

North Carolina Surgical Workforce Trends

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Between 1997 and 2008, the number of general surgeons in North Carolina increased and shifted demographically, geographically, and by specialty. However, surgeon numbers—overall and by specialty—do not appear to have increased as quickly or to have shifted in the same ways as North Carolina's general population.

Surgical Workforce and Population Growth

In 2008, there were approximately 4,000 active, in-state, nonfederally employed surgeons licensed to practice in North Carolina. Growth of the state's surgical workforce lagged behind growth of the general population between 1997 and 2008. Consequently, the overall ratio of the 2 groups decreased from 45.7 surgeons per 100,000 population in 1997 to 44.2 surgeons per 100,000 population in 2008. The decreasing ratio of surgeons to general population is a national phenomenon, and the ratio in North Carolina was on par with the national value in 2008 [1, 2].

Although the ratio of surgeons to population decreased during 1997-2008 in North Carolina, the absolute number of surgeons grew in most surgical specialties. Thoracic surgeons and orthopedic surgeons showed the greatest absolute increases. A relative increase in general surgeons was also observed in the state, with 9.5 practitioners per 100,000 population in 2008, compared with 6.4 per 100,000 in 1997. The latter finding differed from the national trend during the same period, which reflected a decreased ratio of general surgeons per population [1, 2].

Geographic Distribution of the Surgical Workforce

The geographic distribution of surgeons shifted considerably during 1997-2008, leaving many North Carolina counties with no surgeons. More than half of all counties in North Carolina experienced a decrease in the surgeon-to-population ratio between 1997 and 2008, and 19 of 100 counties lacked a surgeon by 2008 (Figure 1). Fifty-seven counties had fewer surgeons per capita in 2008 than in 1997, including 5 rural counties (Anson, Hoke, Swain, Warren, and Washington) that lost all of their surgeons. In total, 81 of North Carolina's 100 counties had at least 1 surgeon in 2008, although general surgeons were practicing in only 75 counties.

Although the ratio of surgeons to population decreased in both urban and rural North Carolina counties, the ratio in rural areas decreased disproportionately to the ratio in

urban areas (Table 1). In 2008, only 20% of North Carolina surgeons practiced in one of the state's 65 rural counties, whereas 31% of the state's population resided in rural counties.

Twenty-three urban counties and 34 rural counties had fewer surgeons per capita in 2008 than in 1997. Of the 19 counties with no surgeons by 2008, 16 were rural, whereas 2 other rural counties that had no surgeons in 1997 acquired at least 1 by 2008 (Figure 2). During this shift, 27 counties experienced gains in the surgeon-to-population ratio, of which 18 were rural.

Changes in the Number of Surgeons, by Specialty

Between 1997 and 2008, 10 of the 11 surgical specialty groups [5] experienced growth in their workforce; the only specialty that did not experience growth—otolaryngologic surgery—decreased by 6%, from 255 to 241 surgeons. Although the number of surgeons in each of the 3 largest surgical specialties (ie, general surgery, orthopedic surgery, and obstetric and gynecologic surgery) expanded considerably during 1997-2008, the number of general surgeons grew at a smaller percentage than that for the other 2 specialties. Specifically, the number of general surgeons grew by 14%, from 746 to 853 practitioners; the number of obstetric and gynecologic surgeons grew by 17%, from 946 to 1,108; and the number of orthopedic surgeons grew considerably, by 32%, from 513 to 679.

Large percentage increases were observed for several specialties during 1997-2008, although many continue to have a small number of practitioners (ie, <100). For example, the number of thoracic surgeons expanded by 39%, the largest percentage growth across all specialties, yet only 16 more thoracic surgeons were practicing in 2008 than in 1997.

Demographic Characteristics of the Surgical Workforce

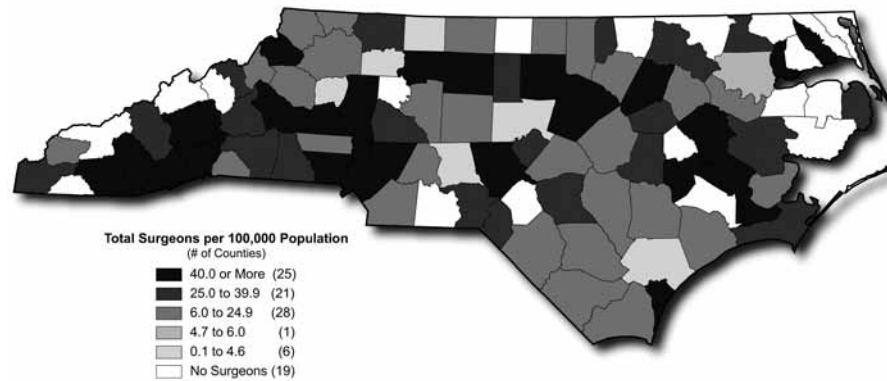
As the number of surgeons grew between 1997 and 2008, the demographic characteristics of the surgical workforce underwent significant changes. The proportion of

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FIGURE 1.
Total Surgeons per 100,000 Population, North Carolina, 2008



Note. Data are from the North Carolina Health Professions Data System [3], derived from the North Carolina Medical Board, 1997 and 2008; and from the Area Resource File [4], 2010. Data are for licensed physicians practicing in North Carolina as of October 31, 2008, who are younger than 70 years and have a self-reported primary specialty or surgical subspecialty. The map was produced on August 3, 2010, by the American College of Surgeons Health Policy Research Institute, Cecil G. Sheps Center for Health Services Research, University of North Carolina–Chapel Hill.

female surgeons increased from 10.3% to 18.9%. Whereas the female surgical workforce experienced steady growth during the study period, the minority surgical workforce underwent its greatest increase between 1997 and 1999, with slower growth afterward. The mean age of the surgical workforce remained fairly steady, ranging from 46–48 years, during the study period.

Training Characteristics of the Surgical Workforce

The number of surgeons in North Carolina who trained at in-state medical schools decreased slightly during the study period. In 1997, 29.3% of surgeons licensed in North Carolina had attended medical school in the state. By 2008, the proportion had decreased to 27.3%. Conversely, the percentage of surgeons who completed residency training in North Carolina increased slightly, from 26.6% in 1997 to 27.4% in 2008, peaking at 29.5% in 2006.

Surgical residency programs in North Carolina are located in 7 North Carolina hospitals. In 2008, there were 660 residents in residency programs for surgical specialties, up from 592 in 1997. More than half of surgical residents

were trained at the state's 2 largest academic medical centers, Duke University School of Medicine and the University of North Carolina–Chapel Hill School of Medicine, and data showed very little change in the location of residents over time.

Implications

North Carolina's supply of surgeons has grown in the past decade, but it has not kept pace with the growth in the state's general population. Additionally, the growth rate in the number of general surgeons lags behind that for several other surgical specialties, a trend that has implications for access to basic surgical services, particularly in rural areas, which often rely on general surgeons.

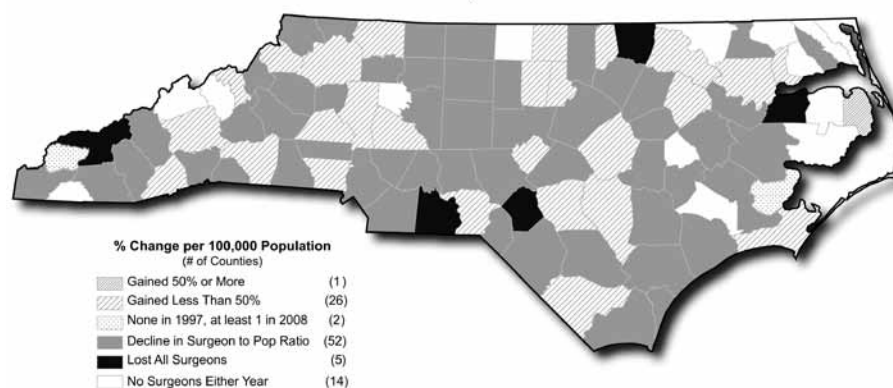
The demographic characteristics of surgeons practicing in North Carolina reflect demographic shifts taking place among surgeons across the country, with higher numbers of women and minorities entering the surgical workforce. Although North Carolina's teaching hospitals increased the number of surgeons in residency training between 1997 and 2008, this growth was smaller than the expansion of the state's surgeon supply and the state's overall population during the same period. Research by Charles and colleagues [6] highlighted the need to expand capacity within the national residency training system, to produce more surgeons and alleviate the shortage in the general surgery workforce. However, it is important for state policymakers to carefully assess the value of additional residency training slots at state-supported training sites. Our data suggest that a decreasing percentage of surgeons practicing in North Carolina trained at a North Carolina medical school or residency program. However, it is unclear whether this is due to the departure of surgeons trained in North Carolina or to an influx of surgeons trained elsewhere.

TABLE 1.
Surgeons per 100,000 Population, by Specialty and Rural-Urban Status, North Carolina, 1997 and 2008

Surgical specialty	Rural		Urban	
	1997	2008	1997	2008
General	6.75	5.27	8.85	7.85
Nongeneral	16.6	16.5	30.4	29.4
Overall	23.4	21.8	39.3	37.8

Note. Data are from the North Carolina Health Professions Data System [3], derived from the North Carolina Medical Board, 1997 and 2008; and from the Area Resource File [4], 2010.

FIGURE 2.
Percentage Changes in Surgeons per 100,000 Population, North Carolina, 1997-2008



Note. Data are from the North Carolina Health Professions Data System [3], derived from the North Carolina Medical Board, 1997 and 2008; and from the Area Resource File [4], 2010. Data are for licensed physicians practicing in North Carolina as of October 31, 2008, who are younger than 70 years and have a self-reported primary specialty or surgical subspecialty. The map was produced on August 3, 2010, by the American College of Surgeons Health Policy Research Institute, Cecil G. Sheps Center for Health Services Research, University of North Carolina-Chapel Hill.

Data and Methods

Physician data from 1997-2008 were obtained from the North Carolina Health Professions Data System (HPDS) for analysis [3]. Physician data in the HPDS are derived from the North Carolina Medical Board's licensure files. Included in this analysis were practicing, licensed physicians younger than 70 years with a self-reported primary specialty in a recognized surgical specialty; individual surgical specialties were clustered into specialty groups. Data on surgeons in postgraduate medical training programs were analyzed separately from data on all other licensed surgeons. Descriptions of surgical specialty categories and additional methods used in this analysis are available elsewhere [5]. Population data from 1997-2008 were obtained from the Area Resource File, which is produced by the US Department of Health and Human Services Health Resources and Services Administration [4]. NCMJ

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