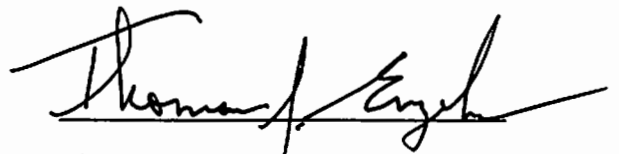


**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
HEALTH RESOURCES AND SERVICES ADMINISTRATION**

**REPORT TO THE SENATE COMMITTEE ON APPROPRIATIONS**

**BUREAU OF HEALTH WORKFORCE  
NATIONAL CENTER FOR HEALTH WORKFORCE ANALYSIS**

A handwritten signature in black ink, appearing to read "Thomas J. Engels", written over a horizontal line.

**Thomas J. Engels  
Administrator**

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## **Acronym List**

CDC	U.S. Centers for Disease Control and Prevention
FTE	Full-Time Equivalent
HHS	U.S. Department of Health and Human Services
HRSA	Health Resources and Services Administration
HWSM	Health Workforce Simulation Model
MSA	Metropolitan Statistical Area
NCHS	National Center for Health Statistics

## I. Key Findings

In the United States there exists a mal-distribution of general surgeons among urban, suburban, and rural areas. At the national level in 2017:

- There were only enough general surgeons to meet 69 percent of the demand for care in rural areas.
- There were only enough general surgeons to meet 75 percent of the demand for care in suburban areas.
- There were 19 percent more general surgeons than required to meet the demand for care in urban areas.

Projecting forward to 2030, the national supply of general surgeons will increase approximately 25 percent, while demand will increase approximately 16 percent. Thus, at the national level, it will appear as though there may be a future oversupply of general surgeons. However, this projected oversupply masks the mal-distribution of general surgeons, which will persist across the urban-suburban-rural continuum, similar to 2017. In interpreting these results, note that these projections reflect assumptions that current patterns of workforce supply and health care use are constant across the projection period. By the year 2030 at the national level, assuming current patterns of workforce supply and health care use hold constant, it is projected that:

- There will only be enough general surgeons to meet 79 percent of the demand for care in rural areas.
- There will only be enough general surgeons to meet 77 percent of the demand for care in suburban areas.
- There will be 28 percent more general surgeons than required to meet the demand for care in urban areas.

The general surgery workforce present in adjacent central metro areas, which are often home to large and specialized medical centers and hospitals with theoretical potential for excess capacity might mitigate some of the projected supply-demand differences for general surgeons observed in suburban areas. Health workforce projections at the national level and across broad urban/suburban/rural categories should be interpreted solely at the level at which they are analyzed and should not be extrapolated to the level of an individual health system, facility, or community.

## II. Legislative Language

The U.S. Department of Health and Human Services (HHS) is providing this report to Congress in response to Senate Report 115-289, Departments of Labor, Health and Human Services, and Education and related Agencies Appropriation Bill, 2019, which states:

*To accurately prepare for physician workforce demands, HHS needs high quality projections by specialty, factoring in population changes (i.e., aging population), geographic location (i.e., rural versus urban), utilization trends, and delivery system changes. For these reasons, Congress urges HRSA, to study access by underserved*

*populations to general surgeons and provide a report to the Committee 18 months after enactment detailing potential surgical shortages, especially as it relates to geographic location (i.e., rural, urban, and suburban). For the report to the Committee, HHS should consult with relevant stakeholders, including medical societies, organizations representing surgical facilities, organizations with expertise in general surgery, and organizations representing patients.*

### **III. Introduction**

The Health Resources and Services Administration (HRSA), an operating division within HHS, provides national leadership in the development, distribution, and retention of a diverse, culturally competent health workforce that can adapt to the population's changing health care needs and provide quality care for all. In support of this mission, HRSA administers a wide range of training grants, scholarships, loans, and loan repayment programs that strengthen the health care workforce and respond to the evolving needs of the U.S. health care system.

The National Center for Health Workforce Analysis (the National Center) informs public and private sector decision-making on the U.S. health workforce by expanding and improving health workforce data and its dissemination to the public, improving and updating projections of the supply of and demand for health workers, and conducting analyses of issues important to the health workforce.

This report summarizes the findings from a study conducted in fiscal year 2019 to quantify supply of and demand for general surgeons from 2017 through 2030, by state and urban/suburban/rural geography, as requested in Senate Report 115-289. For the purposes of this study, the report examines rurality at the county level, using the six-level Urban-Rural Classification Scheme for Counties developed by the Centers for Disease Control and Prevention (CDC)/National Center for Health Statistics (NCHS).

To define urban/suburban/rural geography using a standardized approach for preparation of this Report, the Bureau of Health Workforce consulted with its HRSA colleagues in the Federal Office of Rural Health Policy, as well as NCHS. HRSA also contacted the American College of Surgeons to share preliminary findings and solicit feedback.<sup>1</sup>

### **IV. Overview**

The practice location of providers is one of the most pressing considerations affecting access to health care services. Actual delivery locations of surgeons, physicians, nurses, dentists, and the many other individuals working in health care is important and is one of the most critical dimensions of health care access for individuals seeking health care. Thus, there is a need to determine where providers are currently practicing, whether there are not enough or too many of

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<sup>1</sup> HRSA contacted other organizations representing surgeons, surgical facilities, and patients, but these organizations did not express interest in participating.

them in a given location, and what we can project may happen to that workforce in that location in the future.

Research and analyses of the health care workforce involve geographic analysis at the national, state, and/or county levels. However, there are also other ways to delineate where individuals working in health care are located, and whether or not the population in that service area has sufficient access to needed providers given many barriers to accessing providers are not related to geographic proximity. Data limitations often preclude workforce assessments at smaller, more refined levels.

In order to investigate the supply and demand for general surgeons at the national level, by geographic area, and across the urban/suburban/rural spectrum, the National Center utilized the Health Workforce Simulation Model (HWSM), which is an integrated model that estimates the current and future supply of and demand for health care workers by occupation, geographic area, and year. A comprehensive technical report documenting the logic, methods, data, assumptions, and validation processes for the HWSM is available for review on the HRSA website.<sup>2</sup>

The next section illustrates key findings from the estimates of the current and future supply of and demand for general surgeons. Then the report presents a brief summary of both the supply and demand modeling approaches. The results section shows estimates of full-time equivalent (FTE) general surgeon supply and demand in 2017 (the base year of the study), by geographic area, followed by projections of future supply and demand in 2030. Lastly, the report describes a number of conclusions drawn from the study findings.

## **V. Summary of Methods**

To estimate the current and future supply of and demand for general surgeons by geographic area and year, HWSM uses a microsimulation approach to modeling, meaning that individual people are the basic unit of analysis in modeling both supply and demand.

### **Modeling Supply**

For supply modeling, HWSM simulates labor force participation decisions for a representative, de-identified sample of the current general surgeon workforce to project how supply will evolve over time. The projections reflect estimates of the annual number and assumed characteristics of newly trained general surgeons completing residency training (health workforce entrants), combined with prediction equations that describe workforce attrition probabilities and weekly number of hours worked. The modeling assumes overall workforce supply patterns, meaning factors such as typical new entrant demographics and workforce participation rates are constant over the projection period (2017-2030).

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<sup>2</sup> U.S. Department of Health and Human Services, Health Resources and Services Administration, National Center for Health Workforce Analysis. 2018. Technical Documentation for Health Resources and Services Administration's Health Workforce Simulation Model. Available at: <https://bhwh.hrsa.gov/sites/default/files/bhw/health-workforce-analysis/research/projections/technical-documentation-health-workforce-simulation-model.pdf>, accessed November 10, 2019.

With training, general surgeons manage a broad spectrum of surgical conditions. Estimates of the number and characteristics of general surgeons active in the workforce come from the 2017 American Medical Association Masterfile, a recognized source of current and historical data on the education, training, and professional certification of all physicians who reside in the United States. Key database variables include physician age, sex, activity status, and primary office address (mapped to state and county). The Masterfile contains information on physicians' first and second self-designated medical specialties. This analysis categorizes physicians in the Masterfile as general surgeons if they self-identified "general surgery" as their first specialty and claimed no second specialty (20,120 FTE physicians).

This approach captures physicians who solely practice general surgery. Admittedly, this approach may not capture a small subset of surgical specialists and subspecialists who may serve in many clinical roles for their communities, and in particular who may provide some part-time level of general surgery services to communities facing physician shortages. However, neither the Masterfile nor other recognized workforce data sources provide FTE level of effort information to allow such a detailed level of analysis (e.g., 6 hours of weekly general surgery procedure time by a full-time vascular surgeon). Thus, in order to ensure accuracy and consistency, only data for self-reported general surgeons as the primary specialty provided the basis for the following health workforce projection findings. Although the Masterfile is a widely used source of physician workforce statistics, the self-reported nature of this data is another limitation of its use for workforce analyses. The HRSA HWSM technical report provides additional details on the physician supply modeling process and the data sources used in the HWSM.<sup>3</sup>

## Modeling Demand

The demand analysis models current patterns of health care use, including office and outpatient visits to general surgeons as well as emergency visits and hospitalizations requiring surgery. Demand for surgery-related services is then used to model demand for general surgeons, and takes into consideration geographic variation in the availability of specialty surgeons, which may increase or decrease demand for general surgeons. The microsimulation approach models demand for health care services by using individual-level (micro) data on predictors of health care use for each person in a representative sample of a designated geographic region (national, state, or county-equivalent). The three-part modeling process (1) constructs a representative sample of the population in each county; (2) estimates the use of surgery-related services by this population, by applying factors from a set of regression models to estimate current, national-level average health care utilization patterns for a population having certain demographic, geographic, and health status characteristics; and (3) models general surgeon workforce for the delivery of services demanded. The HRSA HWSM technical report provides additional details on demand modeling and data sources used in the HWSM.<sup>4</sup>

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<sup>3</sup> Ibid. Accessed November 7, 2019.

<sup>4</sup> Ibid. Accessed November 7, 2019.

## Geographic Classification

In response to the request in the Senate Report, the National Center attempted to define and then produce workforce projections at the rural, urban, and suburban level. It is worth noting that health workforce projections at the national level, and across broad urban/suburban/rural categories, do not necessarily reflect the nuances and challenges in health worker recruitment and retention observed at the level of an individual health system, facility, or community. Therefore, projection findings should be interpreted solely at the level at which they are analyzed.

One challenge in producing estimates for geographic areas with similar population sizes and densities, however, is that there is no broad consensus about how to define “rural, urban, and suburban,” which can sometimes be defined differently in individual studies within the health workforce analysis field.

In consultation with the Federal Office of Rural Health Policy, this report geographically classifies the supply of general surgeons and demand for services provided by general surgeons by the six NCHS urban-rural categories. Use of NCHS data systems to study associations between urbanization level and health as well as to monitor population health is common.<sup>5</sup> The NCHS scheme has four metropolitan levels and two nonmetropolitan levels, reflective of the fact that the large U.S. metropolitan population (roughly 85 percent of the total U.S. population in 2010) can support a more granular classification than the smaller non-metropolitan population.<sup>6</sup> Figure 1 defines the six-level urban-rural classification scheme for U.S. counties and county-equivalent entities.<sup>7</sup>

**Figure 1: NCHS Six-Level Urban-Rural Classification Scheme for Counties**

CDC NCHS Six-Level Urban-Rural Classification	Description <sup>8</sup>
Large Central Metro	Counties in metropolitan statistical area (MSA) of 1 million or more population that: (1) contain the entire population of the largest principal city of the MSA, or (2) have their entire population contained in the largest principal city of the MSA, or (3) contain at least 250,000 inhabitants of any principal city of the MSA.
Large Fringe Metro	Counties in MSAs of 1 million or more population that did not qualify as large central metro counties

<sup>5</sup> NCHS Urban-Rural Classification Scheme for Counties. Available at [https://www.cdc.gov/nchs/data\\_access/urban\\_rural.htm](https://www.cdc.gov/nchs/data_access/urban_rural.htm), accessed on November 7, 2019.

<sup>6</sup> Ibid. Accessed November 7, 2019.

<sup>7</sup> Ibid. Accessed November 7, 2019.

<sup>8</sup> Metropolitan Statistical Areas have at least one urbanized area of 50,000 or more population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties. Micropolitan Statistical Areas have at least one urban cluster of at least 10,000 but less than 50,000 population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties. Source: OMB Bulletin No. 18-04. Available from: <https://www.whitehouse.gov/wp-content/uploads/2018/09/Bulletin-18-04.pdf>. Accessed January 27, 2020.



<b>CDC NCHS Six-Level Urban-Rural Classification</b>	<b>Description<sup>8</sup></b>
Medium Metro	Counties in MSAs of populations of 250,000-999,999
Small Metro	Counties in MSAs of populations less than 250,000
Micropolitan	Counties in micropolitan statistical areas
Non-Core	Nonmetropolitan counties that did not qualify as micropolitan

Additionally, the NCHS Six-Level Urban-Rural Classification Scheme aggregates the findings into three broader categories: urban, suburban, and rural. This report presents both classifications. Figure 2 defines the urban, suburban, and rural categories.

**Figure 2: Three-Level Urban-Suburban-Rural Classification Scheme for Counties**

<b>Urban-Suburban-Rural Classification</b>	<b>CDC NCHS Six-Level Urban-Rural Classification</b>
Urban	Large Central Metro
	Medium Metro
	Small Metro
Suburban	Large Fringe Metro
Rural	Micropolitan
	Non-Core

## **VI. Results**

The results presented below emphasize a principal assumption of the HWSM that in the base year (2017) the supply and the demand are roughly at equilibrium at the national level. This assumption is consistent with prevailing practices in the health workforce analysis field.<sup>9</sup> The future projection analysis aims to show whether there will likely be sufficient workforce supply to provide a level of care at least consistent with current levels. Supply Percent Adequacy is defined as the ratio between supply and demand, expressed as a percentage (i.e.,  $100 * \text{supply} / \text{demand}$ ). Thus, a Supply Percent Adequacy of 100 percent indicates that supply is approximately equal to demand.

<sup>9</sup> Ono, T., Lafortune, G., Schoenstein, M. 2013. “Health workforce planning in OECD countries: a review of 26 projection models from 18 countries.” OECD Health Working Papers, No. 62. France: OECD Publishing 2013: 8-11.

The nature of general surgery practice varies across urban/rural areas. Rural areas that often have few if any specialty surgeons need general surgeons experienced in performing a wide variety of surgeries. Physicians trained as general surgeons but working in urban areas may also self-identify as specialists if the scope of surgeries they have completed in practice is narrower. As a result, the comparison of “general surgeons” across rurality classifications involves some differences in professional characteristics. HRSA bases the estimates in this report on analysis of available data that may not fully capture these differences in professional characteristics.

Comparison of supply to demand in the base year suggests that in the rural areas (which encompass both the non-core and micropolitan counties), the available supply of general surgeons is only sufficient to provide about 69 percent of a national average level of care to the population residing in those areas (Figure 3). This percentage rises to 93 percent in micropolitan areas alone, and 88-98 percent in small and medium metro locations (Figure 4). The extent to which the supply is sufficient to provide the national average level of care in the large metro areas is 75 percent for large fringe metro areas and 154 percent for large central metro areas, with this geographic variation likely reflecting that large, teaching hospitals providing care to patients from across the region are predominantly located in the central areas of large metropolitan areas.

When combining NCHS urban-rural classifications in rural areas (i.e., non-core and micropolitan combined), there is a shortfall of approximately 1,210 general surgeons, and supply is adequate to provide over half (69 percent; Figure 3) of the demand for care at the national average level. In small and medium metro areas combined, supply and demand are roughly in equilibrium (with supply able to meet 94 percent of projected demand). In large central metro areas, there are approximately 2,470 more general surgeons than required to provide a national average level of care to the population residing in those areas, with some portion of these resources possibly used by patients traveling from outside of large metropolitan areas to obtain care.

**Figure 3: General Surgeon National FTE Supply and Demand by Urban-Suburban-Rural Classification, 2017**

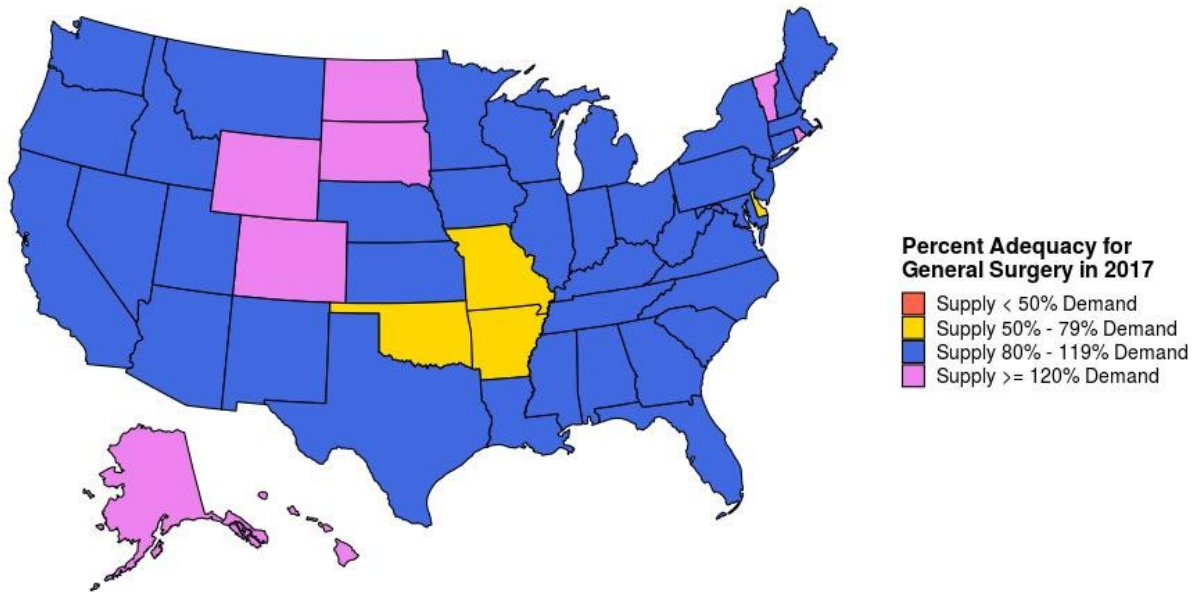
<b>Urban—Suburban-Rural Classification</b>	<b>Supply</b>	<b>Demand</b>	<b>Supply - Demand</b>	<b>Percent Adequacy (Supply ÷ Demand)</b>
Urban	13,330	11,230	2,100	119%
Suburban	4,060	5,390	-1,330	75%
Rural	2,730	3,940	-1,210	69%
<b>Total</b>	<b>20,120</b>	<b>20,560</b>	<b>-440</b>	<b>98%</b>

**Figure 4: General Surgeon National FTE Supply and Demand by NCHS Urban-Rural Classification, 2017**

CDC NCHS Six-Level Urban-Rural Classification	Supply	Demand	Supply - Demand	Percent Adequacy (Supply ÷ Demand)
Non-core	830	1,890	-1,060	44%
Micropolitan	1,900	2,050	-150	93%
Small metro	2,100	2,380	-280	88%
Medium metro	4,180	4,270	-90	98%
Large fringe metro	4,060	5,390	-1,330	75%
Large central metro	7,050	4,580	2,470	154%
<b>Total</b>	<b>20,120</b>	<b>20,560</b>	<b>-440</b>	<b>98%</b>

When we use the average level of care at the national level to develop state level estimates in the base year (Figure 5), we find that supply and demand are roughly in balance for most states, with supply below 80 percent of estimated demand for only four states.

**Figure 5: General Surgeon State Adequacy of Supply, 2017**



Assuming that current workforce delivery patterns continue unchanged, the supply of general surgeons is estimated to increase 25 percent to 25,120 FTEs by 2030 (21,930 in metro areas and 3,190 in non-metro areas – see Figures 6 and 7), while demand is estimated to increase 16 percent to 34,680 (19,730 in metro areas and 4,060 in non-metro areas). While the national

supply increases slightly faster than the demand, the geographic mal-distribution continues over the projection period. Although a faster increase in supply is projected in both metro and non-metro areas under the HWSM assumptions, the supply still provides only 79 percent of expected demand in non-metro (i.e., rural) areas by 2030.

**Figure 6: General Surgeon National FTE Projected Supply and Demand by Urban-Suburban-Rural Classification, 2030**

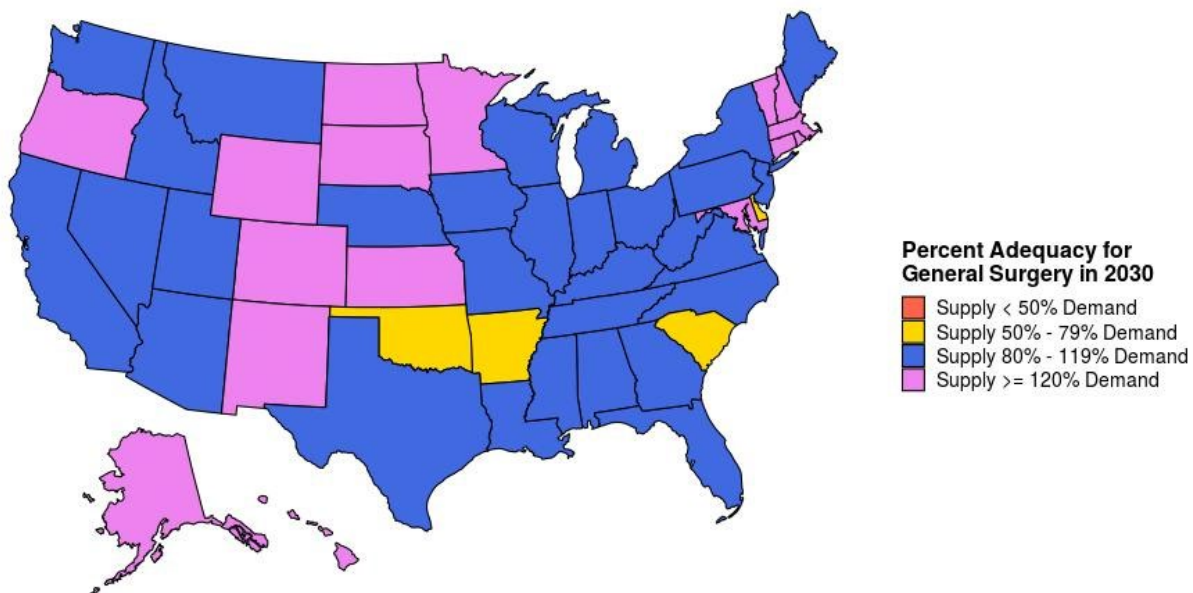
Urban—Suburban-Rural Classification	Supply	Demand	Supply - Demand	Percent Adequacy (Supply ÷ Demand)
Urban	16,940	13,260	3,680	128%
Suburban	4,990	6,470	-1,480	77%
Rural	3,190	4,060	-870	79%
<b>Total</b>	<b>25,120</b>	<b>23,790</b>	<b>1,330</b>	<b>106%</b>

**Figure 7: General Surgeon National FTE Projected Supply and Demand by NCHS Six-Level Urban-Rural Classification, 2030**

CDC NCHS Six-Level Urban-Rural Classification	Supply	Demand	Supply - Demand	Percent Adequacy (Supply ÷ Demand)
Non-core	960	1,910	-950	50%
Micropolitan	2,230	2,150	80	104%
Small metro	2,650	2,660	-10	100%
Medium metro	5,280	4,950	330	107%
Large fringe metro	4,990	6,470	-1,480	77%
Large central metro	9,010	5,650	3,360	159%
<b>Total</b>	<b>25,120</b>	<b>23,790</b>	<b>1,330</b>	<b>106%</b>

At the state level (Figure 8), supply and demand are still roughly in balance for most states, with supply below 80 percent of estimated demand for only four states.

**Figure 8: General Surgeon State Adequacy of Projected Supply, 2030**



## VII. Conclusions

A mal-distribution of general surgeons exists across states, and most markedly, across the urban-rural continuum. Other research suggests a growing shortfall of specialty surgeons as well, and such a shortfall could create greater demand for surgeons to sub-specialize instead of choosing general surgery or to focus on a general surgery sub-specialization (e.g., hand surgery), positions that are primarily in urban areas, which could exacerbate shortages in rural areas.<sup>10</sup>

This report analyzes each of the six NCHS urban-rural classifications separately, as well as aggregates those classifications into urban, suburban, and rural categories. Currently, the supply can only provide an estimated 75 percent of demand for general surgeons in suburban areas (large fringe metros in the NCHS classification system), at a national average level of care. However, the adjacent central metro areas (often home to large and specialized medical centers and hospitals, and high concentrations of specialty providers), may have excess capacity. This capacity has not been quantified and is purely hypothetical; however, since the complexity of care and time dedicated to physician education and training at urban medical centers may necessitate having a larger surgical workforce. Analyzed together, the supply of general

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<sup>10</sup> Dall TM, Reynolds R, Jones K, Chakrabarti R, Iacobucci W. 2019 Update, The Complexities of Physician Supply and Demand: Projections from 2017 to 2032. Washington, D.C.: IHS Markit report prepared for the Association of American Medical Colleges; 2019. [https://aamc-black.global.ssl.fastly.net/production/media/filer\\_public/31/13/3113ee5c-a038-4c16-89af-294a69826650/2019\\_update\\_-\\_the\\_complexities\\_of\\_physician\\_supply\\_and\\_demand\\_-\\_projections\\_from\\_2017-2032.pdf](https://aamc-black.global.ssl.fastly.net/production/media/filer_public/31/13/3113ee5c-a038-4c16-89af-294a69826650/2019_update_-_the_complexities_of_physician_supply_and_demand_-_projections_from_2017-2032.pdf).

surgeons in urban and suburban areas appears adequate to meet projected demand for services in those areas. HRSA sees similar adequacy patterns projected over the next decade.

Currently, the supply of general surgeons in rural areas meets only an estimated 69 percent of demand. Forecasts show this adequacy gap will close slightly over the next decade but still be 79 percent in 2030, assuming that current patterns of supply and utilization continue.

## **VIII. Assumptions and Limitations**

Similar to all models, HWSM operates under limitations and uncertainties pertaining to data inputs and modeling assumptions:

1. The HWSM model starts with the assumption that current national supply and demand are roughly in equilibrium and extrapolates current patterns of care into the future.<sup>11</sup>
2. The age and sex distribution of new entrants to the workforce in the base year is assumed to continue into the future; present patterns of retirement and hours worked are assumed to remain unchanged within a given age and sex group; prevalence of health behaviors and health conditions within a demographic group are assumed constant across the projection period; and the current pattern of health care use by demographic and health risk groups are assumed to be retained across projection periods.
3. Profiles of individual new general surgeons entering the workforce each year of the projection period were simulated using the state, age, and sex distributions of recent newly trained general surgeons as determined by analysis of the American Medical Association Masterfile, and models these distributions remaining constant over the projection horizon. Modeling new general surgeons entering the workforce requires estimating how many physicians entering surgery remain as general surgeons versus specialize in a surgical subspecialty.
4. The model technical documentation discuss in detail additional limitations with HWSM inputs and modeling assumptions. Some examples of these limitations include uncertainty regarding reductions in hours worked per week or changes in retirement, and uncertainties regarding the impact of potential policy changes or technological innovations that might affect the use or delivery of care.

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<sup>11</sup> A small amount of demand (440 FTEs) in the base year was estimated to reflect the extended scope of work for general surgeons in rural areas due to a lack of specialist surgeons in rural areas.