyn shortage (U.S. Department of Health and Human Services, Health Resources and Services Administration, 2016).

Using licensure data, we found that there are geographic disparities in the distribution of ob-gyn physicians across Arizona. The ratio of ob-gyns per 10 000 women in urban areas is 2.1, compared to 1.5 in large rural city/towns and 1.1 in small rural towns. There are no practicing ob-gyn physicians in isolated small rural towns. This geographic distribution is mirrored in the CNM workforce, which similarly favors urban over rural areas. While the UME physician training pipeline increased and matched population growth, the number of GME residency slots has not. Thus, many Arizonans graduating from our medical and osteopathic schools in the state are forced to leave the state to obtain residency and fellowship training. Studies show that medical and osteopathic school graduates who remain in the state for residency and fellowship GME training are more likely to remain in that state to practice. Nineteen percent of ob-gyn physicians in Arizona graduated from UME in Arizona and 34.4% completed their GME training in Arizona. There are currently no CNM training programs located in Arizona.

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Appendix A

Health Care Providers	
Accredited Birth Center	See American Association of Birth Centers' Standards for Birth Centers
Level I (Basic Care)	<ul style="list-style-type: none"> • Every birth attended by at least 1 qualified birthing professional (midwife, family physician, or ob-gyn) and an appropriately trained and qualified registered nurse (RN) with level-appropriate competencies as demonstrated by nursing competency documentation • Physician with privileges to perform emergency cesarean delivery readily available at all times • Primary maternal care providers, including midwives, family physicians, or ob-gyns readily available at all times • Appropriately trained and qualified RNs with level-appropriate competencies as demonstrated by nursing competency documentation readily available at all times • Nursing leadership has level-appropriate formal training and experience in maternal care • Anesthesia providers, such as anesthesiologists, nurse anesthetists, or anesthesiologist assistants, working with an anesthesiologist{ for labor analgesia and surgical anesthesia readily available at all times
Level II Specialty Care	<p>Level I providers +</p> <ul style="list-style-type: none"> • Ob-gyn readily available at all times <ul style="list-style-type: none"> ○ Based upon available resources and facility determination of the most appropriate staffing, it may be acceptable for a family physician with obstetric fellowship training or equivalent training and skills in obstetrics, and with surgical skill and privileges to perform cesarean delivery to meet the criteria for being readily available at all times • Physician obstetric leadership is a board-certified ob-gyn with experience in obstetric care <ul style="list-style-type: none"> ○ Based upon available resources and facility determination of the most appropriate staffing, it may be acceptable for such leader to be board certified in another specialty with privileges and expertise in obstetric care including with surgical skill and privileges to perform cesarean delivery • An MFM (Maternal Fetal Medicine specialist) readily available at all times for consultation onsite, by phone, or by telemedicine, as needed • Anesthesiologist readily available at all times • Internal or family medicine physicians and general surgeons readily available at all times for obstetric patients
Level III Subspecialty Care	<p>Level II providers +</p> <ul style="list-style-type: none"> • Nursing leaders and adequate number of RNs who have special training and experience in the management of women with complex and critical maternal illnesses and obstetric complications • Board-certified# ob-gyn physically present** at all times • An MFM with inpatient privileges readily available at all times, either onsite, by phone, or by telemedicine. Timing of need to be onsite is directed by urgency of clinical situation. However, MFM must be able to be onsite to provide direct care within 24 hours. • Director of maternal-fetal medicine service is a board-certified MFM • Director of obstetric service is a board-certified ob-gyn or MFM

	<ul style="list-style-type: none"> • Board-certified anesthesiologist physically present at all times • Director of obstetric anesthesia services is board-certified anesthesiologist with obstetric anesthesia fellowship training or experience in obstetric anesthesia • Full complement of subspecialists, such as subspecialists in critical care, general surgery, infectious disease, hematology, cardiology, nephrology, neurology, gastroenterology, internal medicine, behavioral health, and neonatology, readily available for inpatient consultation at all times
Level IV Regional Perinatal Health Care Centers	<p>Level III providers +</p> <ul style="list-style-type: none"> • Maternal-fetal medicine care team with expertise to manage highly complex, critically ill, or unstable maternal patients. A board-certified MFM attending with full inpatient privileges is readily available at all times for consultation and management. This includes co-management of intensive care unit obstetric patients. • Nursing Service Line leadership with advanced degree and national certification • Continuous availability of adequate numbers of RNs who have experience in the care of women with complex medical illnesses and obstetric complications with close collaboration between critical care nurses and obstetric nurses with expertise in caring for critically ill women. • Board-certified anesthesiologist with obstetric anesthesia fellowship training or experience in obstetric anesthesia physically present at all times. • At least 1 of the following adult subspecialties readily available at all times for consultation and treatment as needed onsite: neurosurgery, cardiac surgery, or transplant. If the facility does not have all 3 subspecialties available, there should be a process in place to transfer women to a facility that can provide the needed service.

Reproduced from: Kilpatrick et al., 2019)

Appendix B

Arizona Physician Licensure Data Disk Public Data Fields Include:

License Information

- License Number
- License Type
- Status (e.g., active)
- License Date
- Due to Renew By
- Expiration Date

Personal Information

- Last Name, First Name, MI, Suffix
- Street1 / Street 2
- City, State, ZIP
- Phone Number

Education Information

- Medical School Attended
- Graduation Date

Area of Interest

- Open text field for specialty or area of focus)

Appendix C

Primary and Secondary RUCA codes.

Primary and Secondary RUCA Codes	
Code	Classification Description
1 Metropolitan area core: primary flow within an urbanized area (UA)	
1.0	No additional code
1.1	Secondary flow 30% to 50% to a larger UA
2 Metropolitan area high commuting: primary flow 30% or more to a UA	
2.0	No additional code
2.1	Secondary flow 30% to 50% to a larger UA
3 Metropolitan area low commuting: primary flow 10% to 30% to a UA	
3.0	No additional code
4 Micropolitan area core: primary flow within an urban cluster of 10,000 to 49,999 (large UC)	
4.0	No additional code
4.1	Secondary flow 30% to 50% to a UA
5 Micropolitan high commuting: primary flow 30% or more to a large UC	
5.0	No additional code
5.1	Secondary flow 30% to 50% to a UA
6 Micropolitan low commuting: primary flow 10% to 30% to a large UC	
6.0	No additional code
7 Small town core: primary flow within an urban cluster of 2,500 to 9,999 (small UC)	
7.0	No additional code
7.1	Secondary flow 30% to 50% to a UA
7.2	Secondary flow 30% to 50% to a UC
8 Small town high commuting: primary flow 30% or more to a small UC	
8.0	No additional code
8.1	Secondary flow 30% to 50% to a UA
8.2	Secondary flow 30% to 50% to a UC
9 Small town low commuting: primary flow 10% to 30% to a small UC	
9.0	No additional code
10 Rural areas: primary flow to a tract outside a UA or UC	
10.0	No additional code
10.1	Secondary flow 30% to 50% to a UA
10.2	Secondary flow 30% to 50% to a UC
10.3	Secondary flow 30% to 50% to a small UC

Source: USDA ERS. (2016). 2010 Rural-Urban Commuting Area (RUCA) Codes. Retrieved from:
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Key Terms

Accreditation Commission for Midwifery Education (ACME)

Affordable Care Act (ACA)

Agency for Healthcare Research and Quality (AHRQ)

American College of Nurse Midwives (ACNM)

American College of Obstetricians and Gynecologists (ACOG)

Arizona Health Care Cost Containment System

Centers for Disease Control and Prevention (CDC)

Certified Nurse Midwife (CNM)

Graduate Medical Education (GME)

Maternal Health Task Force (MHTF)

Maternal Mortality Ratio (MMR)

Obstetrician and Gynecologist physician (ob-gyn)

Rural Urban Commuting Area (RUCA)

Undergraduate Medical Education (UME)