

# **A Twenty-Year Profile of Trends in Licensed Health Professions in North Carolina: 1979-1998**

*A report produced by*  
**The Cecil G. Sheps Center for Health Services Research and  
The North Carolina Area Health Education Centers Program**  
*with the support of the*  
**University of North Carolina at Chapel Hill Office of the Provost**

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# A Twenty-Year Profile of Trends in Licensed Health Professions in North Carolina: 1979-1998

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- North Carolina Board of Physical Therapy Examiners
- North Carolina Board of Podiatry Examiners
- North Carolina Psychology Board
- North Carolina State Board of Dental Examiners
- North Carolina State Board of Examiners in Optometry
- North Carolina Midwifery Joint Committee
- Office of State Planning, Office of the Governor
- Bureau of Health Professions, US Department of Health and Human Services
- US Bureau of the Census

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# I. Introduction

Access to health care services is an important determinant of the health and well-being of North Carolina's citizens. Examining the supply and distribution of the professionals who provide these vital services is a crucial component to understanding whether North Carolina has an adequate number of professionals to meet the state's health care needs. Knowing where these professionals are practicing, and the level of their activity, can help determine whether there are current problems with access to health care services in specific regions within the state.

Examining trends in the supply and distribution of health care professionals over time can also enable researchers and policy makers to determine whether these problems will persist or are due to temporary fluctuations in the ebb and flow of health care professionals in and out of the workforce and from one location to another. This report brings together 20 years of data on the supply and distribution of practitioners in 16 categories of health care professions in North Carolina in an effort to develop a more complete picture of access to health care in the state.

For more than twenty years, the Cecil G. Sheps Center at the University of North Carolina at Chapel Hill has produced an annual publication entitled, *A Special Report on Health Care Resources in North Carolina: North Carolina Health Professions Data Book*. The data book is widely used by state officials, researchers and professionals in the health care industry as the official source of health professions statistics in North Carolina. In 1989, the Sheps Center produced *Health Manpower Trends for North Carolina: A Ten-Year Profile 1978 to 1987*, examining longitudinal trends in the state health professions workforce. This report extends the trend data included in this earlier publication and adds additional analyses.

The data contained in the annual data books, the ten-year trend analysis, and profiled in this twenty-year report, are derived from licensure information provided annually (as of October every year) to the Sheps Center by the health professional licensure boards. The licensure boards provide demographic, practice and location information on every health professional licensed to practice in North Carolina and therefore represent the best single source of accurate information on the state's health professional workforce. These data are housed in the North Carolina Health Professions Data System (HPDS) which is maintained at the Sheps Center in collaboration with the North Carolina Area Health Education Centers (NC AHEC) program.

## A. The Evolution of the North Carolina Health Professions Data System

The North Carolina Health Professions Data System is one of the most comprehensive and one of the few continuously maintained state-level data systems available to track the supply of health professionals (the full history of the North Carolina Health Professions Data System is detailed in the appendix). The system has evolved to accommodate changes in the health professions themselves and to reflect the priorities of the sponsors who have supported the system. In the early years, the data system included both health care workforce and facilities data, as well as data on vital statistics and population health collected by the NC State Center for Health Statistics, and was called the North Carolina Cooperative Health Statistics System. Now the system, maintained by the Sheps Center at UNC-CH, focuses solely on workforce statistics and is called the North Carolina Health Professions Data System.

In 1974, the National Center for Health Statistics (NCHS) solicited proposals from every state to develop various components of the Cooperative Health Statistics System. Three components were funded in North Carolina: a vital statistics component at the North Carolina State Center for Health Statistics; and manpower and health care facilities components at the UNC-CH Health Services Research Center, now the Sheps Center. During the same period, the data system also received state funding from the NC AHEC Program to develop and maintain a statewide data system to assist AHEC's efforts to track the supply and distribution of the state's licensed health professionals. It was both federal funding from the NCHS and state funding from the NC AHEC that made the initial vision of a statewide workforce data system a reality in North Carolina.

Federal funding from the NCHS ended in 1981 and two organizations—the State Health Planning and Development Agency and the Duke Endowment (through the NC Hospital Association)—provided interim funding to supplement the NC AHEC dollars until alternate funding sources could be identified. Without the interim funding of these organizations, the HPDS might not have had the resources to continue. In 1985, the office of the Vice Chancellor for Health Affairs at UNC-CH took the initiative to provide permanent support for the data system in the budget of the Sheps Center. That support, plus the continuing contractual support of the NC AHEC system, has assured the availability of these valuable health professional workforce data for our state.

## **B. Licensed Health Professions Covered in the Health Professions Data System**

In its initial phase, the HPDS received data from 14 independent licensing boards that regulated 20 categories of health professionals in North Carolina. In 1982, veterinarians, sanitarians, opticians and nursing home administrators were dropped from the system due to reduced interest in these data for workforce planning purposes. In 1985, osteopaths (DOs) not licensed by the North Carolina Board of Medical Examiners were not included in the data system since almost all of these professionals were already registered by the NC Medical Board. The HPDS currently maintains data on fifteen categories of health professionals: chiropractors, dentists, dental hygienists, licensed practical nurses, registered nurses, nurse practitioners, optometrists, pharmacists, physical therapists, physical therapist assistants, physicians (MDs & DOs), physician assistants, podiatrists, practicing psychologists and psychological associates. All of the data available through this system remain the property of the respective licensure board collecting them. Access to these data for researcher planning purposes is gained through the independent licensure boards. Without the cooperation of the licensing boards that annually provide the Sheps Center with data on these health professions, this report would not have been possible.

# **II. Sources and Limitations of the Data**

## **A. United States Data**

National health professions data are collected by a wide variety of agencies and organizations for many different purposes. These data are often not directly comparable to the data collected in North Carolina due to inconsistent reporting periods (January to December versus July-

June), and differing definitions of health care professionals across states. To ensure consistency and comparability across professions and time, as much of the national data as possible that are presented in this report were collected from a single source. The primary source for national data was the Bureau of Health Professions in the US Department of Health and Human Services. The Bureau reports national estimates by year for chiropractors, dentists, dental hygienists, licensed practical nurses, optometrists, pharmacists, physical therapists, podiatrists, and registered nurses. The source of data for nurse practitioners and certified nurse midwives was the 1980-1996 editions of *The Registered Nurse: Population Findings from the National Sample Survey of Registered Nurses*, a publication generated every four years by the Bureau. National physician data were drawn from the Bureau of Health Professions Area Resource File, which summarizes the American Medical Association's Physician Master File. Physician assistant and psychologist data were obtained from the *Statistical Abstract of the United States*, 1985 to 1998 editions. US population figures were derived from the US Bureau of the Census; state and county population figures were obtained from the Office of State Planning, North Carolina Office of the Governor. Reliable, consistent national data were not available for comparison to the state's psychological associates or physical therapist assistants.

Most of the national data are estimates derived from samples (except the AMA Masterfile data), and the sources and sampling methodologies were not consistently available. In some instances (see the sections on physician assistants and physical therapists) the national figures fluctuate widely from year to year, producing some concern as to the accuracy of the yearly estimates. For these reasons, the differences between the national and state figures should be interpreted with caution. Due to differences in the national and state data sources, sampling frames, and methodologies, a North Carolina practitioners per 10,000 population ratio above or below the national average might not necessarily mean that the state has, relative to the population, more or fewer health professionals. Where the national data appear stable (and a systematic difference between the national and state data can be inferred), US trends should be more directly comparable to North Carolina trends over the 20-year period, but caution should still be employed when comparing specific yearly ratios.

## **B. North Carolina Data**

The health professions data profiled in this report have been provided to the Cecil G. Sheps Center for Health Services Research annually by the nine boards responsible for their licensure and regulation. Data for certified nurse midwives from 1984-1999 was provided by the Midwifery Joint Committee in 1999. The Boards provide demographic, practice and location information on every health care professional licensed to practice in the state of North Carolina as of October of each year. Because state law requires a license to practice for each of the professions profiled,<sup>1</sup> the totals reported for North Carolina reflect accurate enumerations of the supply and distribution of licensed practitioners. However, because the actual practice status of a given professional may change over time (i.e. the person may retire, move out of state but maintain a license, maintain a license while working in another profession, etc.), having a license does not always indicate that the individual is actively seeing patients or working in

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<sup>1</sup>Nurse practitioners and certified nurse midwives are licensed as registered nurses and are required to obtain an approval to practice.

their professional field. To adjust for this, the data presented in this report include only those individuals who indicated on their annual renewal form that they were working in North Carolina and were actively engaged in the profession.<sup>2</sup>

### III. Analysis

This 20-year report tracks the supply of licensed health professionals (illustrated in graphs) and their distribution across the state (illustrated in maps) over the 20-year period from 1979-1998. Supply data for each of the 16 professions are depicted in three separate different graphs: 1. practitioners per 10,000 population ratios for the state compared to national trends (when comparable national data are available); 2. practitioners per 10,000 population ratios for metropolitan vs. nonmetropolitan counties; and 3. practitioners per 10,000 population ratios for areas that the federal government has persistently designated as health professional shortage areas (HPSAs). Three maps are also included for each profession to illustrate: 1. the 1998 practitioners per 10,000 population ratio; 2. the change in practitioners per 10,000 population ratio from 1979 to 1988 by county; and 3. the change in practitioners per 10,000 population ratio from 1989 to 1998 by county.

#### A. Graphs

##### 1. Practitioners per 10,000 Population Ratios: US and NC

North Carolina's population has grown dramatically over the last twenty years. While the overall population of the US has increased by about 20% since 1979, North Carolina's population has increased by almost 30% (Figure 1). The population has grown fastest in the urbanized counties that form an arc linking Raleigh, Durham, Greensboro, Winston-Salem and Charlotte with the other urban areas of Asheville, Fayetteville and Wilmington experiencing similar growth (Figures 2, 3, 4). Some rural counties, generally those on the coast or in the mountains with recreational or retirement potential, also saw a substantial population expansion. Any examination of the changes in the supply and distribution of the health care workforce must take into account this rapid population growth, as well as the differences in growth rates across counties of the state. To account for these factors, changes in the supply of health care professionals over the 20 years are illustrated for the state and the nation by examining their number per 10,000 people per year. This practitioners per 10,000 population ratio provides a better mechanism to compare the supply and distribution of health professionals across varying geographic areas than would be obtained from use of simple raw counts.

##### 2. Practitioners per 10,000 Population Ratios: Metropolitan-Nonmetropolitan NC

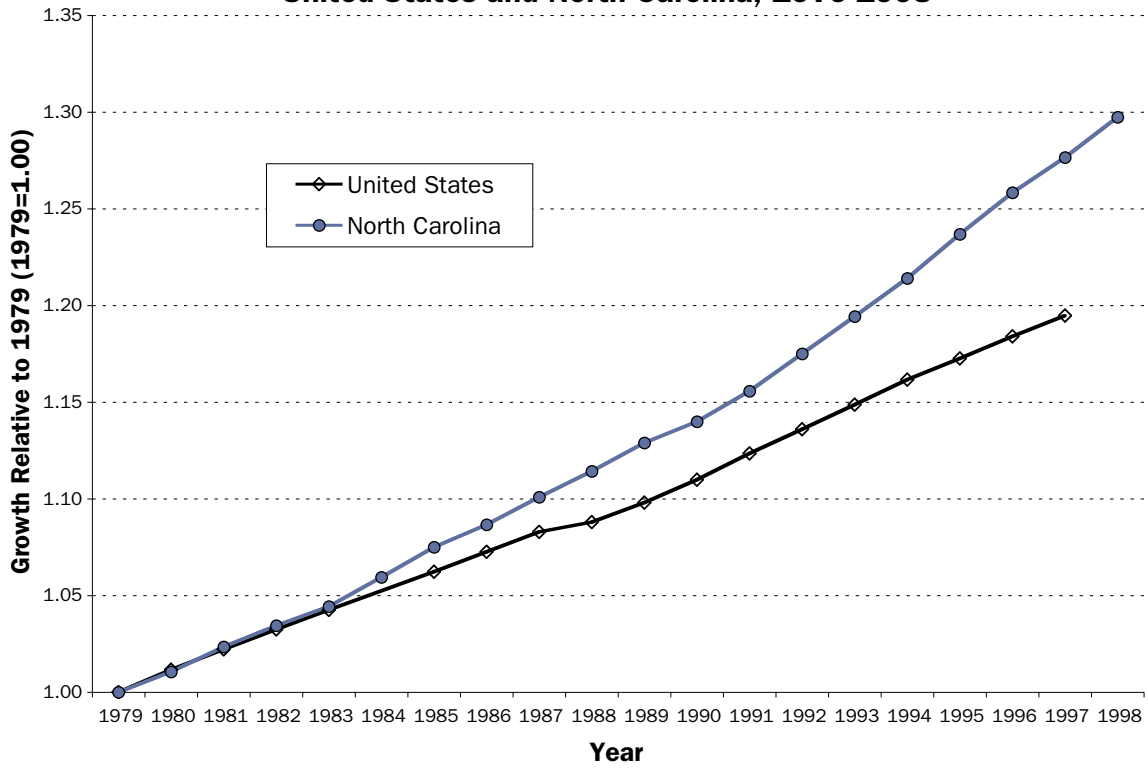
Health care professionals are not distributed evenly across North Carolina; they tend to concentrate in and around cities, and those practitioners in nonmetropolitan locations are more likely to locate in larger rural towns. To illustrate the differences between metropolitan and nonmetro-

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<sup>1</sup>Active status does not always indicate that the health care professional is seeing patients. Active status is self-designated and may include administrators, researchers and educators who are active in the profession but are not engaged in direct clinical practice. Active status is assigned to individuals who do not report their status and to those individuals who report a business address or hours but do not report their status.

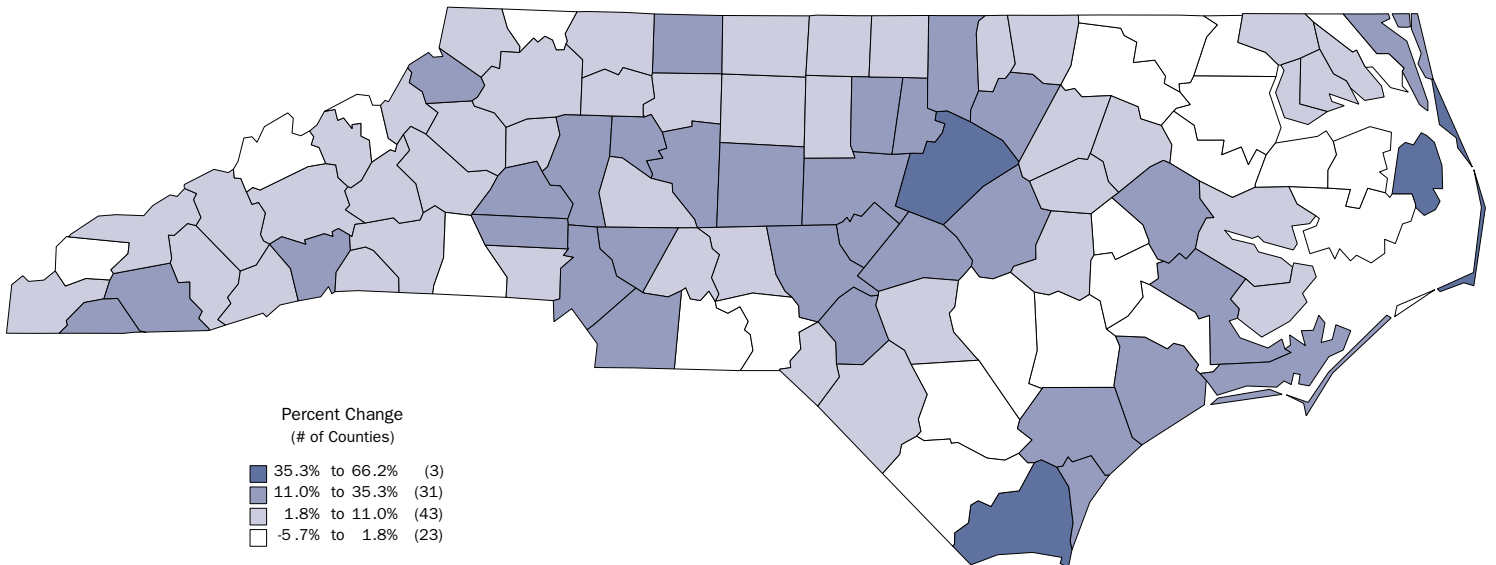


**Figure 1. Population Growth Relative to 1979, United States and North Carolina, 1979-1998**



Sources: US Bureau of the Census;  
North Carolina Office of State Planning

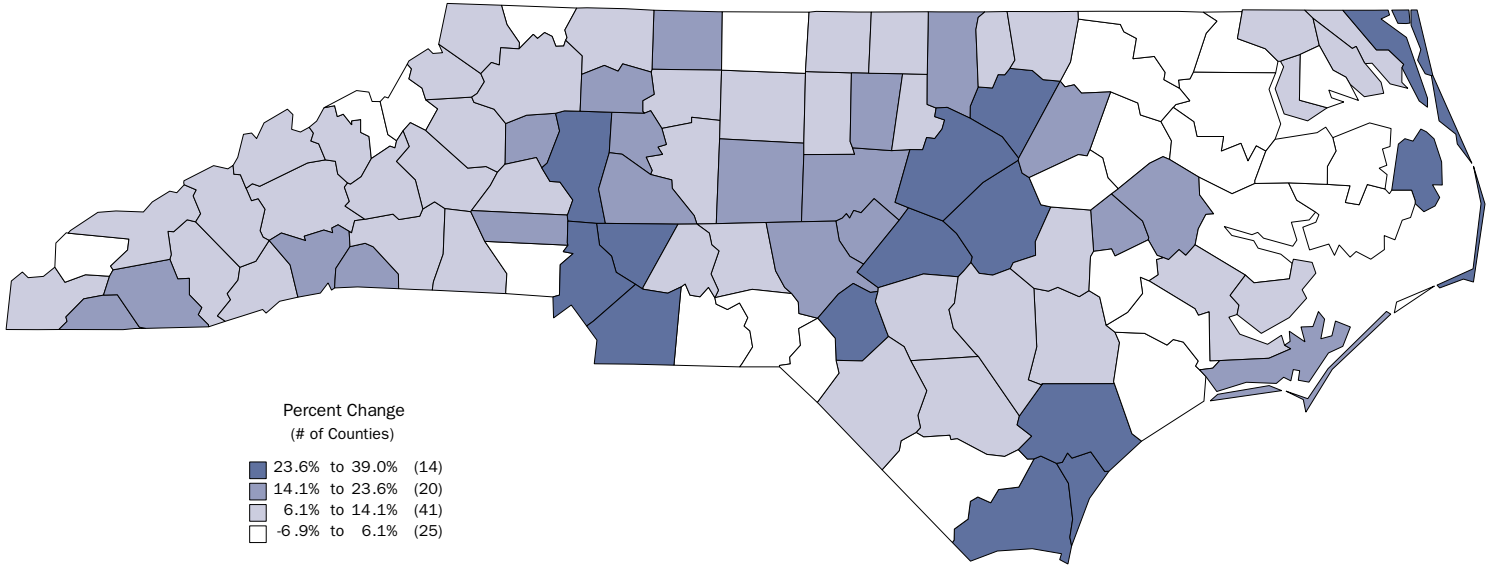
**Figure 2. Percent Change in Population, 1979 to 1988, North Carolina**



Source: North Carolina Office of State Planning, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

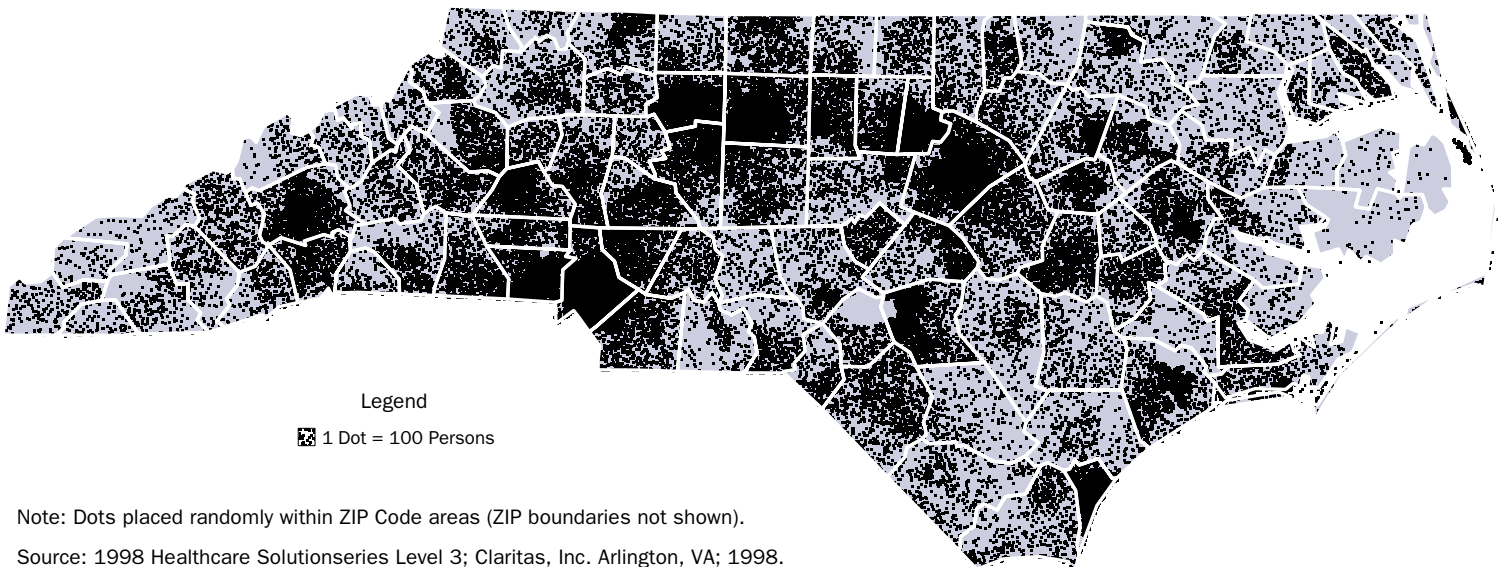
**Figure 3. Percent Change in Population, 1989 to 1998, North Carolina**



Source: North Carolina Office of State Planning, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Figure 4. Distribution of North Carolina Population, 1998**

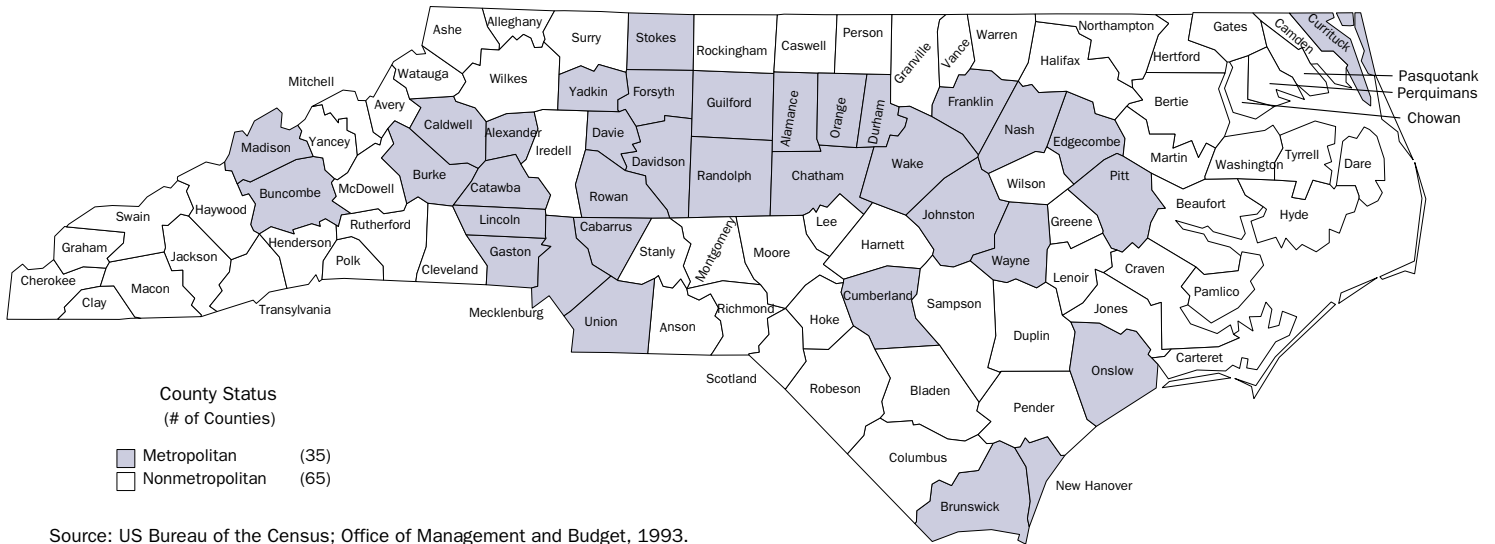


Note: Dots placed randomly within ZIP Code areas (ZIP boundaries not shown).

Source: 1998 Healthcare Solutionseries Level 3; Claritas, Inc. Arlington, VA; 1998.

Produced by: North Carolina Rural Health Research and Policy Analysis Program,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Figure 5. Metropolitan and Nonmetropolitan Counties, North Carolina**



Source: US Bureau of the Census; Office of Management and Budget, 1993.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

politan North Carolina, the professionals-to-population ratios over the 20 years are graphed using a system that classifies counties according to their urban character and their proximity to urban centers. The metropolitan-nonmetropolitan definition used in this report is based on the Federal Office of Management and Budget definition as of June 1, 1993 (which used 1990 census data). Metropolitan counties include central and fringe counties of metropolitan areas of one million population or more and counties in metropolitan areas of fewer than one million population. All other counties are designated as nonmetropolitan. Figure 5 shows the breakdown of metropolitan-nonmetropolitan counties in NC

### 3. Practitioners per 10,000 Population Ratios: Health Professional Shortage Areas

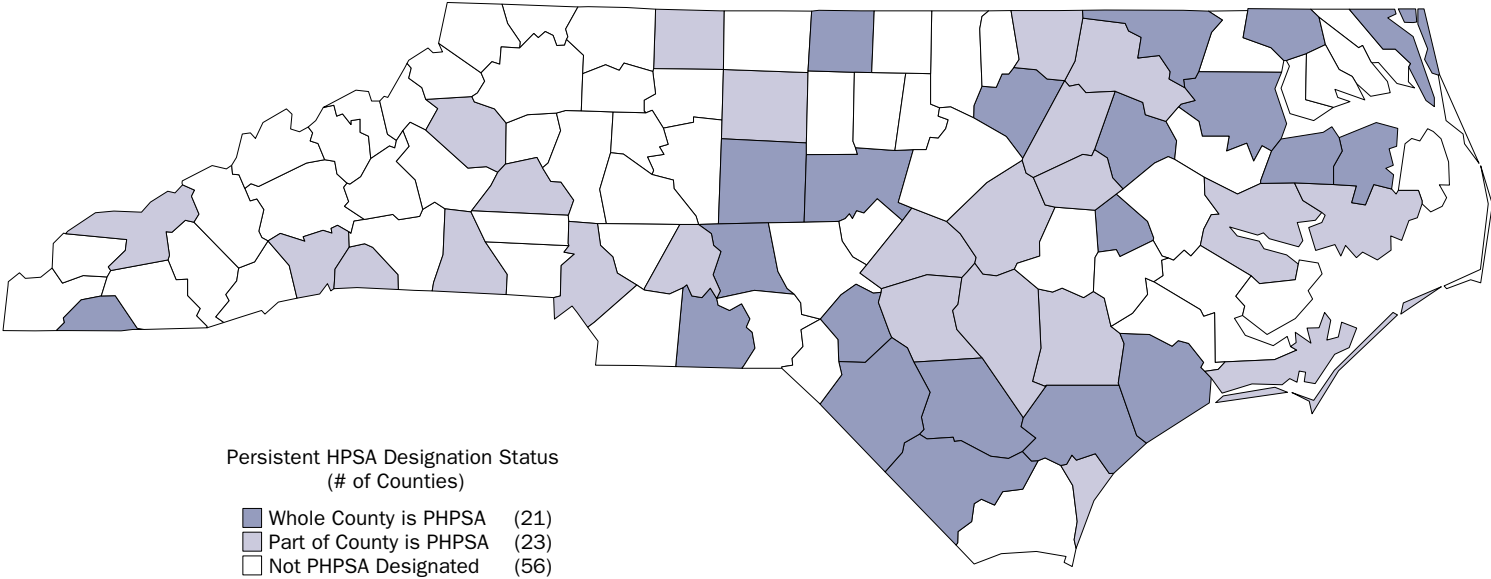
Some North Carolina communities have considerable difficulties attracting and retaining an adequate supply of health care professionals due to geographic isolation, socio-economic factors, or other reasons. The Health Resources and Services Administration (HRSA) of the Department of Health and Human Services tracks the distribution and supply of health care professionals in the US, and designates counties and parts of counties as Health Professional Shortage Areas (HPSAs). Counties with an inadequate number of primary health care professionals, or that have a population with unusually high needs for primary medical care services or whose residents face barriers to accessing primary care services (i.e. services are overutilized, excessively distant, or otherwise inaccessible) are eligible for HPSA designation. Once designated as a HPSA, the county is eligible for several federal programs including the placement of National Health Service Corps professionals, including primary care physicians, nurse practitioners and physician assistants. These designations apply to a specific area for a three-year period and then must be re-designated. Entire counties may be designated as HPSAs and are called “whole county HPSAs.” Likewise, portions of counties without access to contiguous health resources can also be designated as HPSAs and are called “part county HPSAs.” Counties with professional counts near the threshold level for HPSA status often gain and lose HPSA des-

ignation from year to year depending on the location and practice status of one or two professionals, while other counties with professional supplies well below the threshold maintain their HPSA status over many years. In this 20-year report, counties with ongoing health professional shortages have been called "Persistent Health Professional Shortage Areas" (PHPSAs). PHPSAs are defined as those counties that have been designated as whole or part county HPSAs each year from 1993 to 1997, or in six of the last seven releases of the HPSA designations (Figure 6).

**B. Maps**

Three maps are included for each health profession that detail, by county: 1. active practitioners per 10,000 population in 1998; 2. percent change in ratio of active practitioners per 10,000 population, 1979-1988; and 3. percent change in ratio of active practitioners per 10,000 population, 1989-1998. Except where specified, the maps include every active licensed professional for the relevant profession. The shading increases from light to dark with increasing professional-to-population ratios—the more professionals relative to the population, the darker the shading. Counties that have no professionals are shown with no shading. Percentage changes cannot be calculated with a zero denominator, so counties that had no health professionals in the beginning or end of the period are mapped with no shading; counties that began the period with no providers but gained one or more by the end period are mapped with gray shading.

**Figure 6. Persistent Health Professional Shortage Areas\* (PHPSAs)  
North Carolina Counties**



\*Persistent HPSAs are those designated as HPSAs by the Health Resources and Services Administration (HRSA) from 1993 to 1997, or in 6 of the last 7 releases of HPSA definition.

Source: Area Resource File, HRSA, DHHS, 1998.  
Produced by: North Carolina Rural Health Research and Policy Analysis Program,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.





**Physicians** are highly skilled health care professionals and their supply and distribution are considered key characteristics of a health care delivery system. North Carolina lagged the nation in its supply of physicians relative to population until relatively recently. The expansion of the medical school at UNC-Chapel Hill to a four-year curriculum, the establishment of one of the first statewide Area Health Education Center (AHEC) programs in the nation, the creation of the first state Office of Rural Health in the nation, and the creation of the East Carolina University School of Medicine, all have contributed to making North Carolina a leader in physician training and practice support. This has allowed the state to improve its physician supply to close to the national average. In 1971 the state was 36th in the nation in its ratio of physicians to population; in 1998 North Carolina stood 24th (AMA, *Physician Characteristics and Distribution in the US, 1979 and 2000-2001* editions). In the twenty years between 1979 to 1998 the growth trend for North Carolina physicians has closely paralleled national trends (Figure 7).

The physician supply has increased both in metropolitan and nonmetropolitan North Carolina, with the highest physician-to-population ratios in metropolitan counties (Figure 9). Since 1996, nonmetropolitan counties have experienced a 6% annual increase in doctors, exceeding the growth rate for metropolitan areas of the state.

While the ratio of physicians to population improved for the state as a whole, there was only slight improvement in counties that had persistent health professional shortages over the 20 years (Figure 10). Although there remained areas with shortages, every county in the state had at least one licensed, active, patient care physician by 1998 (Figure 8), with 86 counties improving their physician-to-population ratios between 1989 and 1998 (Figure 12).

**Table 1: Summary Statistics for Physicians in North Carolina**

<b>Physicians per 10,000 Population</b>	<b>Total Active Physicians</b>
1979: 12.4	7,242
1989: 16.0	10,498
1998: 20.0	15,135

**Number of Physicians per 10,000 Population in 1998**

Metropolitan Areas:	23.25
Nonmetropolitan Areas:	13.28

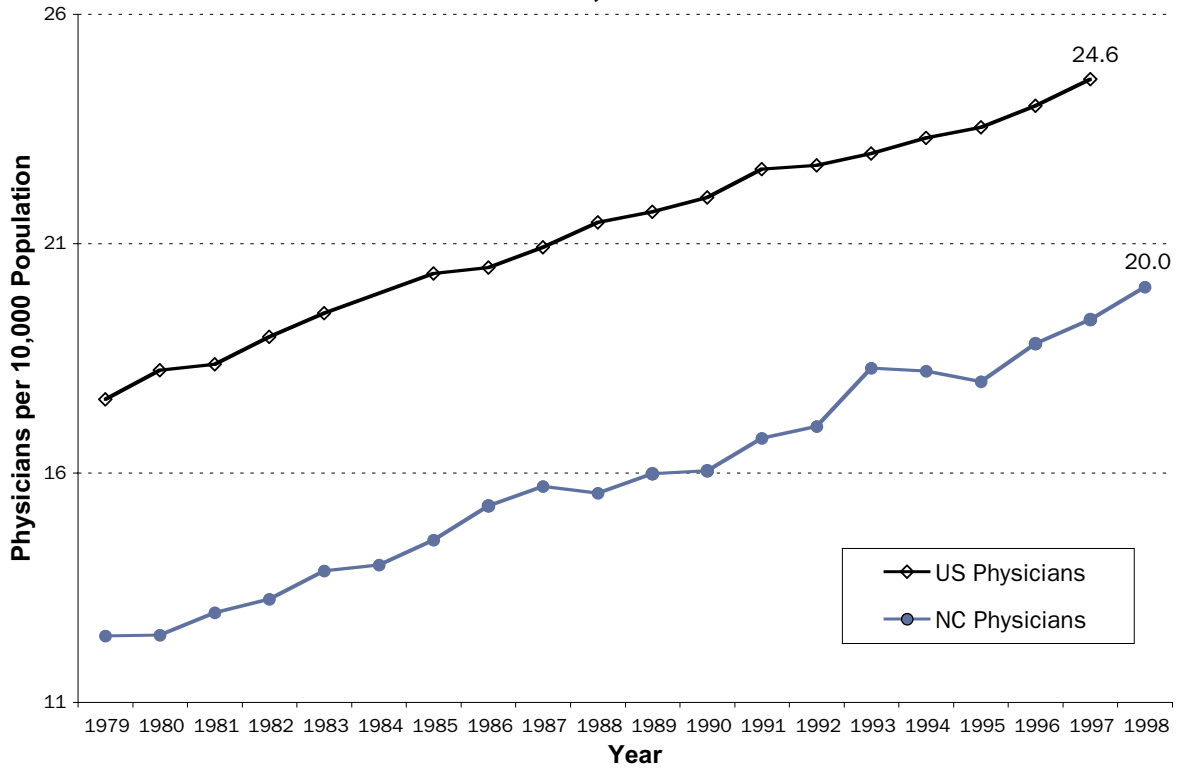
For the 21 counties designated as whole county PHSAs\*: 7.63  
 For the 23 counties designated as part county PHSAs\*: 19.30  
 For the 56 counties not designated as PHSAs\*: 23.15

**County Level Data**

- # of counties increasing physician supply 1989-1998: 86
- # of counties decreasing physician supply 1989-1998: 14
- # of counties with no physicians in 1998: 0

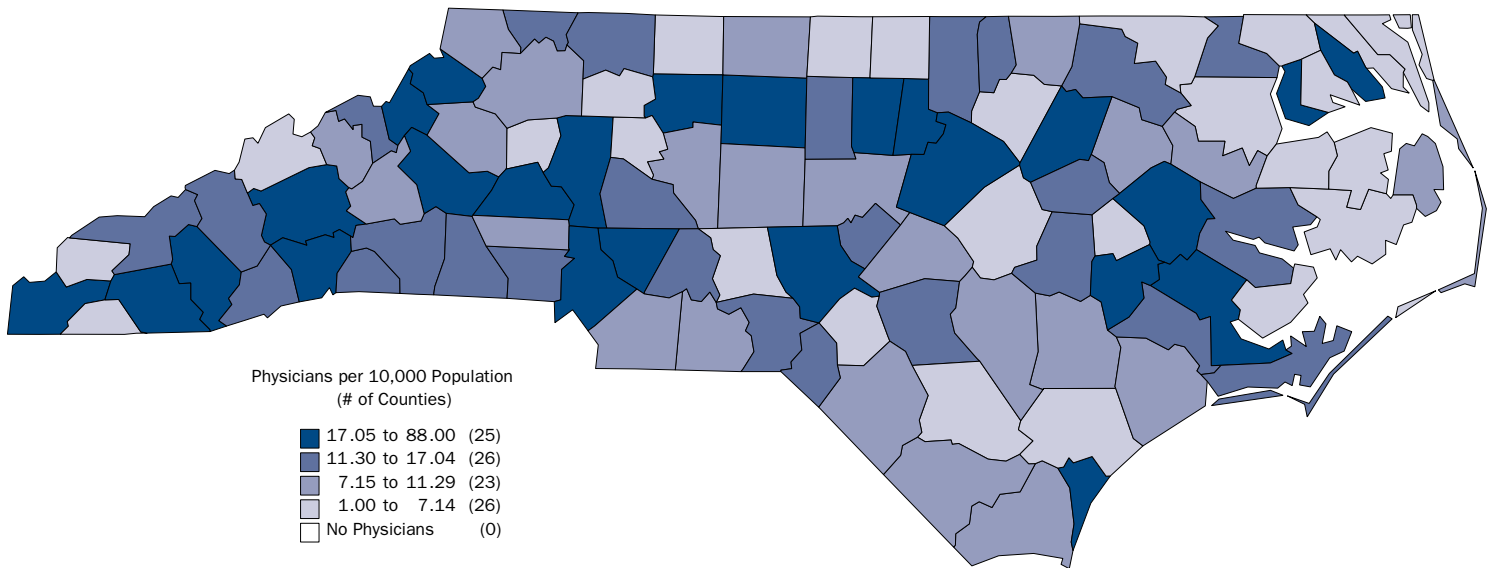
\*Persistent Health Professional Shortage Area

**Figure 7. Physicians per 10,000 Population, US and NC, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; HRSA, Bureau of Health Professions; US Bureau of the Census; North Carolina Office of State Planning  
 Figures include all licensed active in-state non-federal non-resident-in-training physicians

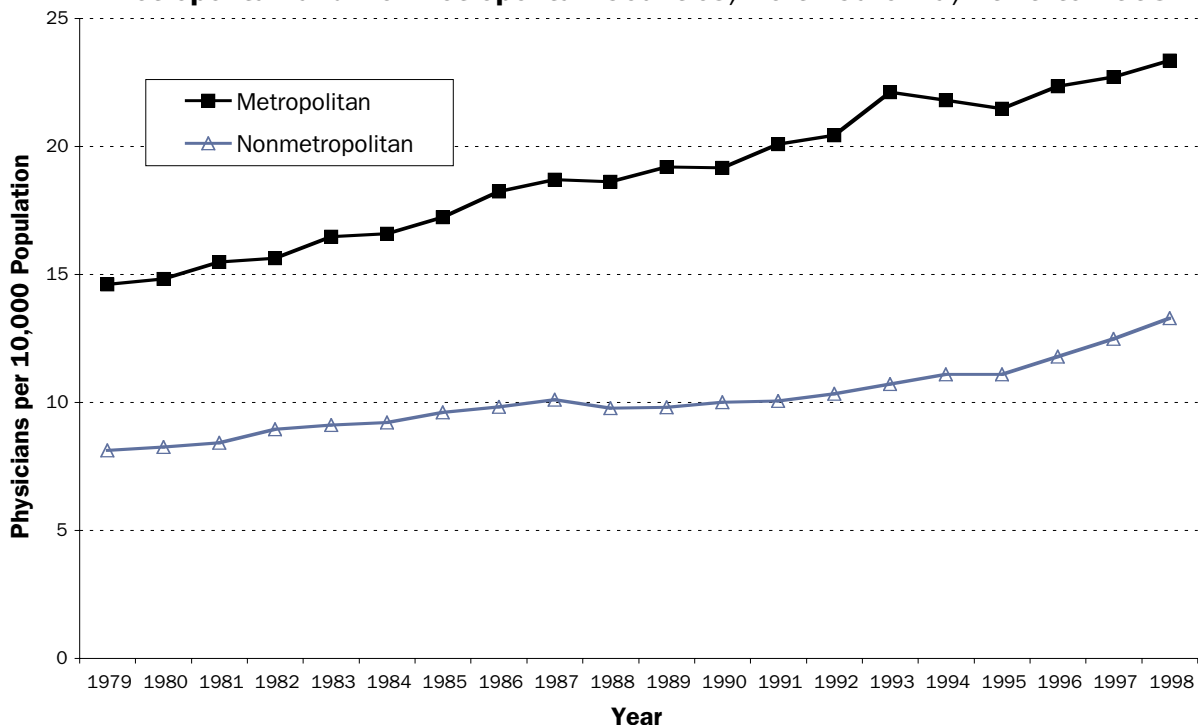
**Figure 8. Active Physicians per 10,000 Population, 1998**



Source: North Carolina Health Professions Data System, 1998.  
 Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
 Cecil G. Sheps Center for Health Services Research,  
 University of North Carolina at Chapel Hill.



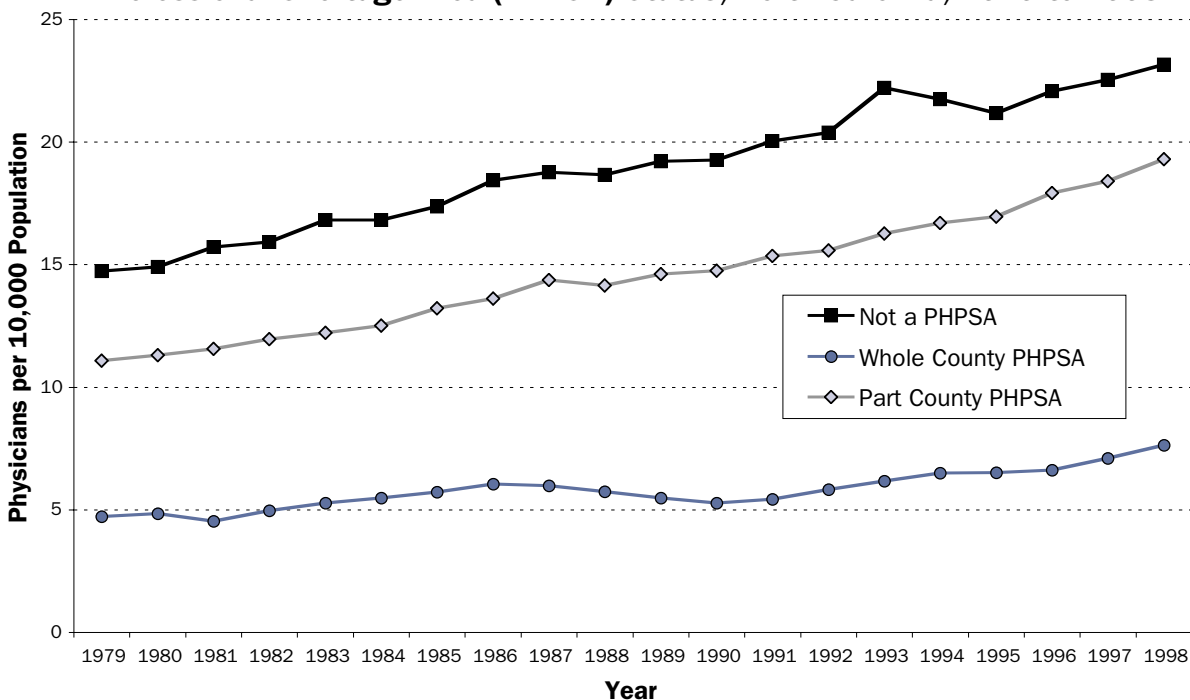
**Figure 9. Physicians per 10,000 Population by Metropolitan and Nonmetropolitan Counties, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active, in-state, nonfederal, non-resident-in-training physicians

Source for Metropolitan-Nonmetropolitan definition: Office of Management and Budget, 1993.

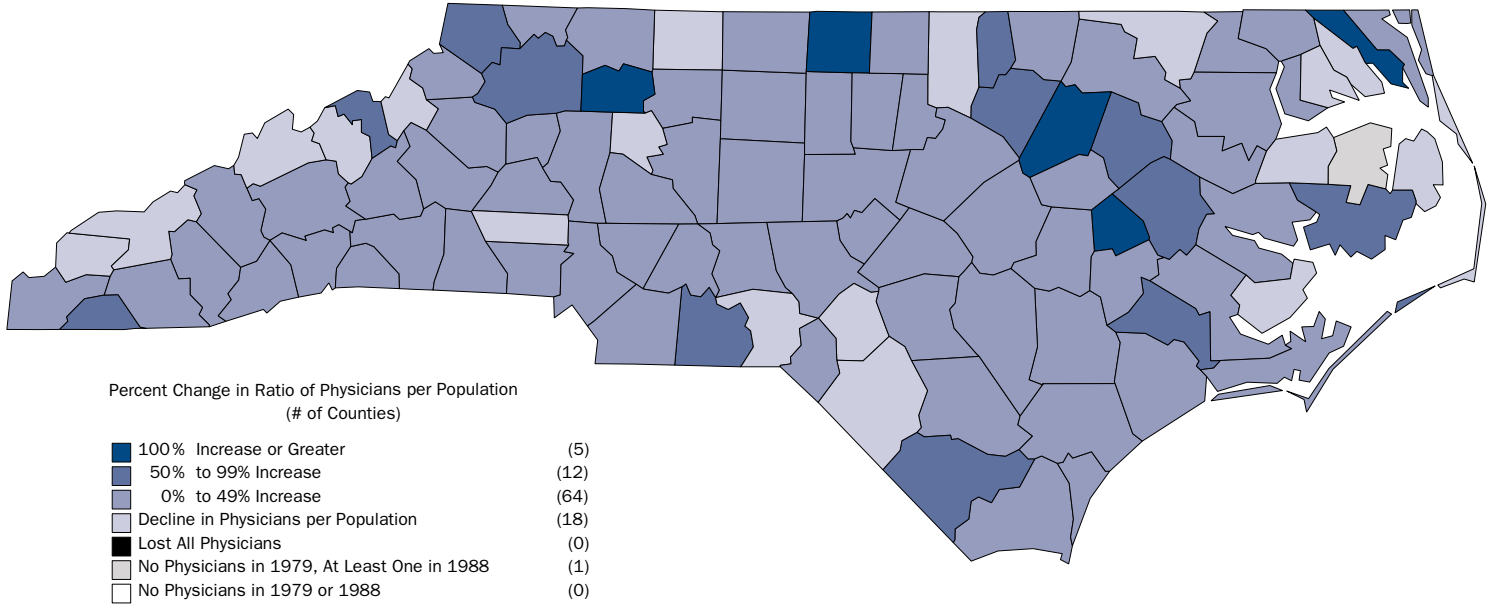
**Figure 10. Physicians per 10,000 Population by Persistent Health Professional Shortage Area (PHPSA) Status, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state non-federal non-resident-in-training physicians

Source for Health Professional Shortage Areas: Area Resource File, HRSA, Department of Health and Human Services, 1998  
 Persistent HPSAs are those designated as HPSAs by HRSA from 1993 through 1997, or in 6 of the last 7 releases of HPSA definitions

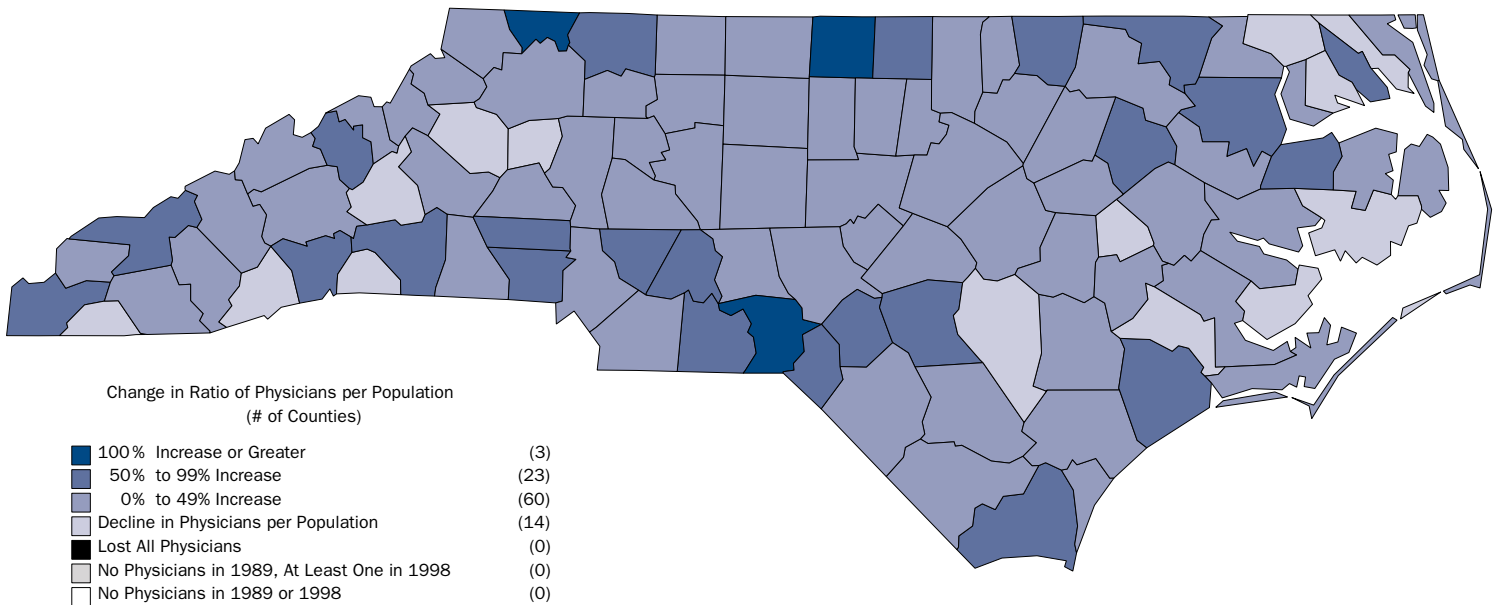
**Figure 11. Percent Change in Ratio of Active Physicians per 10,000 Population from 1979 to 1988**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Figure 12. Percent Change in Ratio of Active Physicians per 10,000 Population from 1989 to 1998**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Primary care physicians** are those doctors who see patients with the most common medical problems. Primary care physicians often coordinate the care of their patients and their patients' families. In this report, primary care includes doctors practicing in Family Practice, General Practice, General Internal Medicine, Obstetrics/Gynecology, and General Pediatrics. North Carolina has focused on improving its primary care physician supply by supporting residency training programs at the four in-state medical schools and in free-standing AHEC and hospital-based settings. North Carolina's medical schools have been encouraging interest in primary care medicine among undergraduates and the expansion of managed care has increased market demand for generalist and primary care physicians. The supply of primary care physicians per person for the state has increased dramatically since 1996 compared to the national trends (Figure 13). US data prior to 1989 are not available because the American Medical Association data from which the numbers are derived were not comparable.

The primary care physician supply has shown a general steady increase in urban North Carolina over the twenty years while the rate of growth in nonmetropolitan counties matched overall rates only after 1995 (Figure 15). The primary care physician-to-population ratio for whole counties designated as persistent health professional shortage areas exhibited the slowest growth over the 20 years (Figure 16). This suggests that current programs to strengthen the supply of primary care doctors in underserved areas should be maintained or expanded.

All of the state's counties had at least one primary care physician by 1998 (Figure 14), and 82 counties had improved their primary care physician supply from 1989 to 1998 (Figure 18).

**Table 2: Summary Statistics for Primary Care Physicians in North Carolina**

<b>Primary Care Physicians per 10,000 Population</b>	<b>Total Active Primary Care Physicians</b>
1980: 5.7	3,644
1989: 6.8	4,457
1998: 8.5	6,380

**Number of Primary Care Physicians per 10,000 Population in 1998**

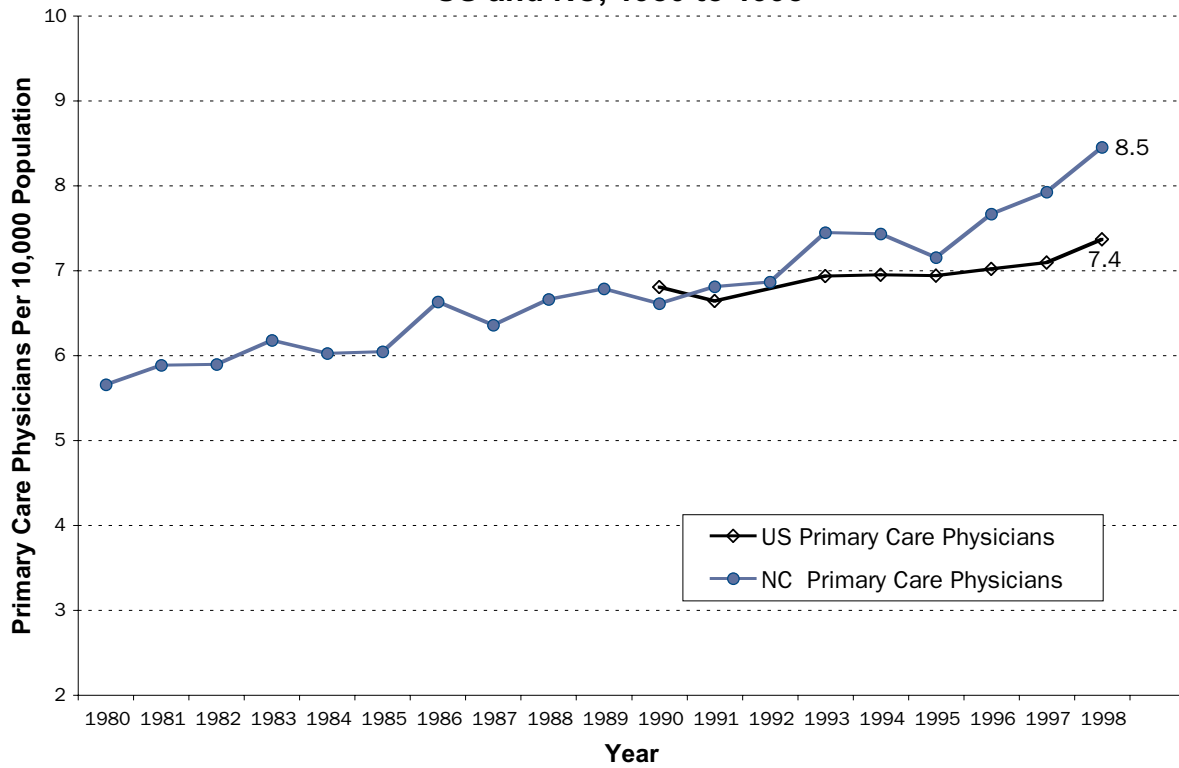
Metropolitan Areas: 9.39  
 Nonmetropolitan Areas: 6.53  
 For the 21 counties designated as whole county PHPSAs\*: 4.43  
 For the 23 counties designated as part county PHPSAs\*: 8.17  
 For the 56 counties not designated as PHPSAs\*: 9.48

**County Level Data**

# of counties increasing primary care physician supply 1989-1998: 82  
 # of counties decreasing primary care physician supply 1989-1998: 18  
 # of counties with no primary care physicians in 1998: 0

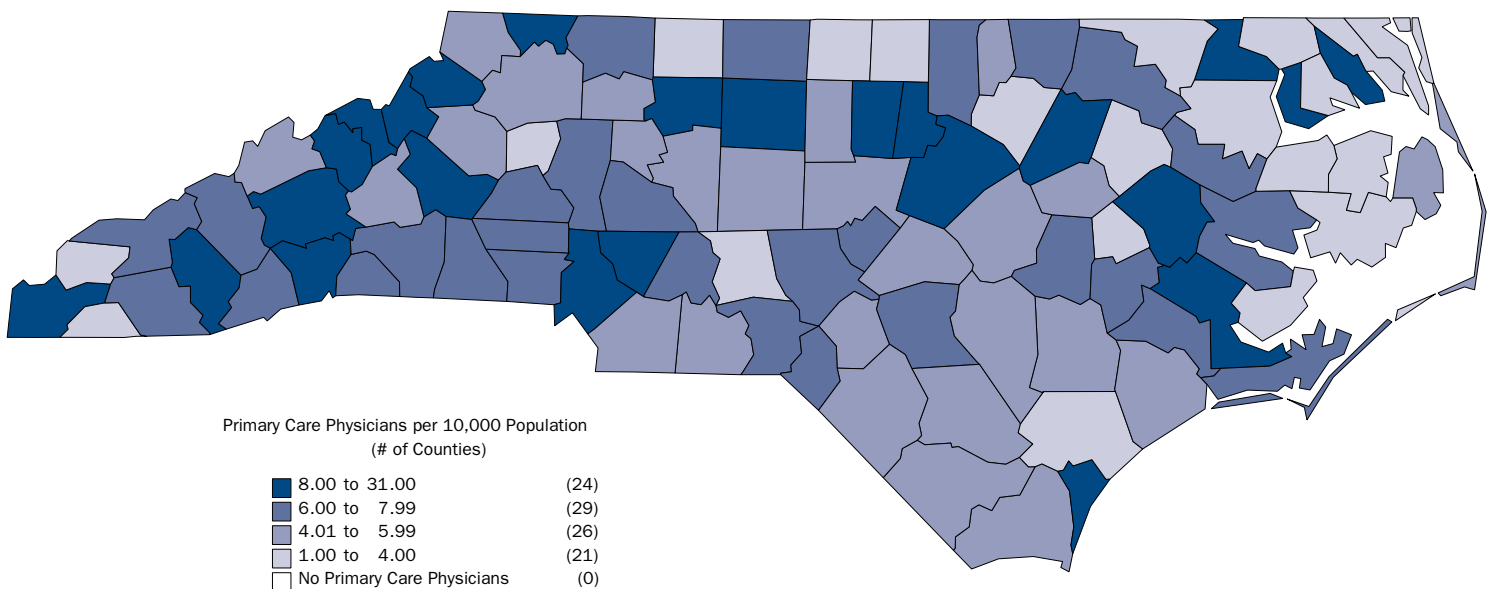
\*Persistent Health Professional Shortage Area

**Figure 13. Primary Care Physicians per 10,000 Population, US and NC, 1980 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; HRSA, Bureau of Health Professions; US Bureau of the Census; North Carolina Office of State Planning  
 Figures include all licensed active nonfederal non-resident-in-training primary care physicians

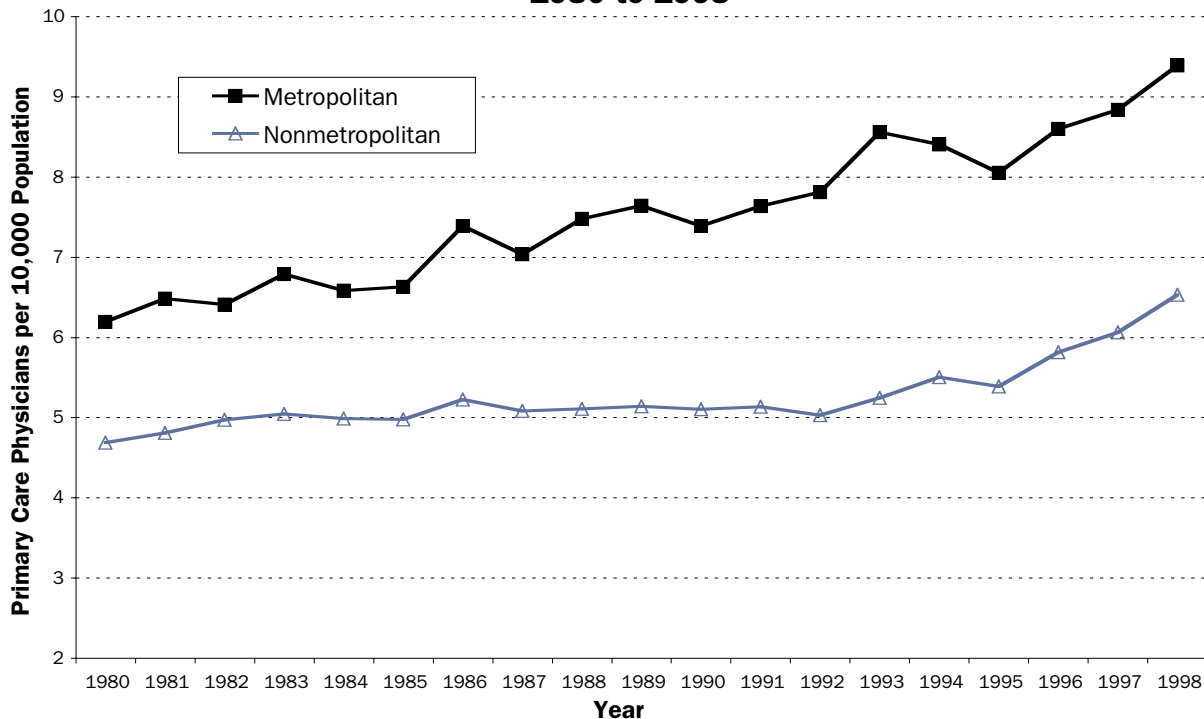
**Figure 14. Active Primary Care Physicians per 10,000 Population, 1998**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center, Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

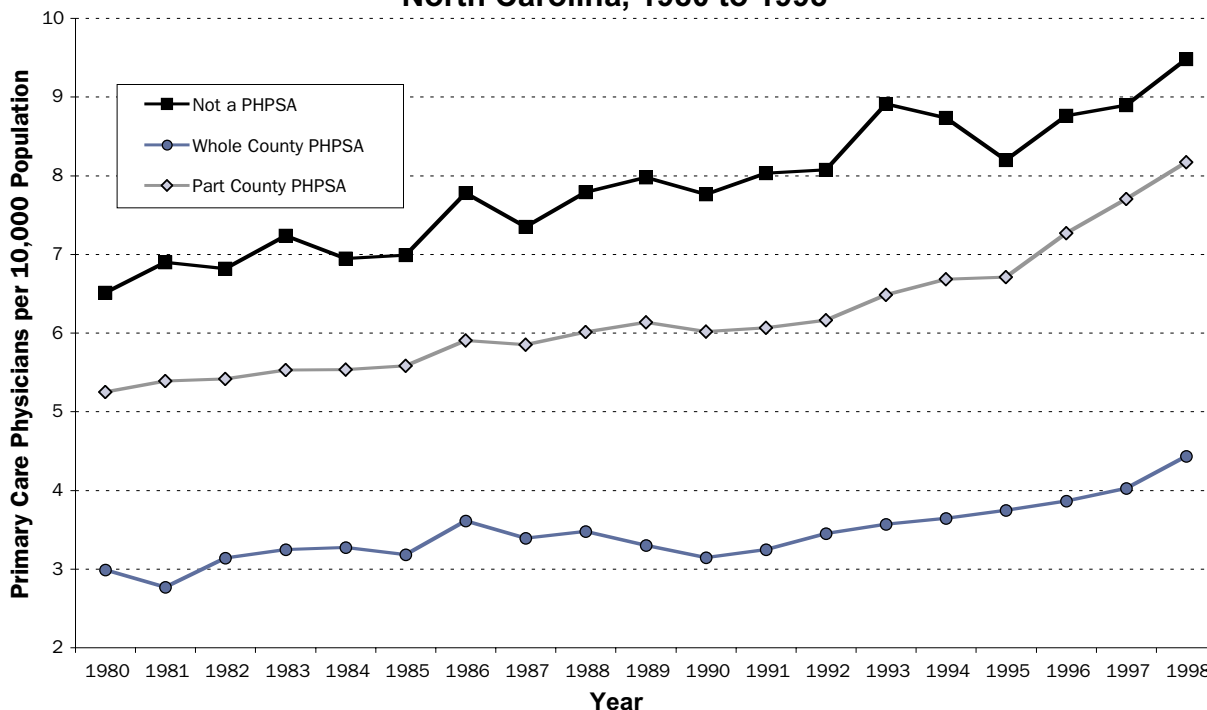
**Figure 15. Primary Care Physicians per 10,000 by Metropolitan and Nonmetropolitan Counties, North Carolina, 1980 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active, in-state, nonfederal, non-resident-in-training primary care physicians

Source for Metropolitan-Nonmetropolitan definition: Office of Management and Budget, 1993.

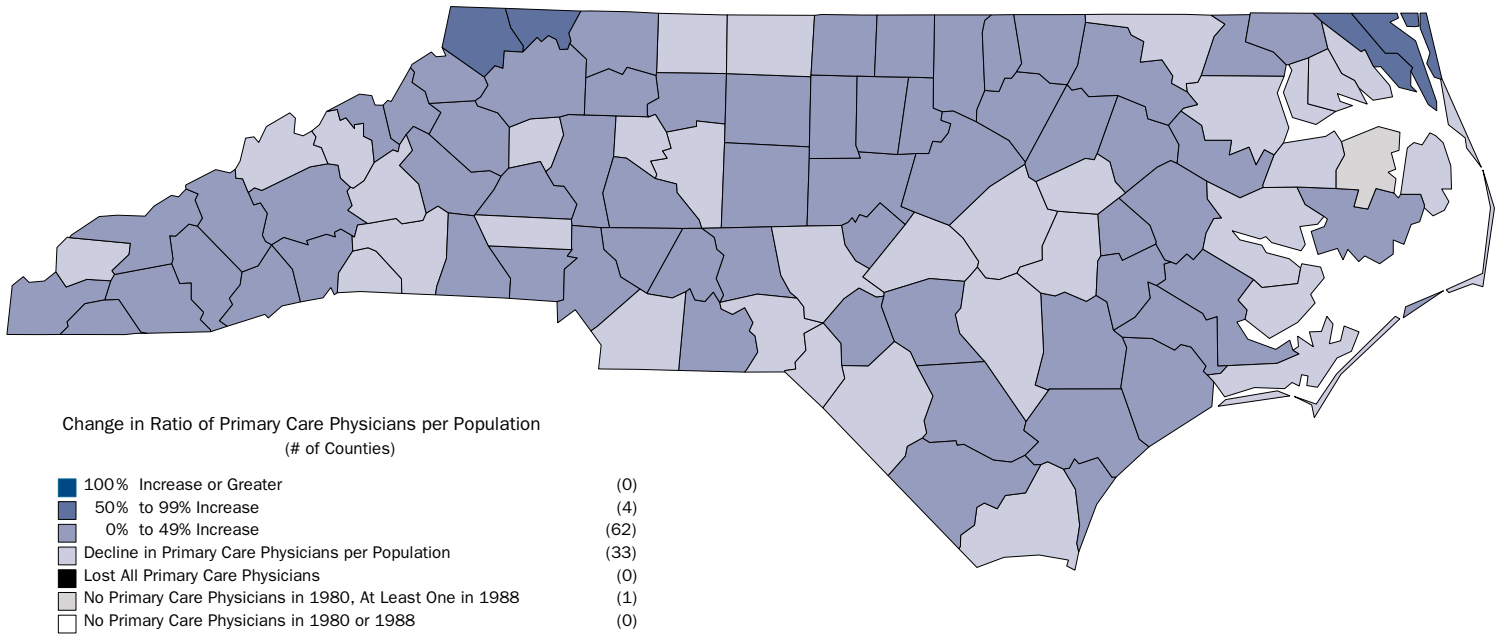
**Figure 16. Primary Care Physicians per 10,000 Population by Persistent Health Professional Shortage Area (PHPSA) Status, North Carolina, 1980 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state non-federal non-resident-in-training primary care physicians

Source for Health Professional Shortage Areas: Area Resource File, HRSA, Department of Health and Human Services, 1998  
 Persistent HPSAs are those designated as HPSAs by HRSA from 1993 through 1997, or in 6 of the last 7 releases of HPSA definitions

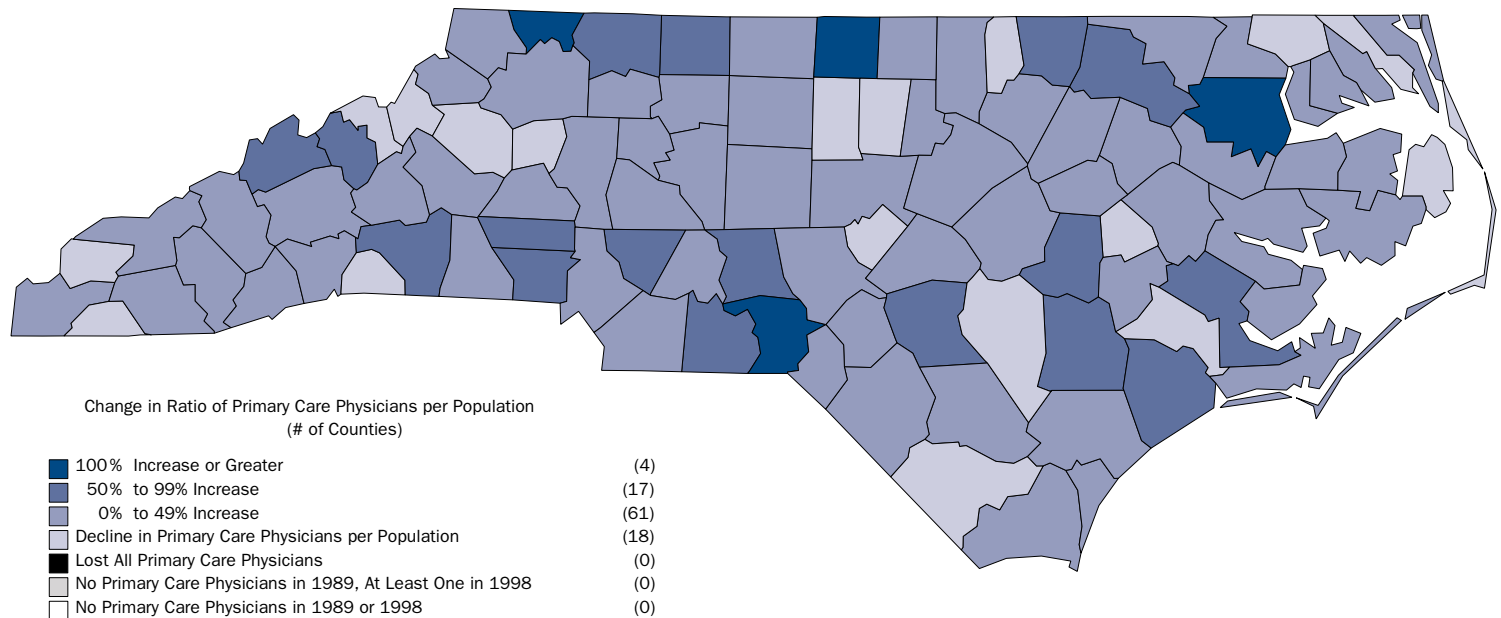
**Figure 17. Percent Change in Ratio of Active Primary Care Physicians per 10,000 Population from 1980 to 1988**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Figure 18. Percent Change in Ratio of Active Primary Care Physicians per 10,000 Population from 1989 to 1998**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Physician assistants (PAs)** provide health care services under the supervision of a physician. PAs are authorized to write prescriptions, dispense drugs, order medications, tests and treatments in hospitals, clinics, nursing homes and other health facilities. Physician assistants are a relatively new profession, developed in the 1960s, as a way to make use of the skills learned by non-physician military medical personnel and to reduce the burden on physicians in hospitals. Their potential for improving access to primary care became apparent early on, and over time, states began to license them to allow a broader scope of practice. Currently PAs are licensed in 37 states and the District of Columbia, certified in 9, and registered in four. (Mississippi has no PA practice act.) In North Carolina the Assistant to the Primary Care Physician Program began at Duke University in 1965 and authority to "delegate" practice responsibilities was authorized by the General Assembly in 1971. Licensure was established in 1974.

National data on the supply of PA professionals have not been regularly collected until recent years and the data exhibit considerable variation before 1994. The national PA-to-population ratio has risen at a greater rate than the state's since 1994 (Figure 19). The PA supply has increased the most in metropolitan North Carolina over the last 20 years (Figure 21). The PA supply increased steadily in non-PHPSA counties and part county PHPSAs during 1979-1998; after 1989, the supply trend picked up in the part county PHPSAs (Figure 22). Ten counties experienced a net decline in PA supply over the last 10 years, while 32 counties more than doubled their PA-to-population ratios (Figure 24).

**Table 3: Summary Statistics for Physician Assistants in North Carolina**

<b>Physician Assistants per 10,000 Population</b>	<b>Total Active Physician Assistants</b>
1979: 0.5	318
1989: 1.1	726
1998: 1.9	1,440

**Number of Physician Assistants per 10,000 Population in 1998**

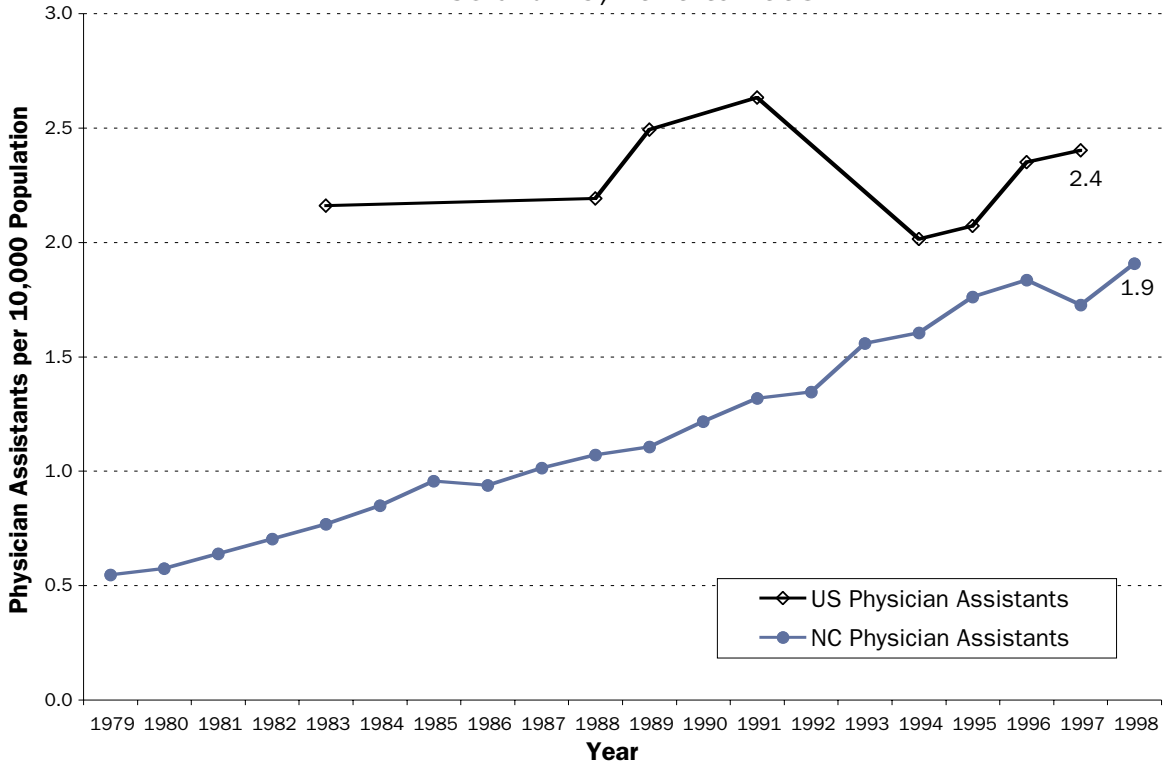
Metropolitan Areas: 2.17  
 Nonmetropolitan Areas: 1.37  
 For the 21 counties designated as whole county PHPSAs\*: 1.11  
 For the 23 counties designated as part county PHPSAs\*: 1.75  
 For the 56 counties not designated as PHPSAs\*: 2.18

**County Level Data**

# of counties increasing physician assistant supply 1989-1998: 90  
 # of counties decreasing physician assistant supply 1989-1998: 10  
 # of counties with no physician assistants in 1998: 10

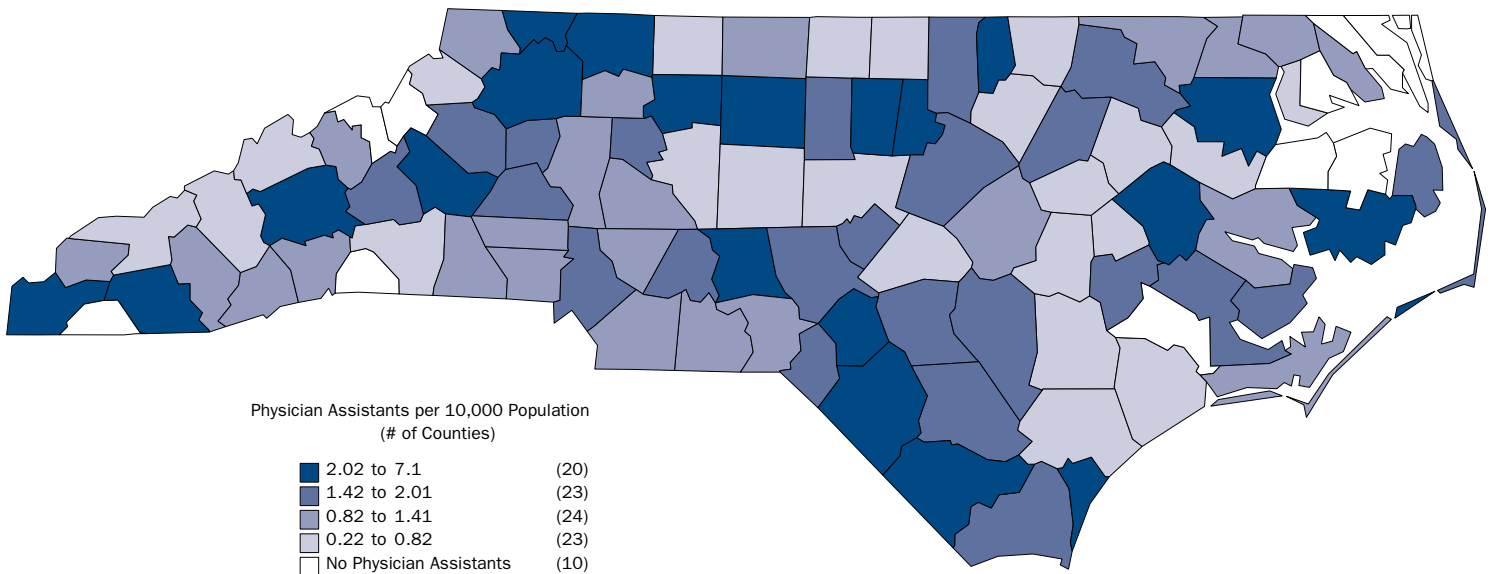
\*Persistent Health Professional Shortage Area

**Figure 19. Physician Assistants per 10,000 Population, US and NC, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; HRSA, Bureau of Health Professions; US Bureau of the Census; North Carolina Office of State Planning  
 Figures include all licensed active physician assistants.

**Figure 20. Active Physician Assistants per 10,000 Population, 1998**

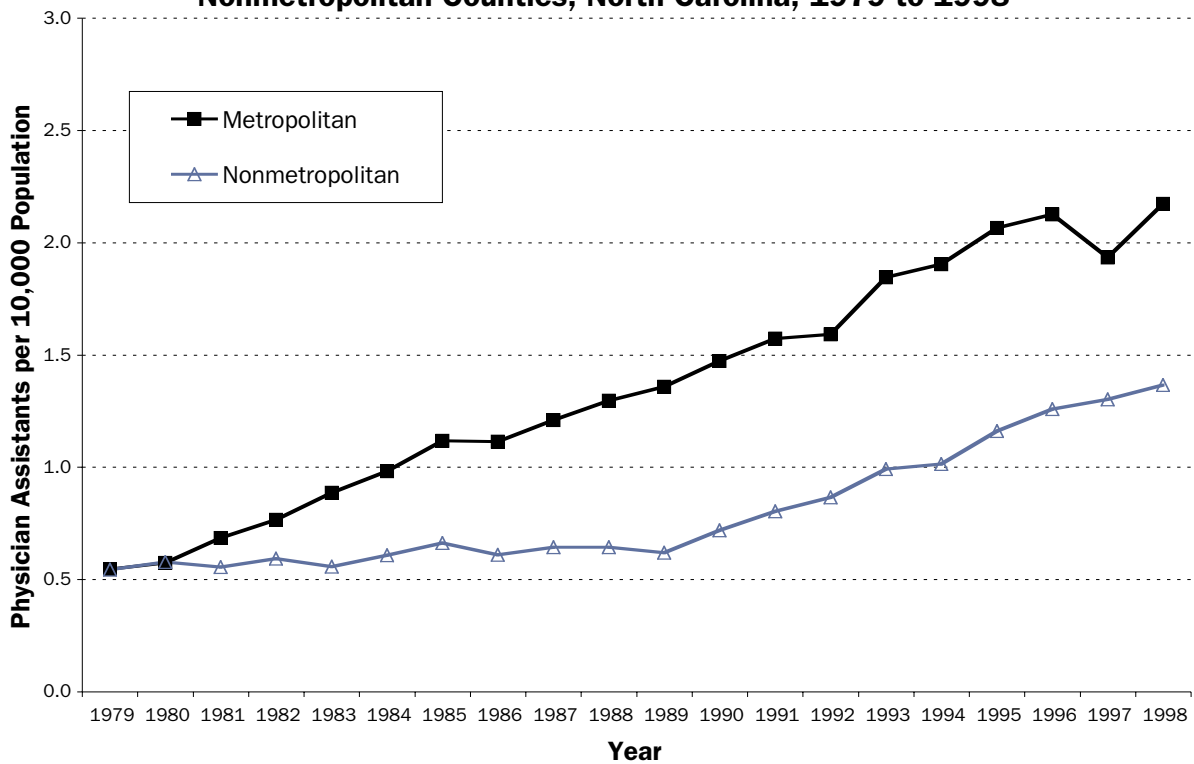


Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
 Cecil G. Sheps Center for Health Services Research,  
 University of North Carolina at Chapel Hill.



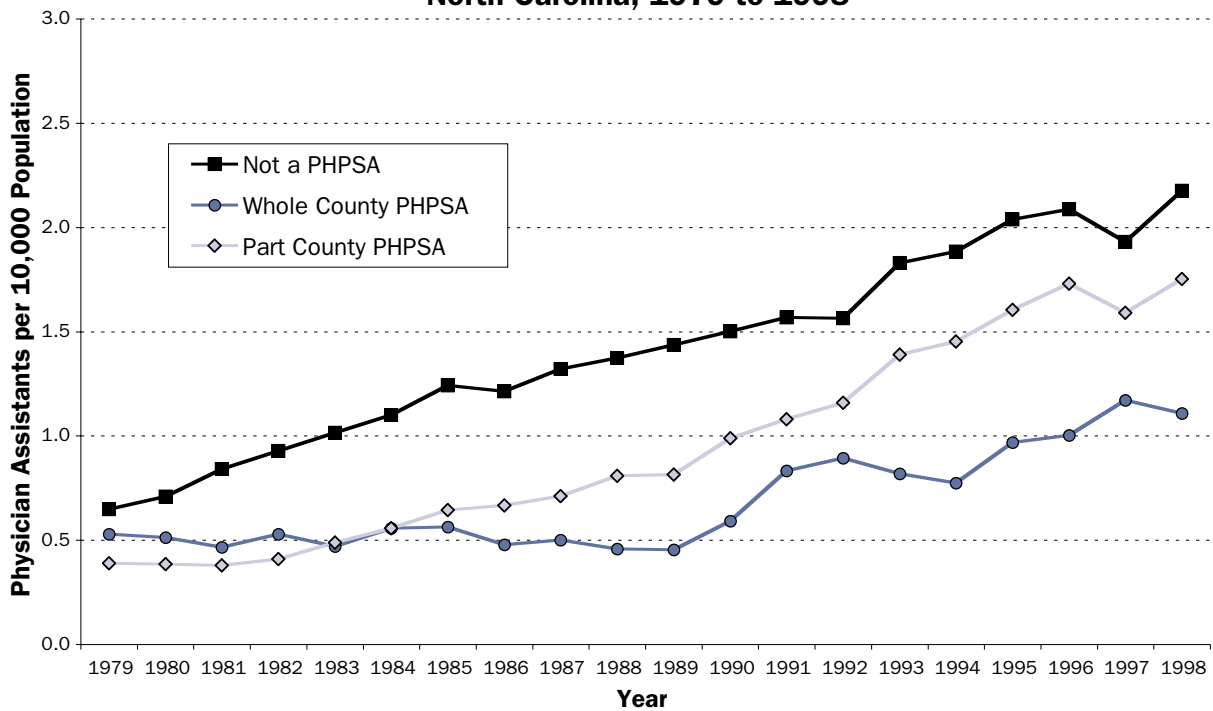
**Figure 21. Physician Assistants per 10,000 by Metropolitan and Nonmetropolitan Counties, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state physician assistants

Source for Metropolitan-Nonmetropolitan definition: Office of Management and Budget, 1993.

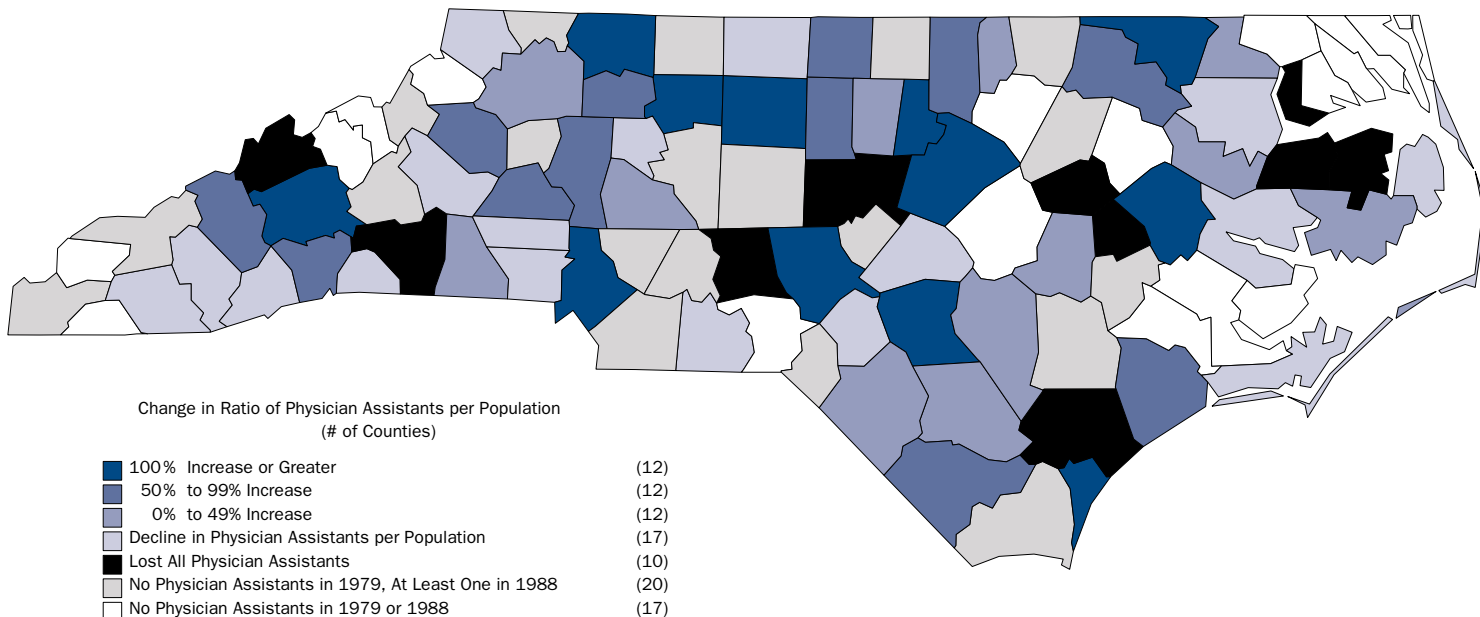
**Figure 22. Physician Assistants per 10,000 Population by Persistent Health Professional Shortage Area (PHPSA) Status, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state physician assistants

Source for Health Professional Shortage Areas: Area Resource File, HRSA, Department of Health and Human Services, 1998  
 Persistent HPSAs are those designated as HPSAs by HRSA from 1993 through 1997, or in 6 of the last 7 releases of HPSA definitions

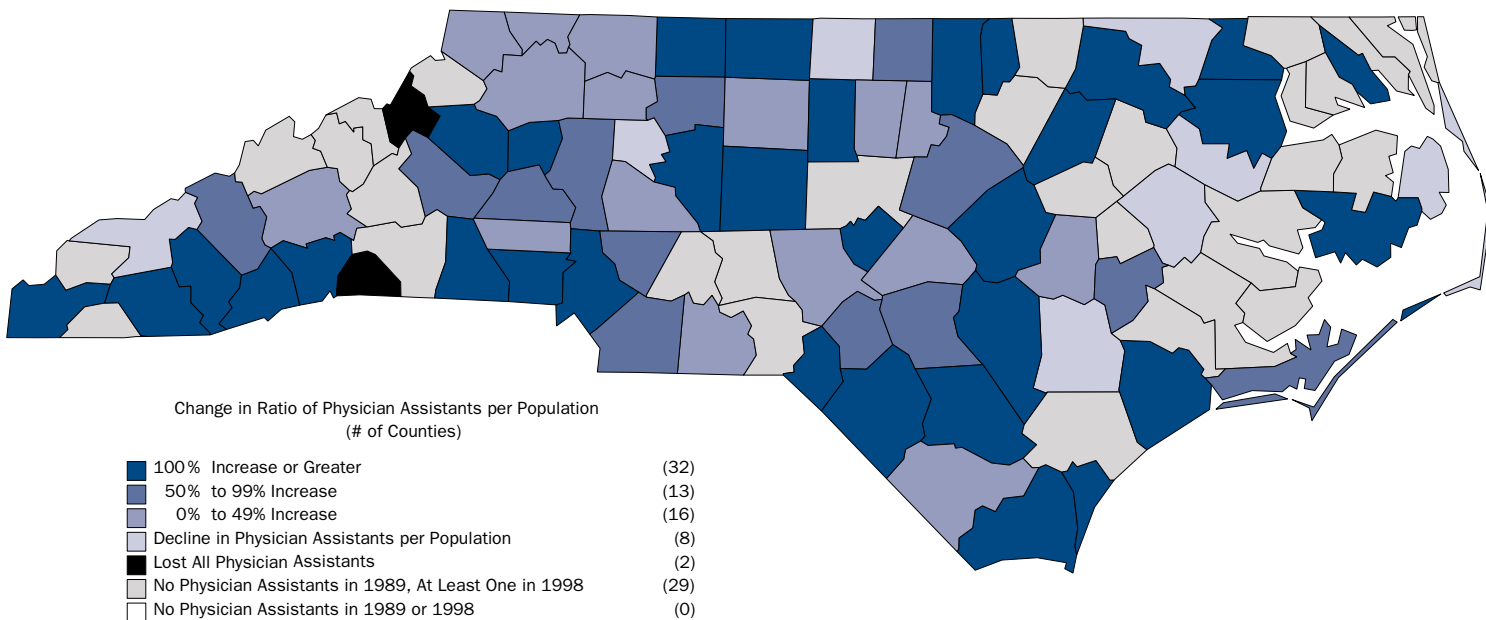
**Figure 23. Percent Change in Ratio of Active Physician Assistants per 10,000 Population from 1979 to 1988**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Figure 24. Percent Change in Ratio of Active Physician Assistants per 10,000 Population from 1989 to 1998**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Chiropractors** adjust the spinal column and other joints of the body to prevent disease, correct abnormalities and to ease irritation to spinal nerves. Chiropractors conduct patient consults, case histories, physical exams, laboratory analysis and X-ray examinations. They may treat patients with exercise, water, light ultrasound or electric and heat therapy. Chiropractors do not write prescriptions or perform surgery. To practice as a Doctor of Chiropractic (D.C.) in North Carolina, an individual must earn a college degree and complete four academic years of resident instruction at a college of chiropractic approved by the North Carolina Board of Chiropractic Examiners. There are no schools of chiropractic in North Carolina.

The chiropractors-per-population ratio in the US has consistently exceeded that of North Carolina over the period from 1979-1998. However, North Carolina has increased its practitioner-to-population ratio faster than the national average (Figure 25). Chiropractors tend to practice in metropolitan counties and the difference in the provider-to-population ratio between metropolitan and nonmetropolitan areas has increased over the period (Figure 27). There has also been a steady widening in the gap in supply of chiropractors relative to the population between whole county PHSAs and non-PHSAs. In 1979, non-PHSA counties had 0.27 chiropractors per 10,000 population; this number more than doubled to 0.68 in 1998. The supply of chiropractors relative to the population in part county PHSAs has exceeded that of non-PHSAs since 1988 (Figure 28). In 1998, there were 15 counties in the state that did not have any chiropractors (Figure 26). The highest practitioner-to-population ratios in 1998 were concentrated in western counties of the state, although selected counties in central and far eastern portions of the state also had higher ratios (Figure 26). Between 1989-1998, 66 counties increased their supply of chiropractors per person and 20 counties experienced a decline (Figure 30).

**Table 4: Summary Statistics for Chiropractors in North Carolina**

**Chiropractors per 10,000 Population      Total Active Chiropractors**

1979:	0.5	311
1989:	0.8	543
1998:	1.3	972

**Number of Chiropractors per 10,000 Population in 1998**

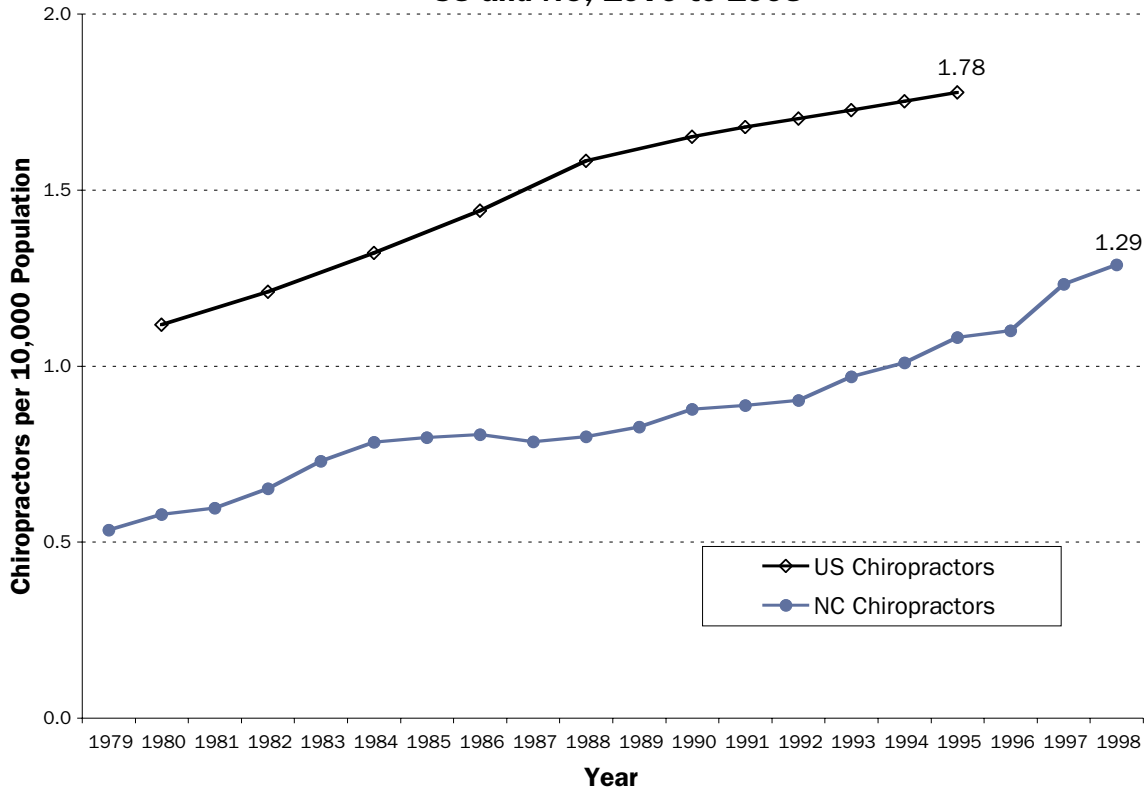
Metropolitan Areas:	1.42
Nonmetropolitan Areas:	1.01
For the 21 counties designated as whole county PHSAs*:	.62
For the 23 counties designated as part county PHSAs*:	1.48
For the 56 counties not designated as PHSAs*:	1.31

**County Level Data**

- # of counties increasing chiropractor supply 1989-1998: 66
- # of counties decreasing chiropractor supply 1989-1998: 20
- # of counties with no chiropractors in 1998: 15

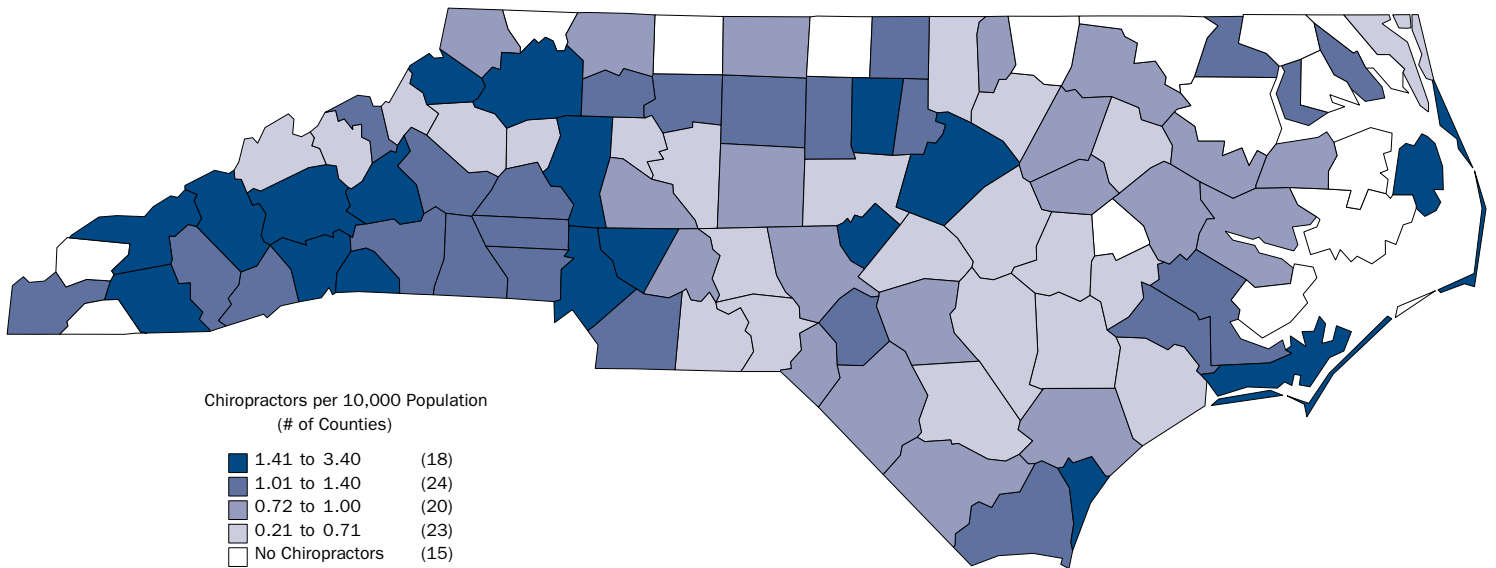
\*Persistent Health Professional Shortage Area

**Figure 25. Chiropractors per 10,000 Population, US and NC, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998;  
 HRSA, Bureau of Health Professions; US Bureau of the Census;  
 North Carolina Office of State Planning  
 Figures include all licensed active chiropractors

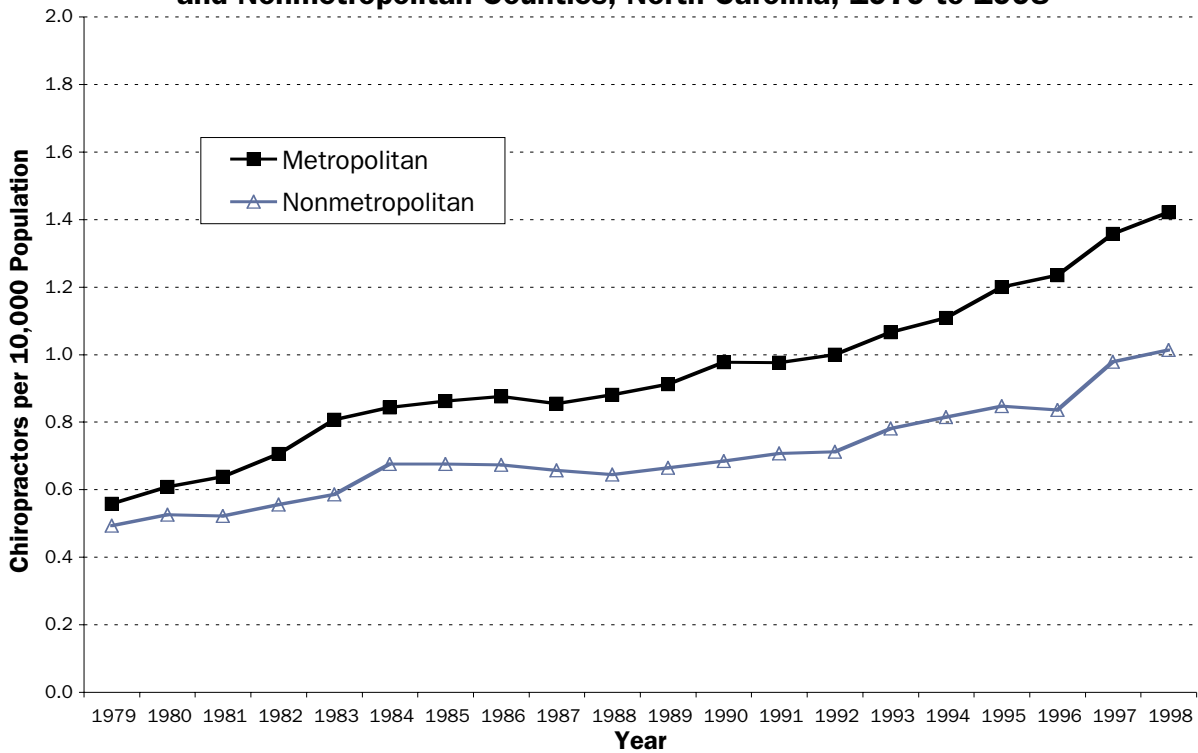
**Figure 26. Active Chiropractors per 10,000 Population, 1998**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
 Cecil G. Sheps Center for Health Services Research,  
 University of North Carolina at Chapel Hill.

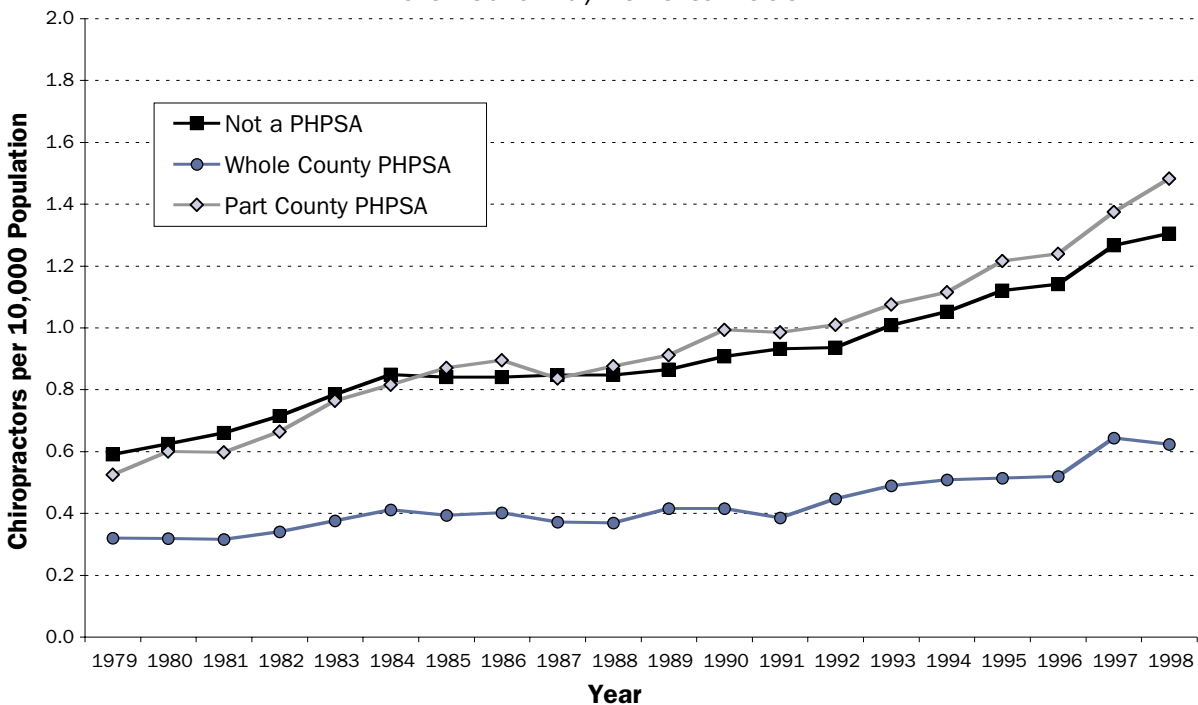
**Figure 27. Chiropractors per 10,000 Population by Metropolitan and Nonmetropolitan Counties, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state chiropractors

Source for Metropolitan-Nonmetropolitan definition: Office of Management and Budget, 1993.

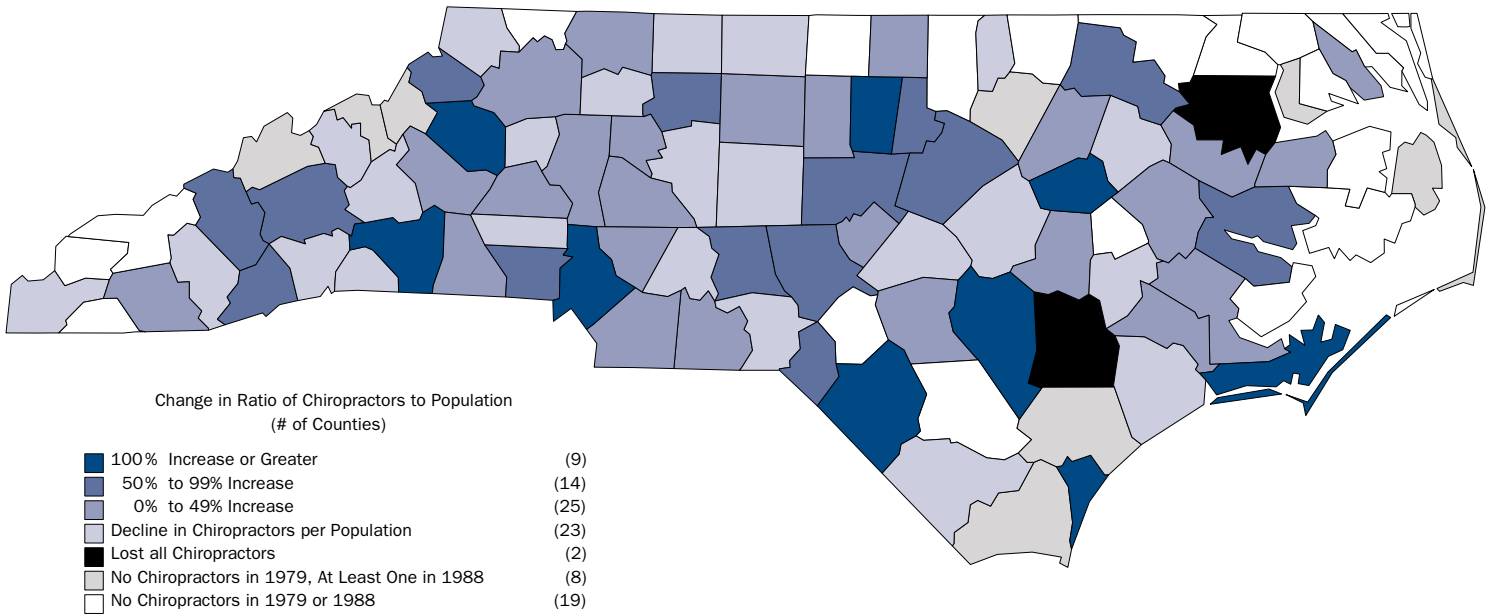
**Figure 28. Chiropractors per 10,000 Population by Persistent Health Professional Shortage Area (PHPSA) Status, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state chiropractors

Source for Health Professional Shortage Areas: Area Resource File, HRSA, Department of Health and Human Services, 1998  
 Persistent HPSAs are those designated as HPSAs by HRSA from 1993 through 1997, or in 6 of the last 7 releases of HPSA definitions

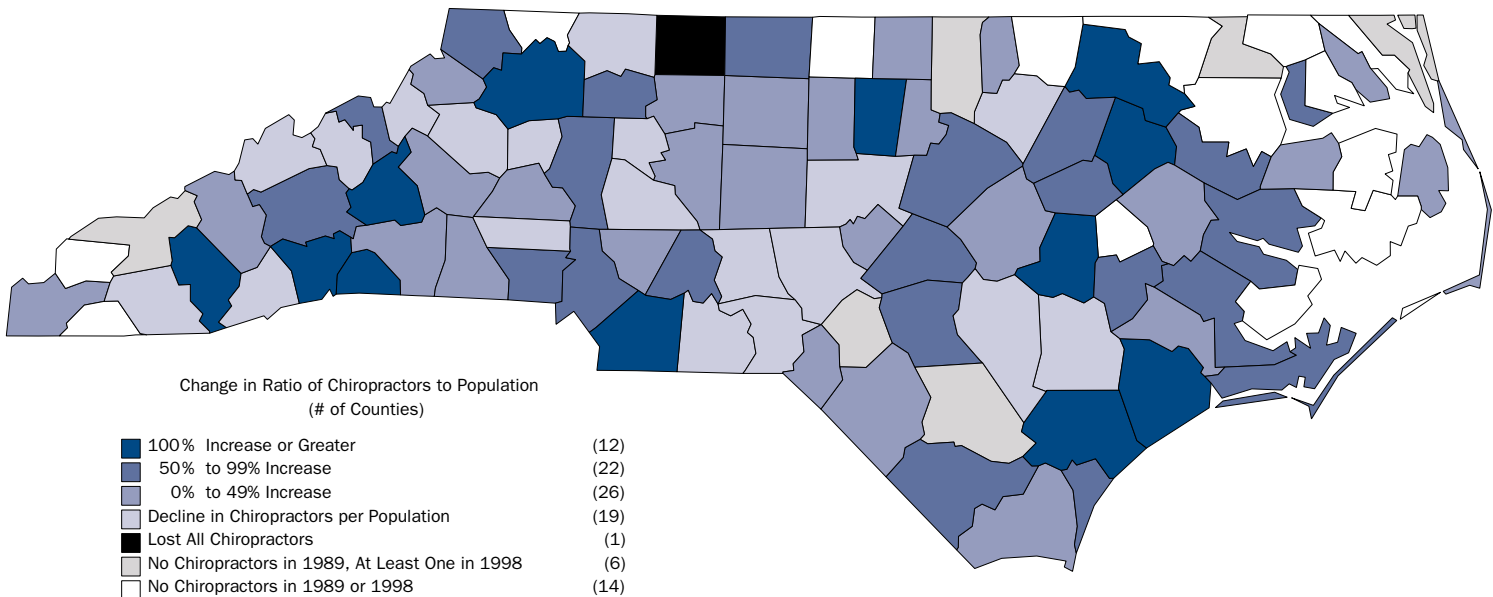
**Figure 29. Percent Change in Ratio of Active Chiropractors per 10,000 Population from 1979 to 1988**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Figure 30. Percent Change in Ratio of Active Chiropractors per 10,000 Population from 1989 to 1998**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Podiatrists** are specialists in the human foot and ankle. They diagnose and treat foot ailments such as tumors, fractures, skin and nail diseases and deformities. These may be corrected surgically through treatment or medication. A minimum of 90 hours of undergraduate preparation is required to enter a professional program in podiatry; most individuals have an undergraduate degree. The educational program in podiatry takes four years, including clinical training. This program is followed by a one- to three-year post-doctoral training period at a teaching hospital. There are no schools of podiatry in North Carolina and only seven accredited schools nationally.

The national supply of podiatrists relative to population exceeds that of the state (Figure 31); however, North Carolina’s supply of podiatrists grew at a faster rate than the national supply from 1979 to 1995, after which the state’s supply has stabilized. Although the supply of podiatrists is greater in metropolitan than in nonmetropolitan areas (Figure 33), since 1994, the highest rate of growth in the supply of podiatrists has been in whole county PHPSAs (Figure 34).

North Carolina had 44 counties without a podiatrist in 1998 (Figure 32). Seventeen counties that had no podiatrists in 1989 had gained at least one by 1998 (Figure 36).

**Table 5: Summary Statistics for Podiatrists in North Carolina**

<b>Podiatrists per 10,000 Population</b>	<b>Total Active Podiatrists</b>
1979: 0.12	70
1989: 0.23	149
1998: 0.27	207

**Number of Podiatrists per 10,000 Population in 1998**

Metropolitan Areas: 0.30  
 Nonmetropolitan Areas: 0.22

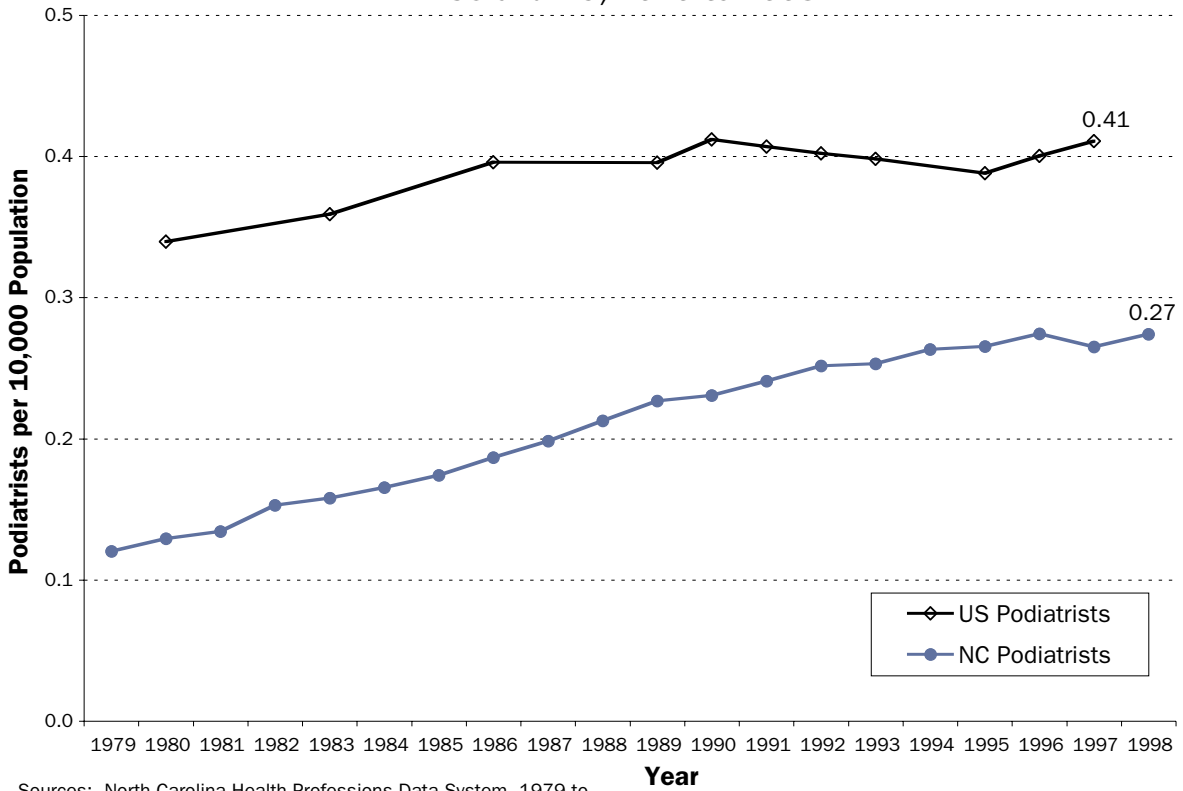
For the 21 counties designated as whole county PHPSAs\*: 0.15  
 For the 23 counties designated as part county PHPSAs\*: 0.32  
 For the 56 counties not designated as PHPSAs\*: 0.27

**County Level Data**

# of counties increasing podiatrist supply 1989-1998: 38  
 # of counties decreasing podiatrist supply 1989-1998: 19  
 # of counties with no podiatrists in 1998: 44

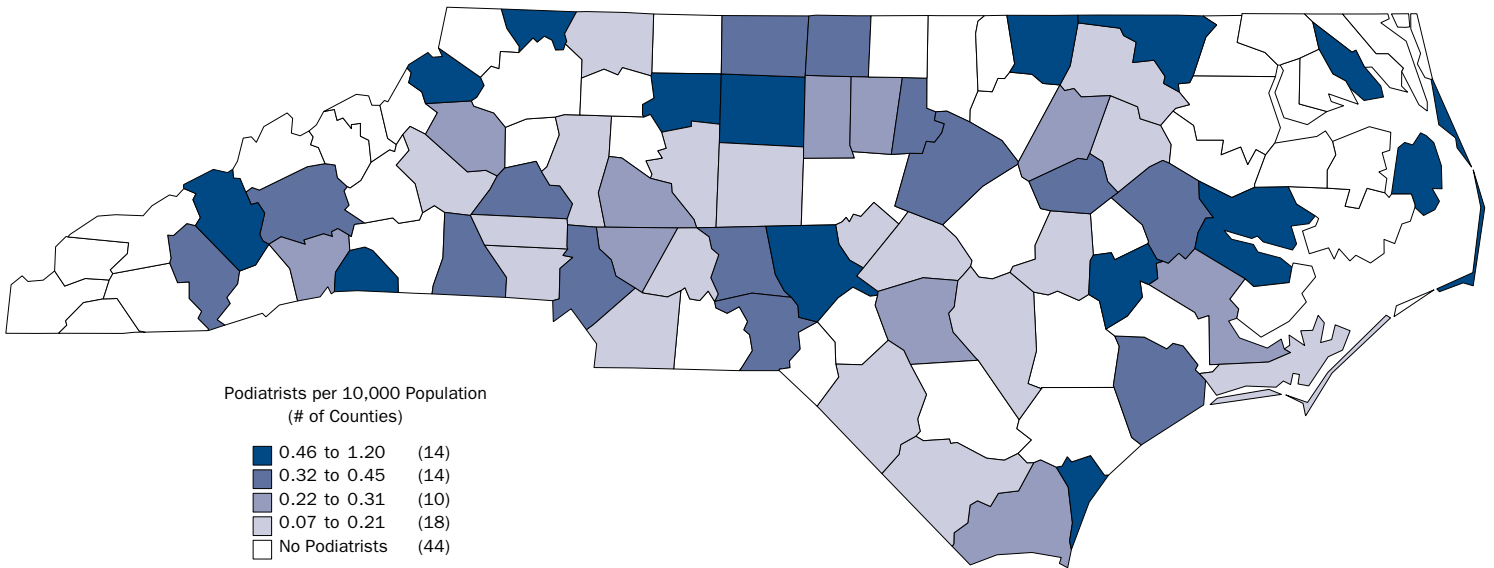
\*Persistent Health Professional Shortage Area

**Figure 31. Podiatrists per 10,000 Population, US and NC, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; HRSA, Bureau of Health Professions; US Bureau of the Census; North Carolina Office of State Planning  
Figures include all licensed active podiatrists.

**Figure 32. Active Podiatrists per 10,000 Population, 1998**

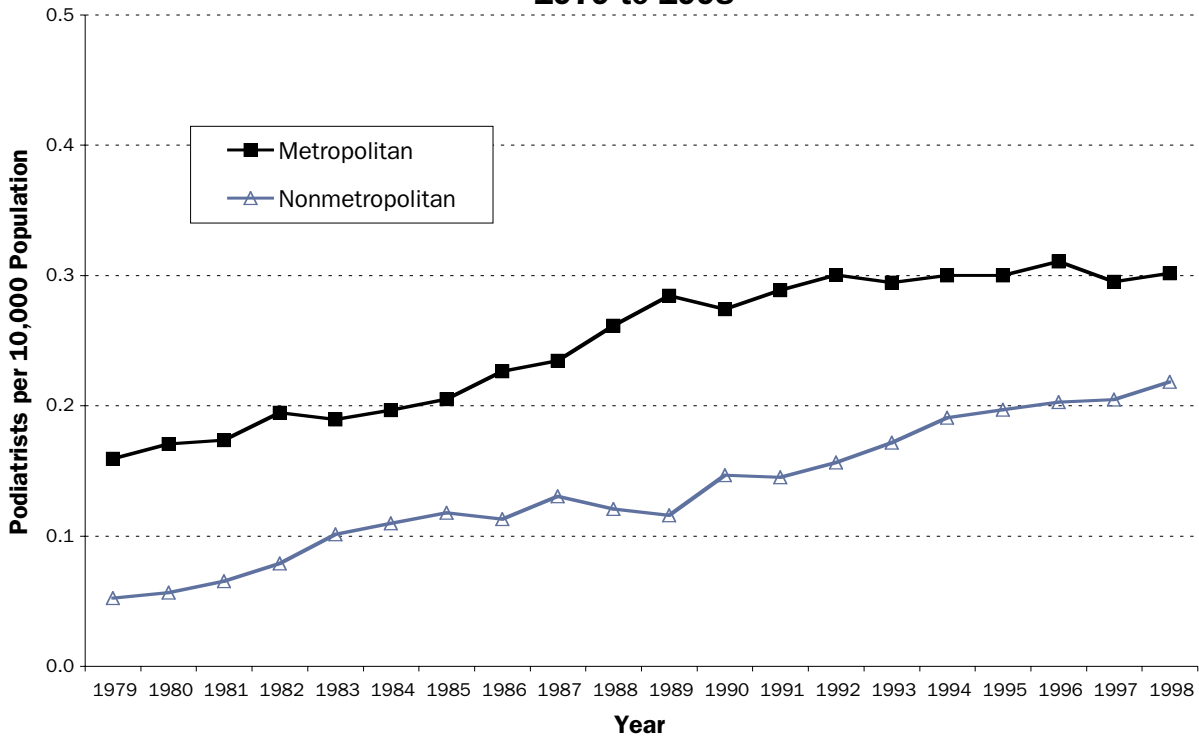


Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center, Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.



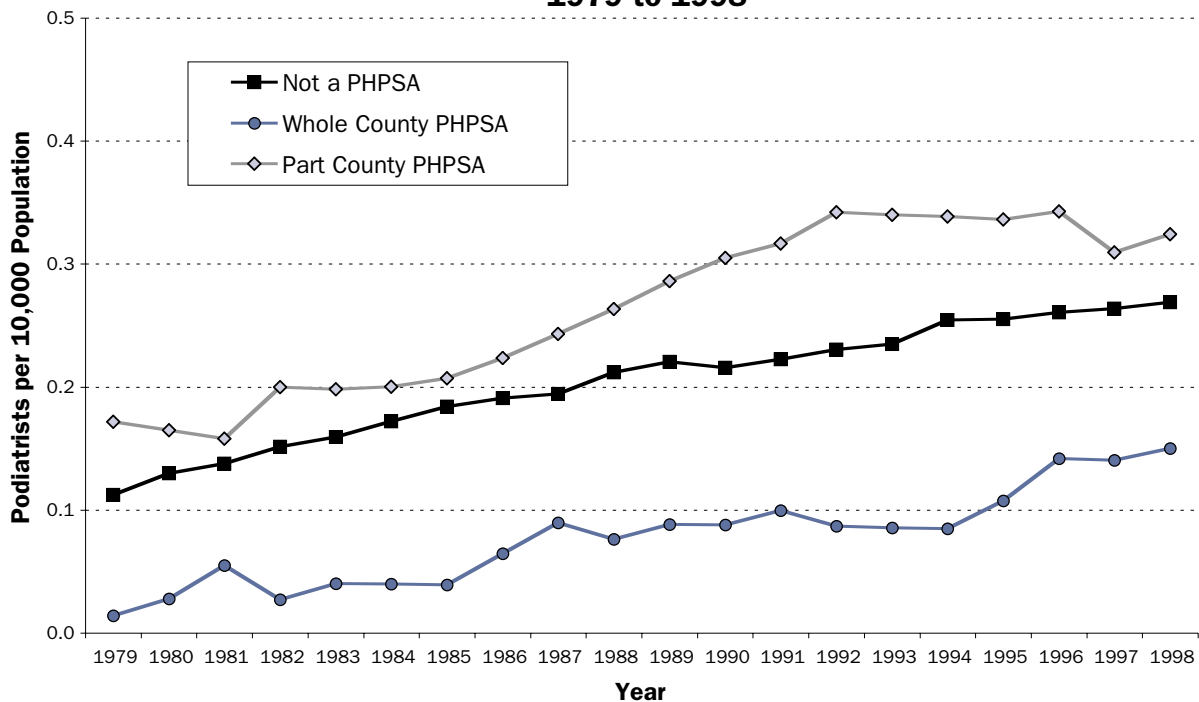
**Figure 33. Podiatrists per 10,000 Population by Metropolitan and Nonmetropolitan Counties, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state podiatrists

Source for Metropolitan-Nonmetropolitan definition: Office of Management and Budget, 1993.

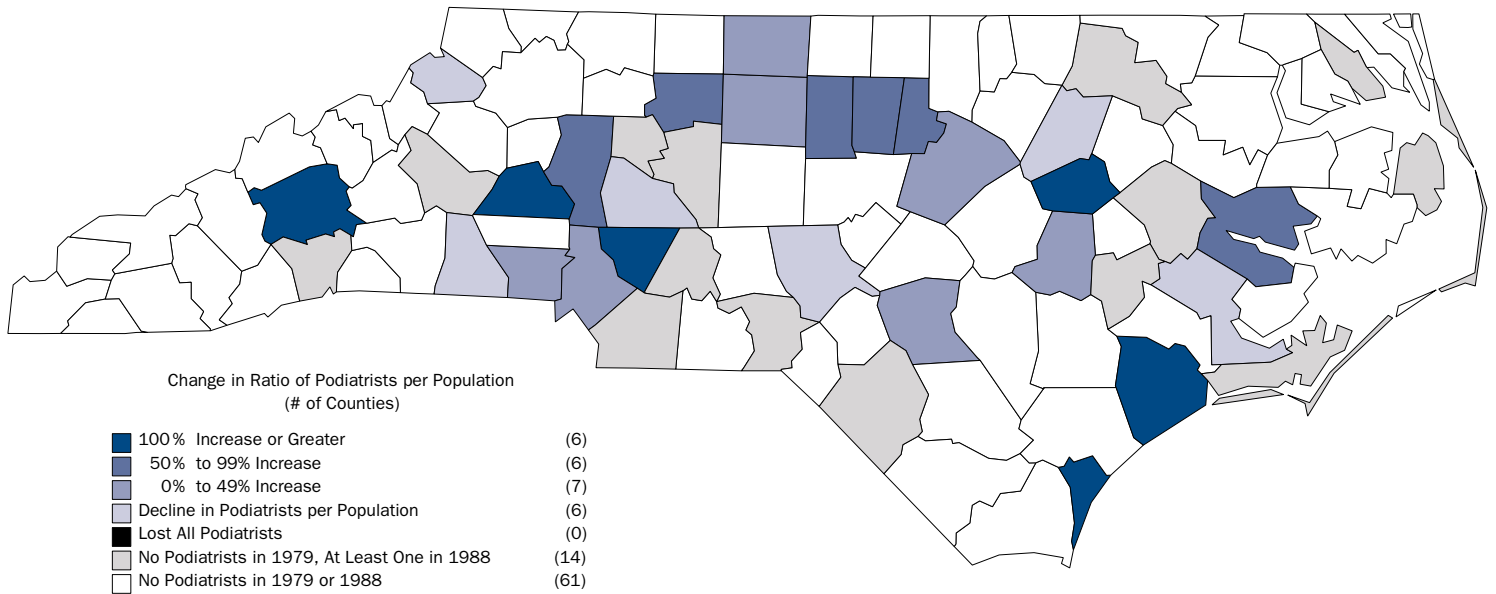
**Figure 34. Podiatrists per 10,000 Population by Persistent Health Professional Shortage Area (PHPSA) Status, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state podiatrists

Source for Health Professional Shortage Areas: Area Resource File, HRSA, Department of Health and Human Services, 1998  
 Persistent HPSAs are those designated as HPSAs by HRSA from 1993 through 1997, or in 6 of the last 7 releases of HPSA definitions

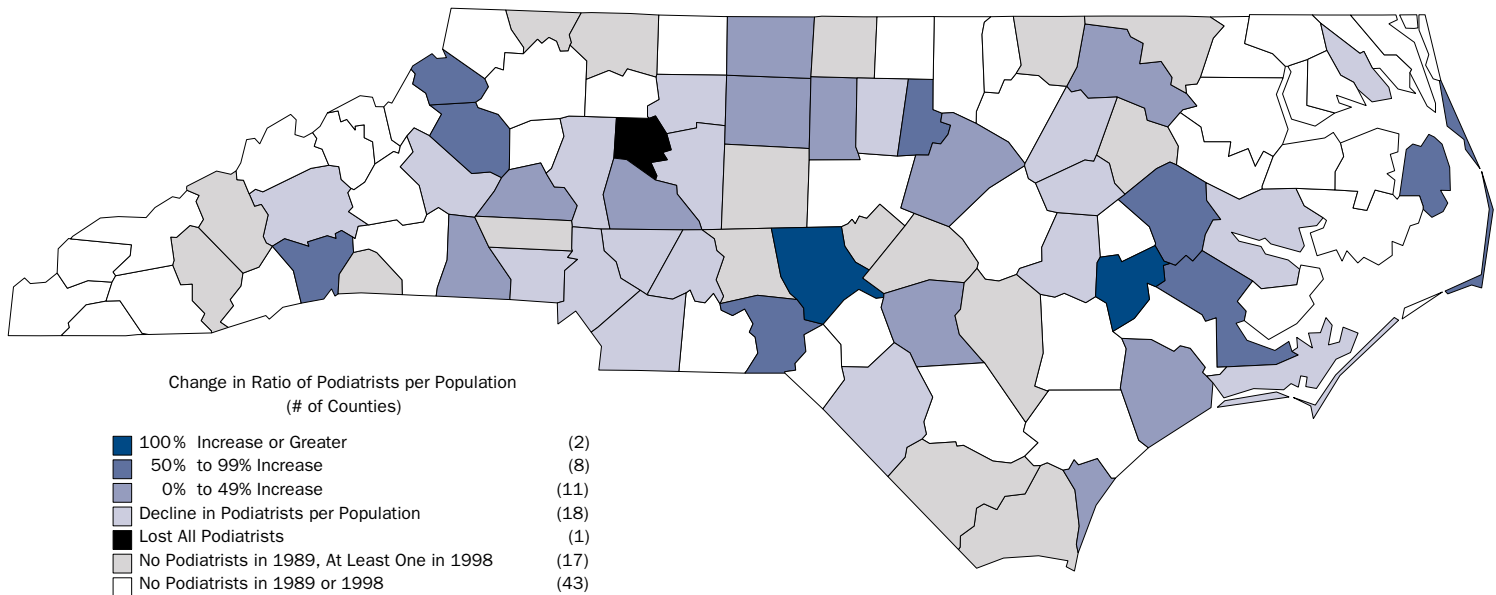
**Figure 35. Percent Change in Ratio of Active Podiatrists per 10,000 Population from 1979 to 1988**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Figure 36. Percent Change in Ratio of Active Podiatrists per 10,000 Population from 1989 to 1998**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Registered nurses** provide care, treatment, counseling and health education to patients and their families. RNs are also involved in health promotion and disease prevention activities; they monitor patients' conditions, give medications and treatments prescribed by doctors; and communicate with physicians and other members of the health care team.

There are three avenues to licensure as an RN: a two-year associate degree from an approved junior or community college; a three-year diploma from an approved hospital-based school of nursing; and a four-year baccalaureate program from an approved university or college.

There are more RNs in North Carolina than any other single health profession; in 1998, there were a total of 68,050 active RNs in North Carolina. The RN-to-population ratio in the state has nearly doubled from 46 RNs per 10,000 people in 1979 to 90 RNs per 10,000 people in 1998. From 1979-1990 the national provider-to-population ratio exceeded that of North Carolina; however, since 1991, North Carolina has had more RNs relative to its population than the national average (Figure 37). The supply of RNs in metropolitan and nonmetropolitan counties has shown similar growth rates since 1979 with metropolitan areas having consistently more RNs per 10,000 people than nonmetropolitan areas (Figure 39).

In 1998, the RN supply per person in counties with adequate numbers of health professionals was more than double that of whole county PHPSAs (Figure 40). Between 1979 and 1988, 13 counties saw a decrease in their RN-to-population ratio (Figure 41); however, this trend was reversed from 1989-1998 with every county in the state increasing its RN-to-population ratio and 17 counties doubling their supplies (Figure 42).

**Table 6: Summary Statistics for Registered Nurses in North Carolina**

Registered Nurses per 10,000 Population	Total Active Registered Nurses
1979: 46	26,807
1989: 68	44,355
1998: 90	68,050

**Number of Registered Nurses per 10,000 Population in 1998**

Metropolitan Areas: 100.28  
 Nonmetropolitan Areas: 69.53

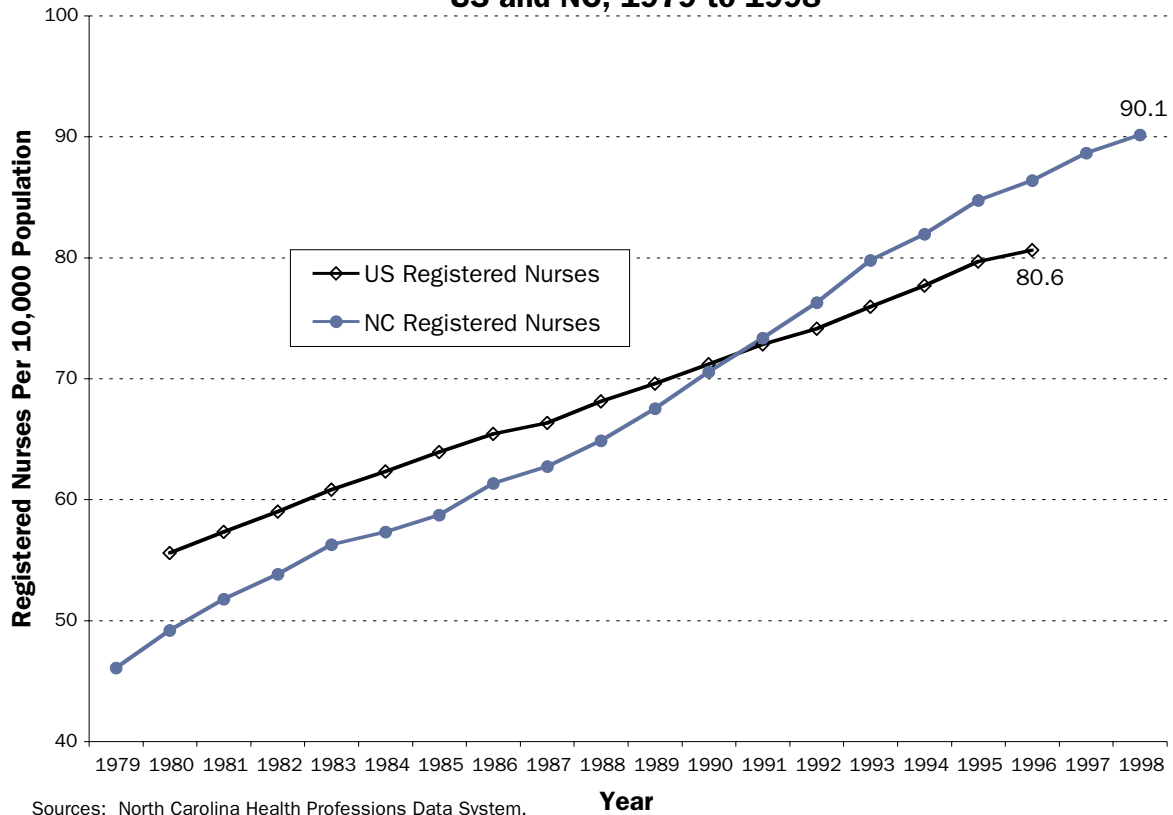
For the 21 counties designated as whole county PHPSAs\*: 47.21  
 For the 23 counties designated as part county PHPSAs\* 92.08  
 For the 56 counties not designated as PHPSAs\*: 98.01

**County Level Data**

# of counties increasing registered nurse supply 1989-1998: 100  
 # of counties decreasing registered nurse supply 1989-1998: 0  
 # of counties with no registered nurses in 1998: 0

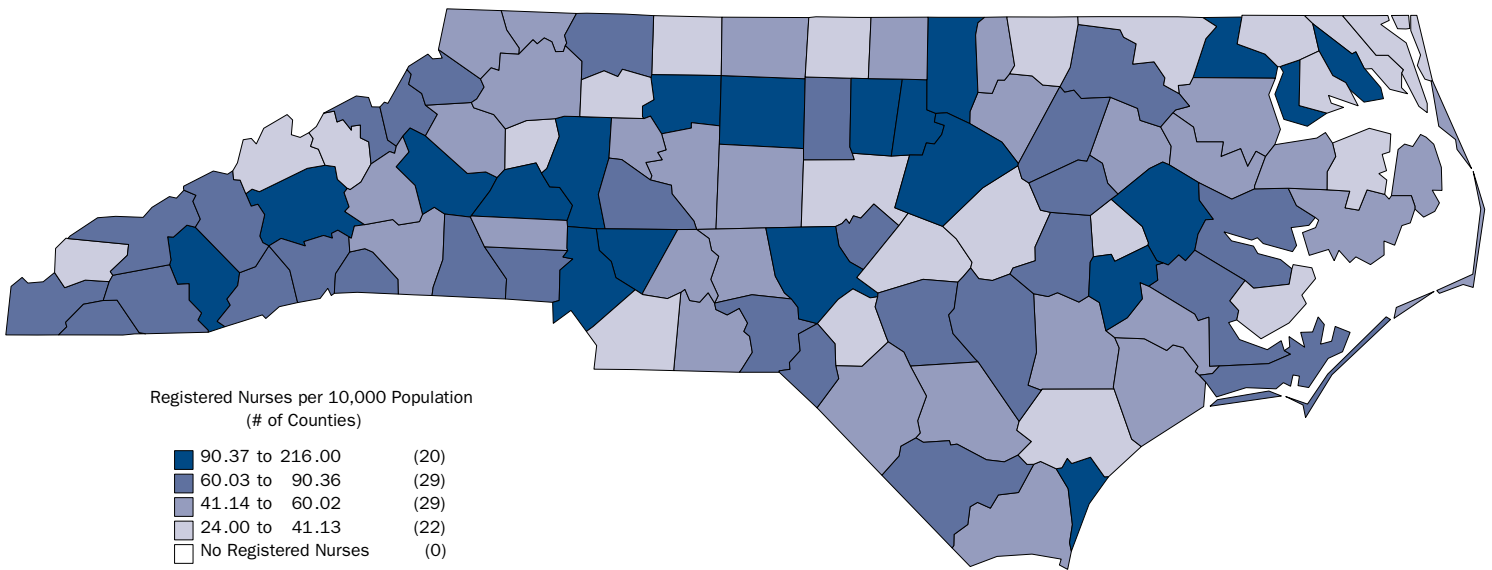
\*Persistent Health Professional Shortage Area

**Figure 37. Registered Nurses per 10,000 Population, US and NC, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; HRSA, Bureau of Health Professions; US Bureau of the Census; North Carolina Office of State Planning  
 Figures include all licensed active registered nurses

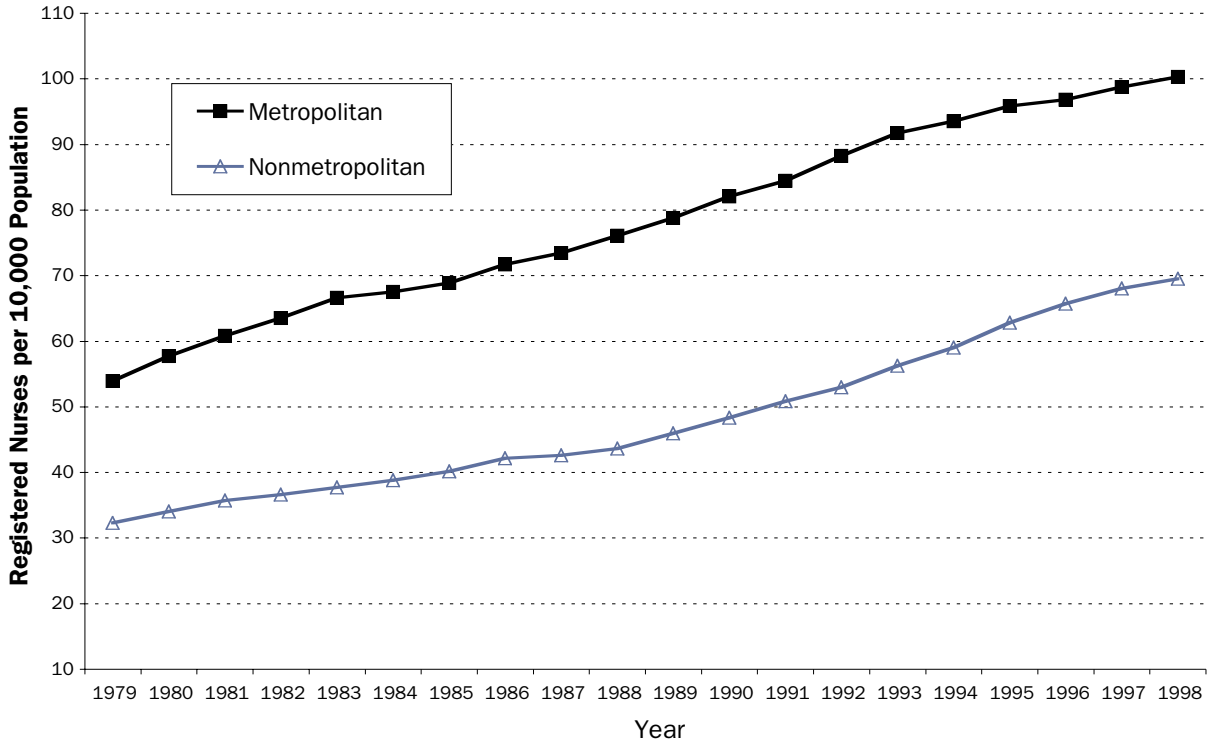
**Figure 38. Active Registered Nurses per 10,000 Population, 1998**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center, Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

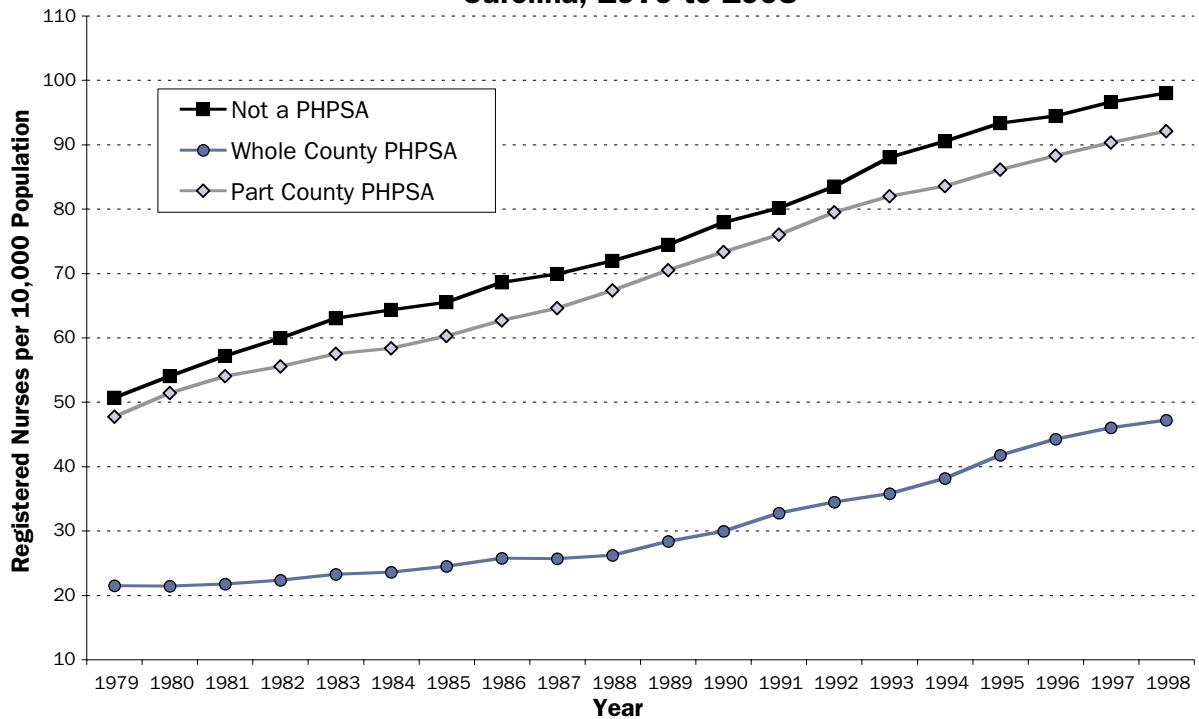
**Figure 39. Registered Nurses per 10,000 Population by Metropolitan and Nonmetropolitan Counties, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state registered nurses

Source for Metropolitan-Nonmetropolitan definition: Office of Management and Budget, 1993.

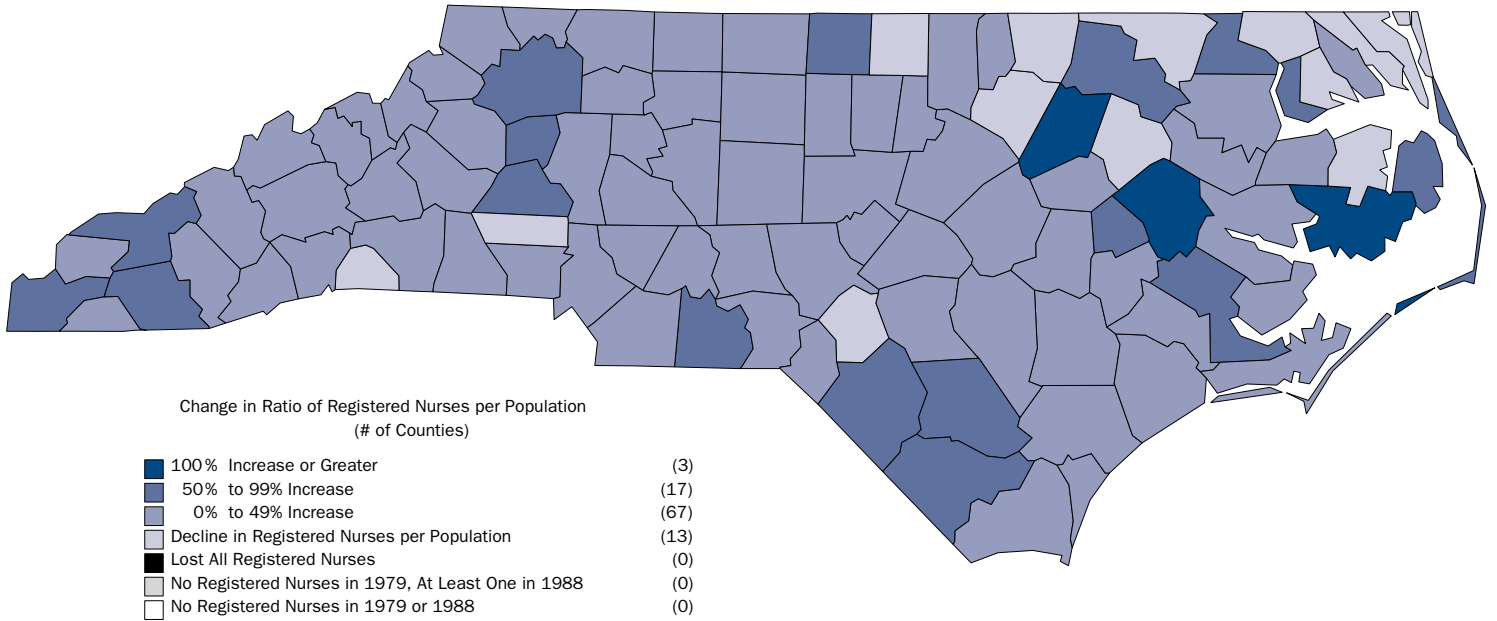
**Figure 40. Registered Nurses per 10,000 Population by Persistent Health Professional Shortage Area (PHPSA) Status, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state registered nurses

Source for Health Professional Shortage Areas: Area Resource File, HRSA, Department of Health and Human Services, 1998  
 Persistent HPSAs are those designated as HPSAs by HRSA from 1993 through 1997, or in 6 of the last 7 releases of HPSA definitions

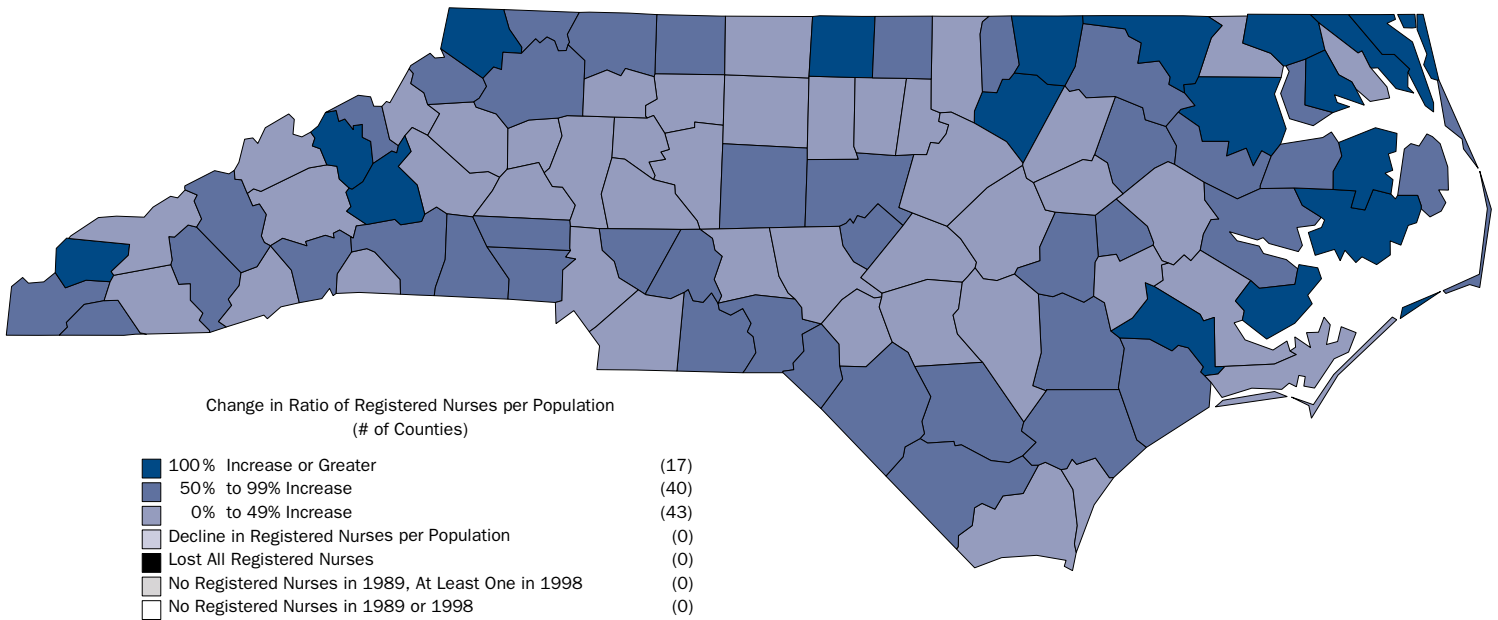
**Figure 41. Percent Change in Ratio of Active Registered Nurses per 10,000 Population from 1979 to 1988**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Figure 42. Percent Change in Ratio of Active Registered Nurses per 10,000 Population from 1989 to 1998**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Nurse practitioners (NPs)** are nurses who have either completed a graduate nursing degree or received certification to provide preventive and medical care to individuals and families in association with a physician. In collaboration with a supervising physician, NPs can write prescriptions, dispense drugs, order medications, tests and treatments in hospitals, clinics, nursing homes and other health facilities. In North Carolina, nurse practitioners are licensed as registered nurses and are jointly approved to practice as nurse practitioners by the Medical Board and the Board of Nursing.

One of the first three family NP education programs in the nation was established in North Carolina. That program was developed specifically for the purpose of preparing these primary care professionals to practice in rural parts of the state. In 1975, NC became the first state to authorize nurses (NPs) to perform medical acts, including diagnosis and prescribing medications. Today, nurse practitioners are recognized in every state and the District of Columbia and their scope of practice has been expanded to allow for independent practice in many settings for many roles.

Between 1980 and 1996 North Carolina's supply of NPs has closely mirrored that of the nation's. Since 1991, the state has experienced a rapid increase in the supply of NPs, which has grown more marked starting in 1995 (Figure 43). Nurse practitioners show one of the most even metropolitan-nonmetropolitan distribution patterns of any health profession in the state (Figure 45) and there were only seven counties without an active nurse practitioner in 1998 (Figure 44).

Counties with health professional shortages have seen numbers of NPs increase steadily since 1992, although faster growth has occurred in non-shortage counties (Figure 46). The ratio of NPs-to-population more than doubled in 36 counties from 1989 to 1998, while eight counties saw declines in their ratios (Figure 48).

**Table 7: Summary Statistics for Nurse Practitioners in North Carolina**

<b>Nurse Practitioners (NPs) per 10,000 Population</b>	<b>Total Active Nurse Practitioners</b>
1979: 0.48	279
1989: 0.76	497
1998: 1.75	1,321

**Number of Nurse Practitioners per 10,000 Population in 1998**

Metropolitan Areas: 1.92  
 Nonmetropolitan Areas: 1.41

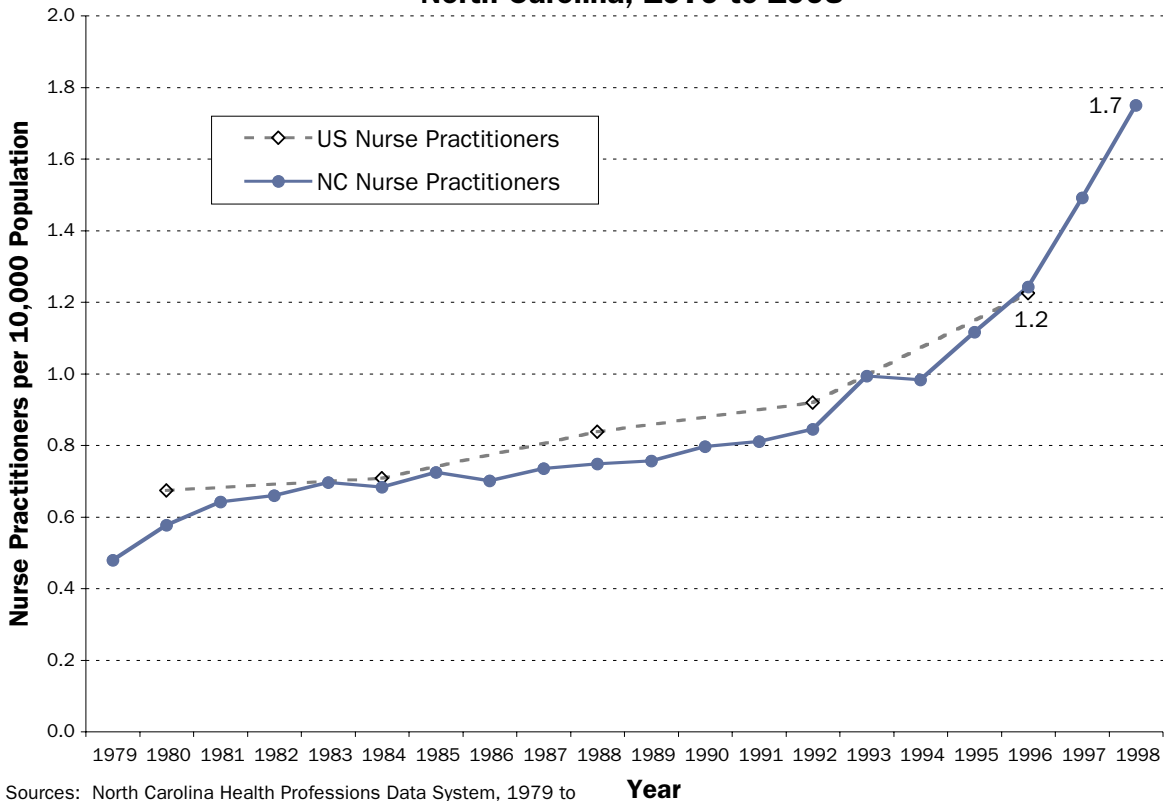
For the 21 counties designated as whole county PHSAs\*: 1.10  
 For the 23 counties designated as part county PHSAs\*: 1.71  
 For the 56 counties not designated as PHSAs\*: 1.92

**County Level Data**

# of counties increasing NP supply 1989-1998: 86  
 # of counties decreasing NP supply 1989-1998: 8  
 # of counties with no NPs in 1998: 7

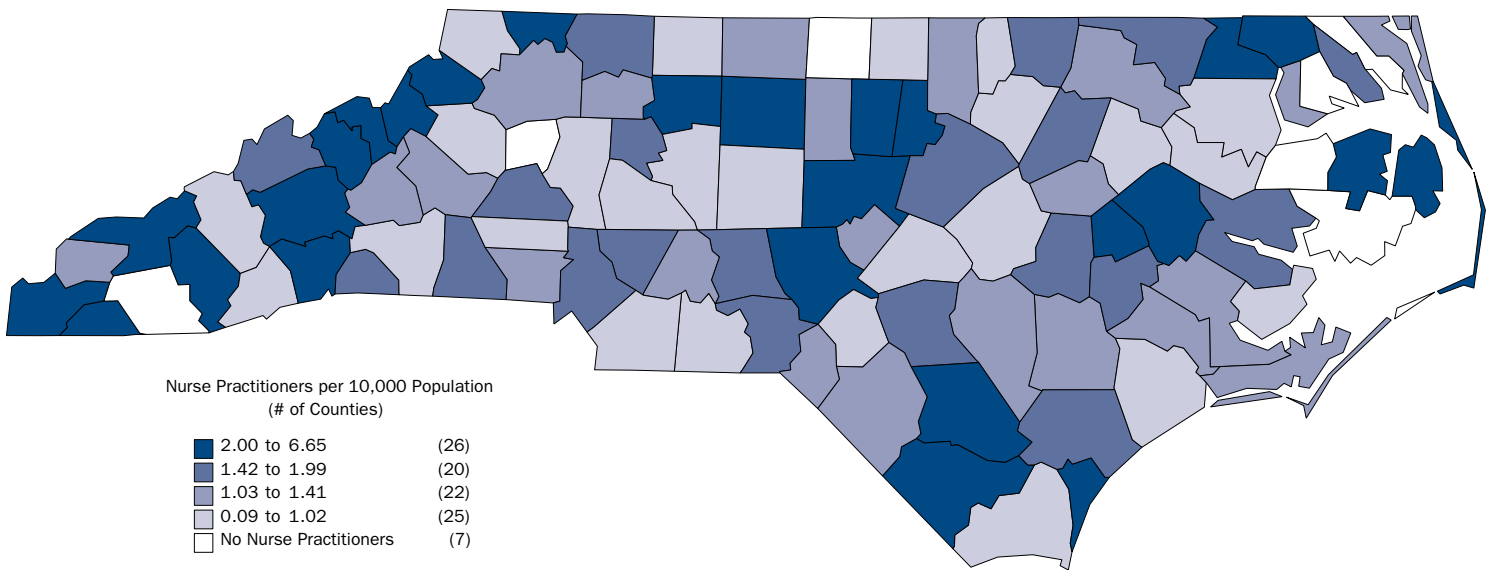
\*Persistent Health Professional Shortage Area

**Figure 43. Nurse Practitioners per 10,000 Population, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; The Registered Nurse Population- Findings from the National Sample Survey of Registered Nurses, 1996, 1992, 1988, 1984, 1980; US Bureau of the Census; North Carolina Office of State Planning  
 Figures include all licensed active in-state nurse practitioners

**Figure 44. Active Nurse Practitioners per 10,000 Population, 1998**

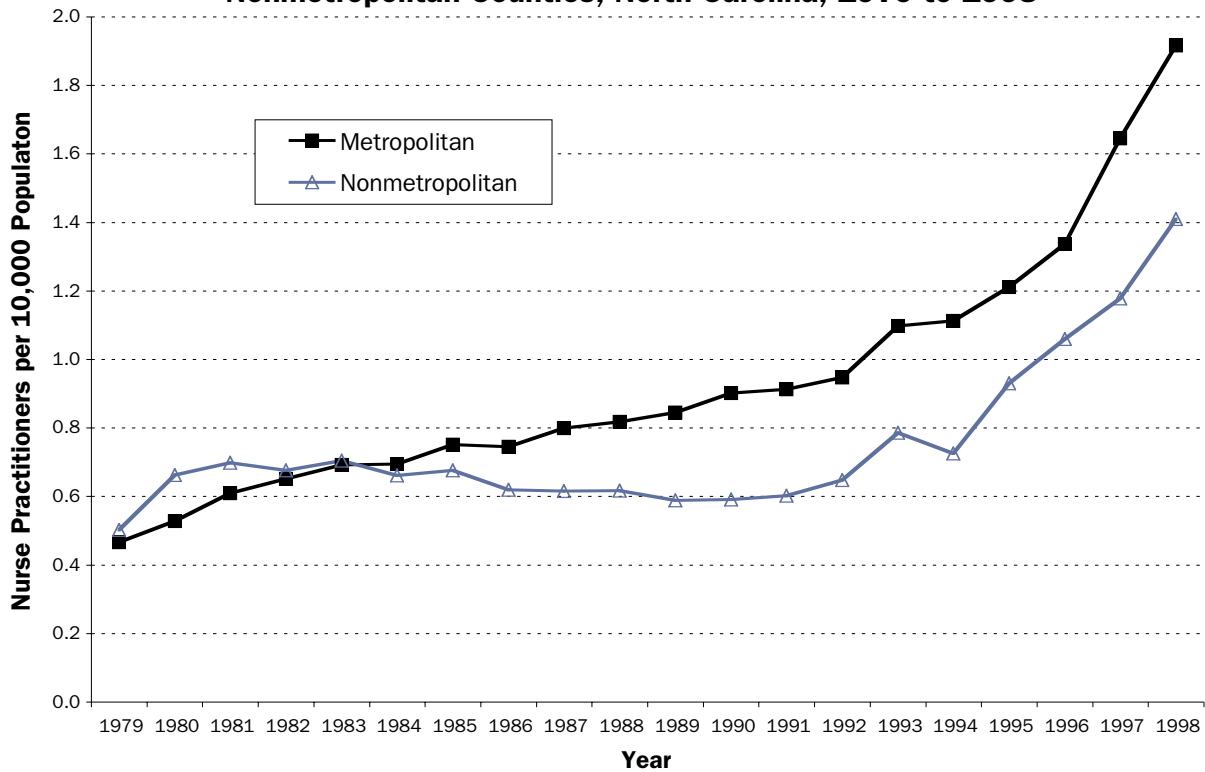


Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center, Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.



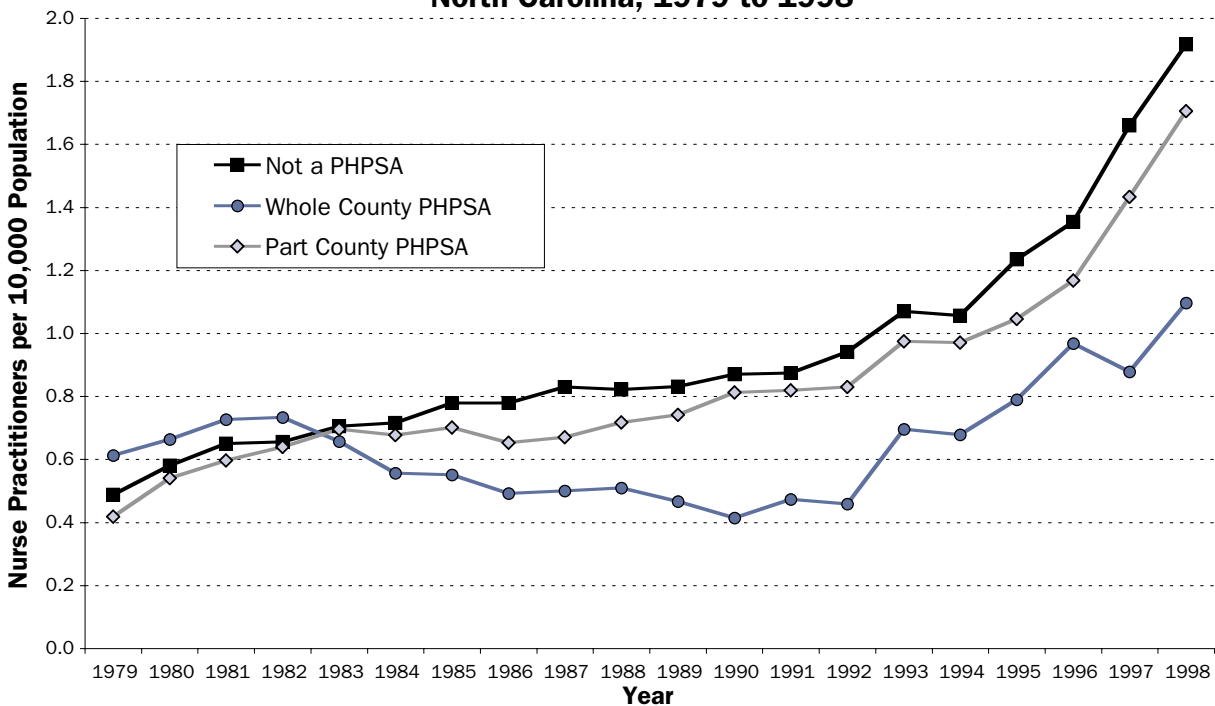
**Figure 45. Nurse Practitioners per 10,000 Population by Metropolitan and Nonmetropolitan Counties, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state nurse practitioners

Source for Metropolitan-Nonmetropolitan definition: Office of Management and Budget, 1993.

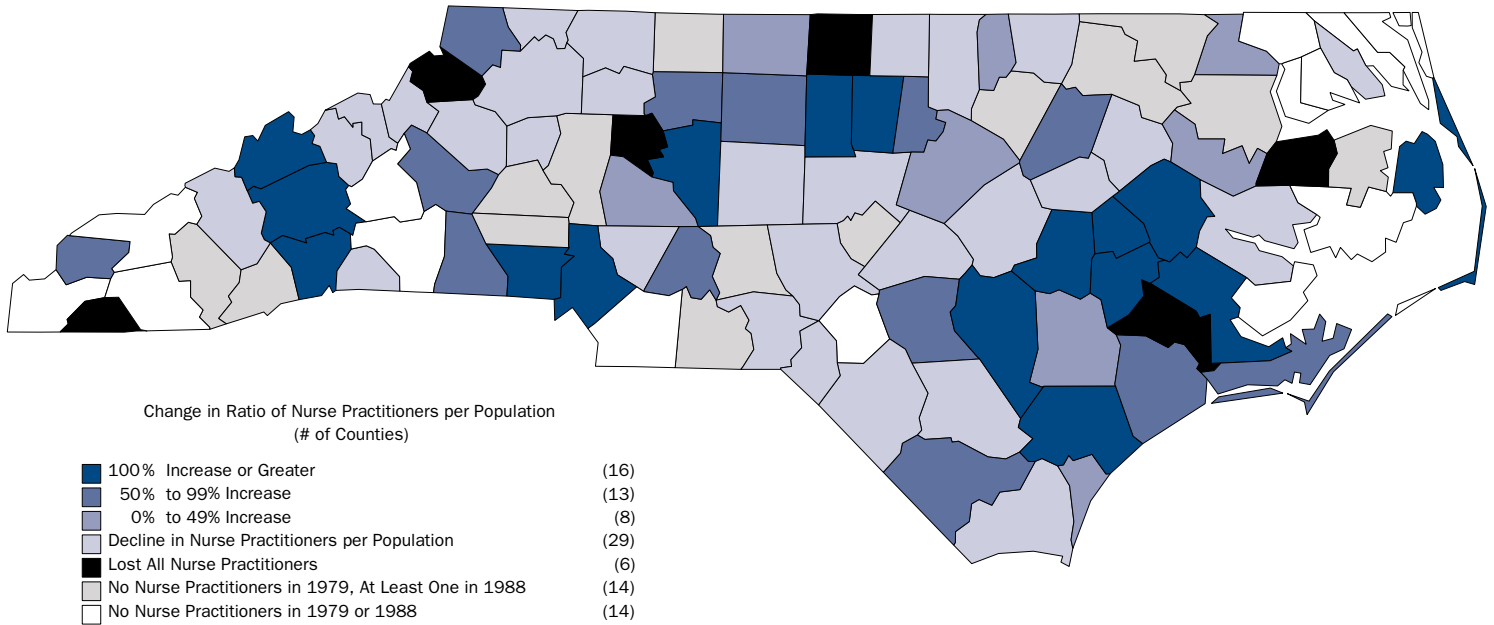
**Figure 46. Nurse Practitioners per 10,000 Population by Persistent Health Professional Shortage Area (PHPSA) Status, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state nurse practitioners

Source for Health Professional Shortage Areas: Area Resource File, HRSA, Department of Health and Human Services, 1998  
 Persistent HPSAs are those designated as HPSAs by HRSA from 1993 through 1997, or in 6 of the last 7 releases of HPSA definitions

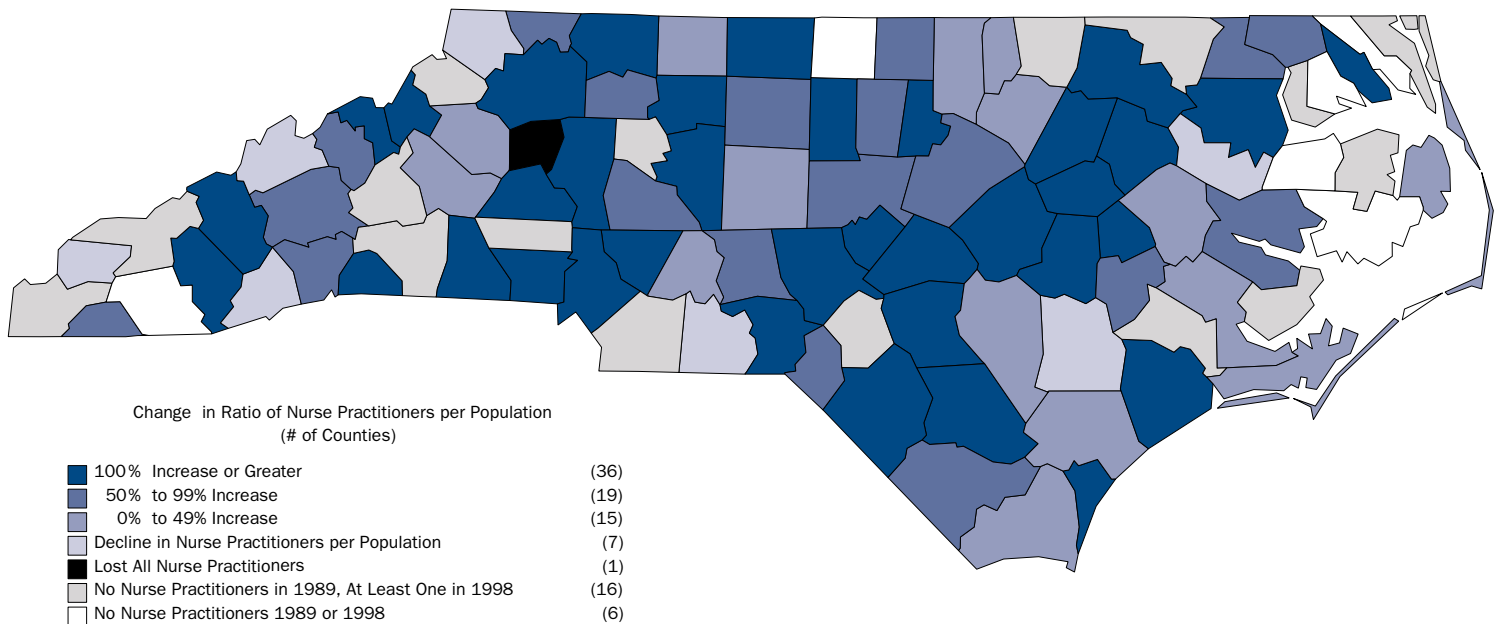
**Figure 47. Percent Change in Ratio of Active Nurse Practitioners per 10,000 Population from 1979 to 1988**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Figure 48. Percent Change in Ratio of Active Nurse Practitioners per 10,000 Population from 1989 to 1998**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Certified nurse midwives (CNMs)** manage the care of healthy women, focusing particularly on pregnancy, childbirth, the postpartum period, care of the newborn, family planning and gynecological needs. Nurse midwifery came to the United States in the 1920's but the first educational programs did not begin until the 1930's. In North Carolina, nurse midwifery was recognized in the 1950s and since 1983, nurse midwives have been regulated by the Midwifery Joint Committee (a committee that includes representatives from the Board of Nursing and the Medical Board). In 1992, an educational program at East Carolina University began; it is currently the only nurse midwifery program in the state. However, there are several distance learning programs outside the state that allow North Carolina students to remain in-state while training to be a midwife.

The supply of CNMs in North Carolina has grown steadily since the late 1980s with the sharpest increases seen after 1991 (Figure 49). Although the number of CNMs per person in the state is subject to wide fluctuations due to small numbers, they are distributed relatively evenly between metropolitan and nonmetropolitan counties (Figure 51). Since CNMs must practice under the supervision of an obstetrician or family medicine physician, their geographic distribution is partly dependent upon the availability of these two types of practitioners. Counties designated as part county persistent health professional shortage areas experienced the greatest increases in supply from 1979 (Figure 52). Sixty of the state's counties had no certified nurse midwives in 1998 (Figure 50).

**Table 8: Summary Statistics for Certified Nurse Midwives in North Carolina**

<b>Certified Nurse Midwives (CNMs) per 10,000 Childbearing Age Females *</b>	<b>Total Active Certified Nurse Midwives</b>
1984: 0.19	29
1989: 0.21	34
1998: 0.82	138

**Number of Certified Nurse Midwives per 10,000 Childbearing Age Females\* in 1998**

Metropolitan Areas: 0.81  
 Nonmetropolitan Areas: 0.84

For the 21 counties designated as whole county PHPSAs\*\*: 0.71  
 For the 23 counties designated as part county PHPSAs\*\*: 0.73  
 For the 56 counties not designated as PHPSAs\*\*: 0.90

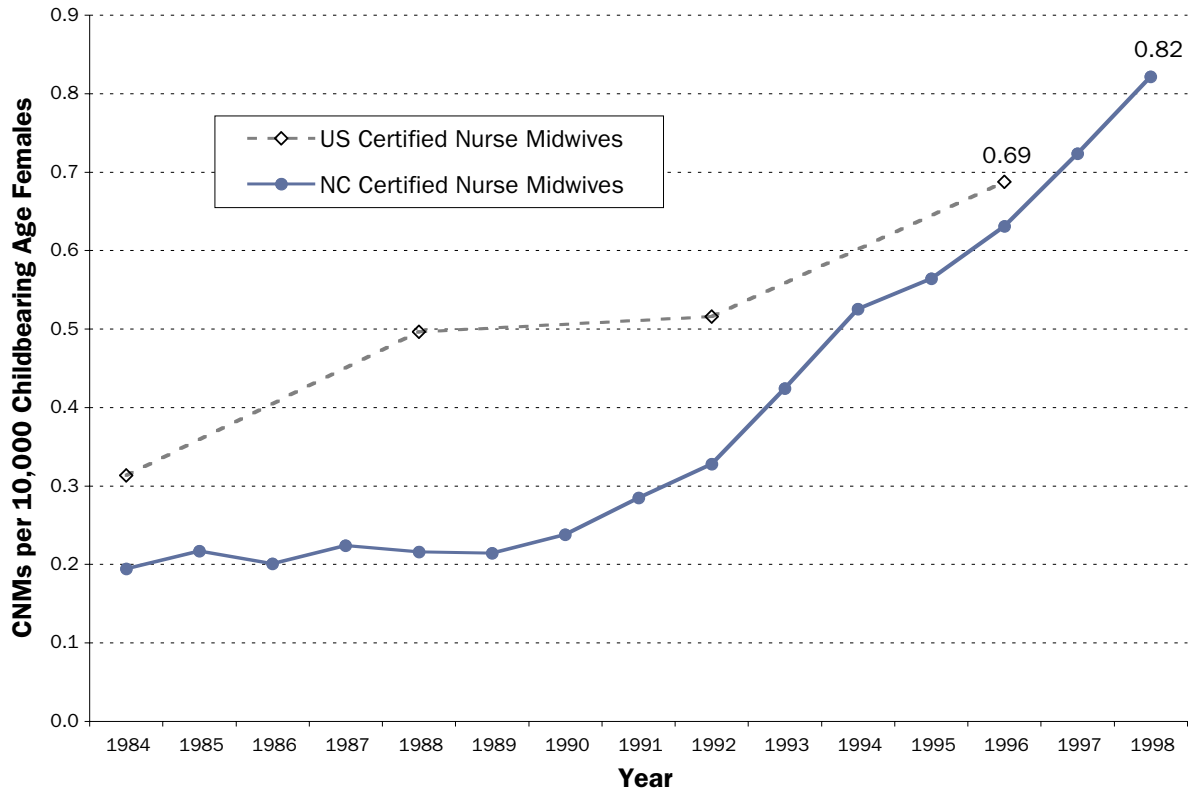
**County Level Data**

# of counties increasing CNM supply 1989-1998: 34  
 # of counties decreasing CNM supply 1989-1998: 7  
 # of counties with no CNMs in 1998: 60

\*Childbearing age: 15-44 years

\*\*Persistent Health Professional Shortage Area

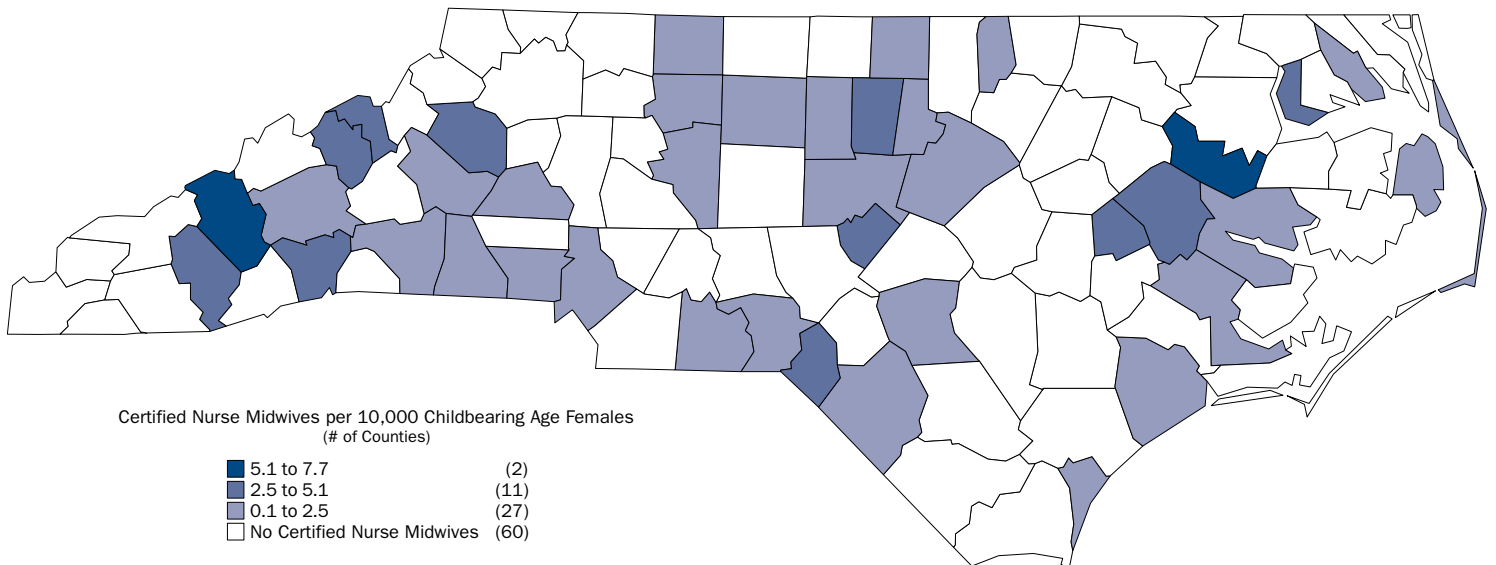
**Figure 49. Certified Nurse Midwives (CNMs) per 10,000 Childbearing Age\* Females, North Carolina, 1984 to 1998**



Sources: North Carolina Board of Nursing; Midwifery Joint Committee, 1999; The Registered Nurse Population- Findings from the National Sample Survey of Registered Nurses, 1996, 1992, 1988, 1984, 1980; US Bureau of the Census; North Carolina Office of State Planning

Figures include all licensed active in-state certified nurse midwives  
\*childbearing age:15-44 years

**Figure 50. Active Certified Nurse Midwives per 10,000 Childbearing Age\* Females, North Carolina, 1998**

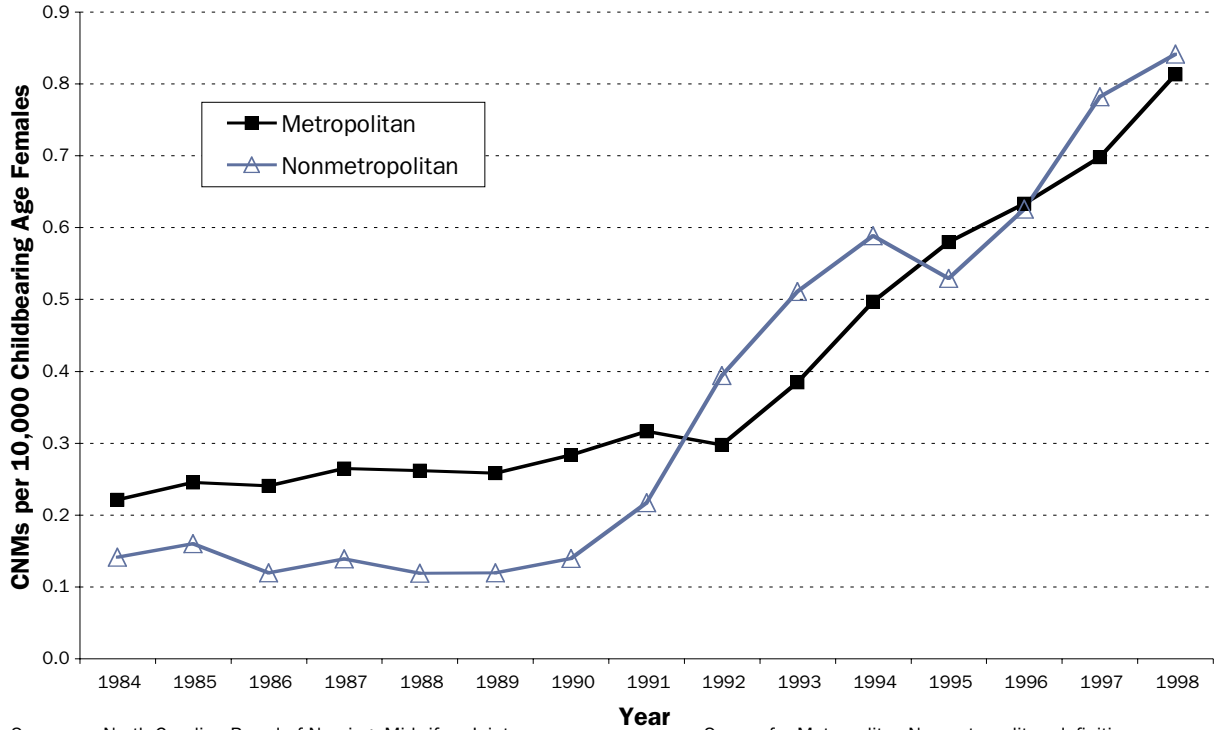


\*Childbearing Age: 15-44 years

Source: North Carolina Board of Nursing; Midwifery Joint Committee, 1999.

Produced By: North Carolina Rural Health Research Program,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

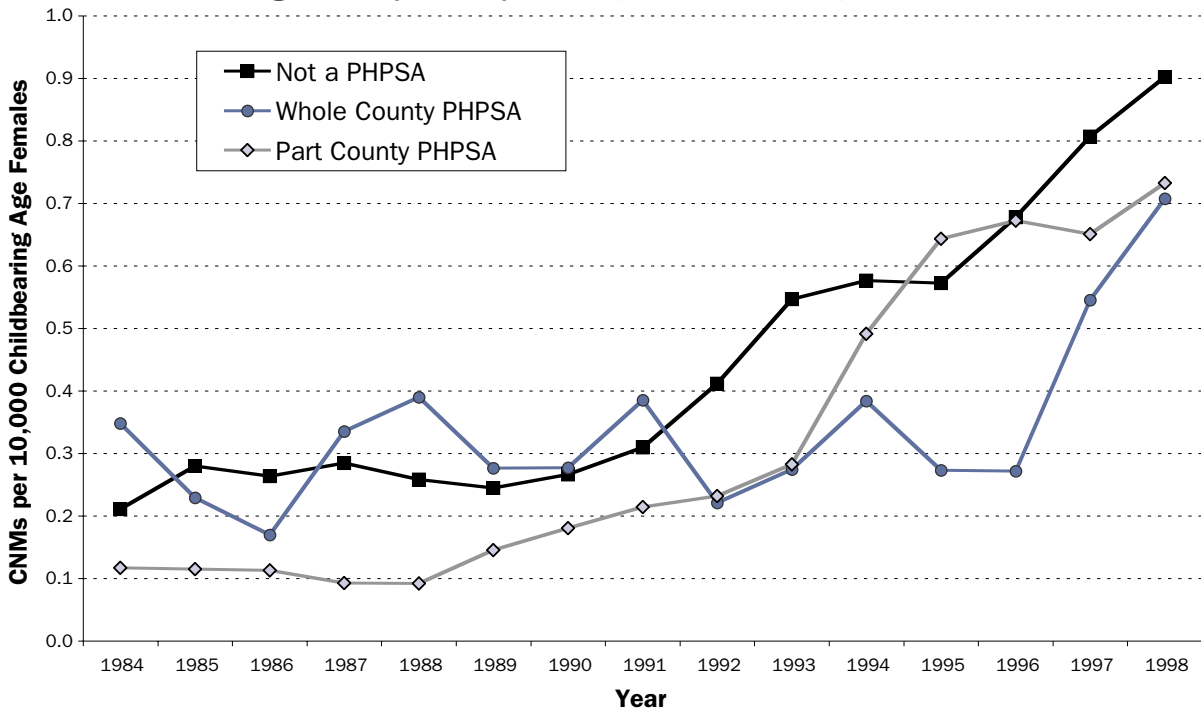
**Figure 51. Certified Nurse Midwives (CNMs) per 10,000 Childbearing Age\* Females by Metropolitan and Nonmetropolitan Counties, North Carolina, 1984-1998**



Sources: North Carolina Board of Nursing; Midwifery Joint Committee 1999; North Carolina Office of State Planning  
 Figures include all licensed active in-state certified nurse midwives  
 \*childbearing age: 15-44 years

Source for Metropolitan-Nonmetropolitan definition: Office of Management and Budget, 1993.

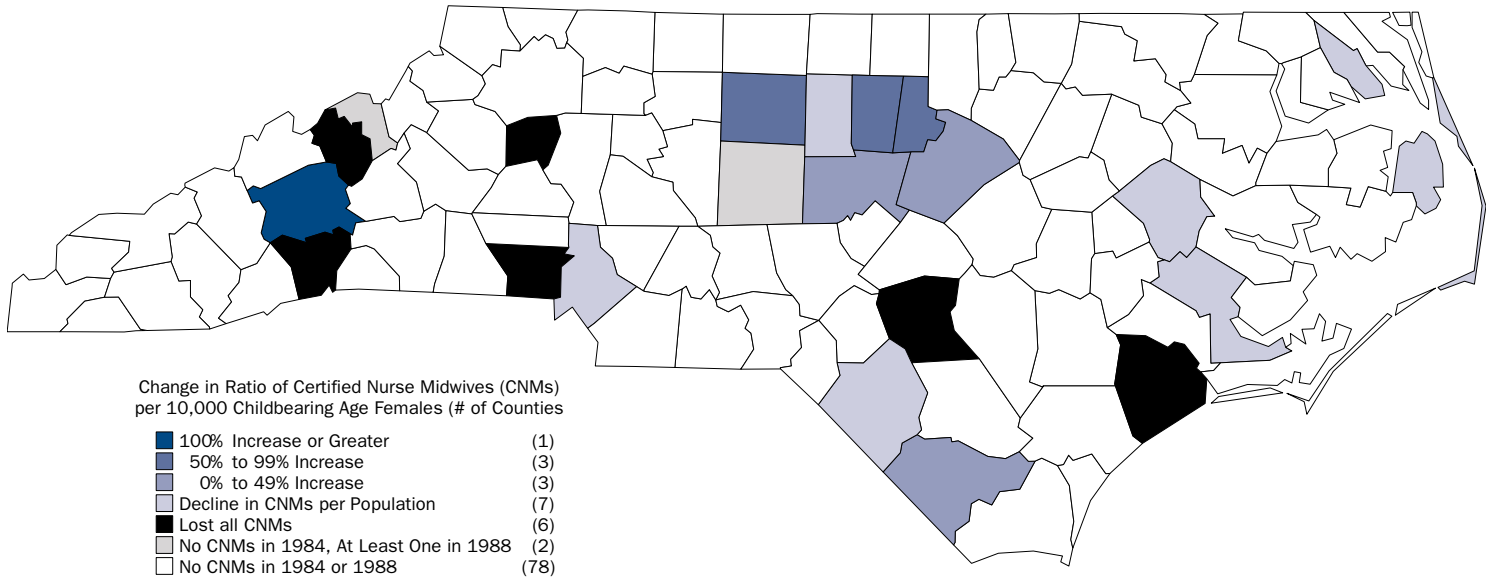
**Figure 52. Certified Nurse Midwives (CNMs) per 10,000 Childbearing Age\* Females by Persistent Health Professional Shortage Area (PHPSA) Status, North Carolina, 1984 to 1998**



Sources: North Carolina Board of Nursing; Midwifery Joint Committee 1999; North Carolina Office of State Planning  
 Figures include all licensed active in-state certified nurse midwives  
 \*childbearing age: 15-44 years

Source for Health Professional Shortage Areas: Area Resource File, HRSA, Department of Health and Human Services, 1998  
 Persistent HPSAs are those designated as HPSAs by HRSA from 1993 through 1997, or in 6 of the last 7 releases of HPSA definitions

**Figure 53. Percent Change in Ratio of Active Certified Nurse Midwives per 10,000 Childbearing Age\* Females from 1984 to 1988**

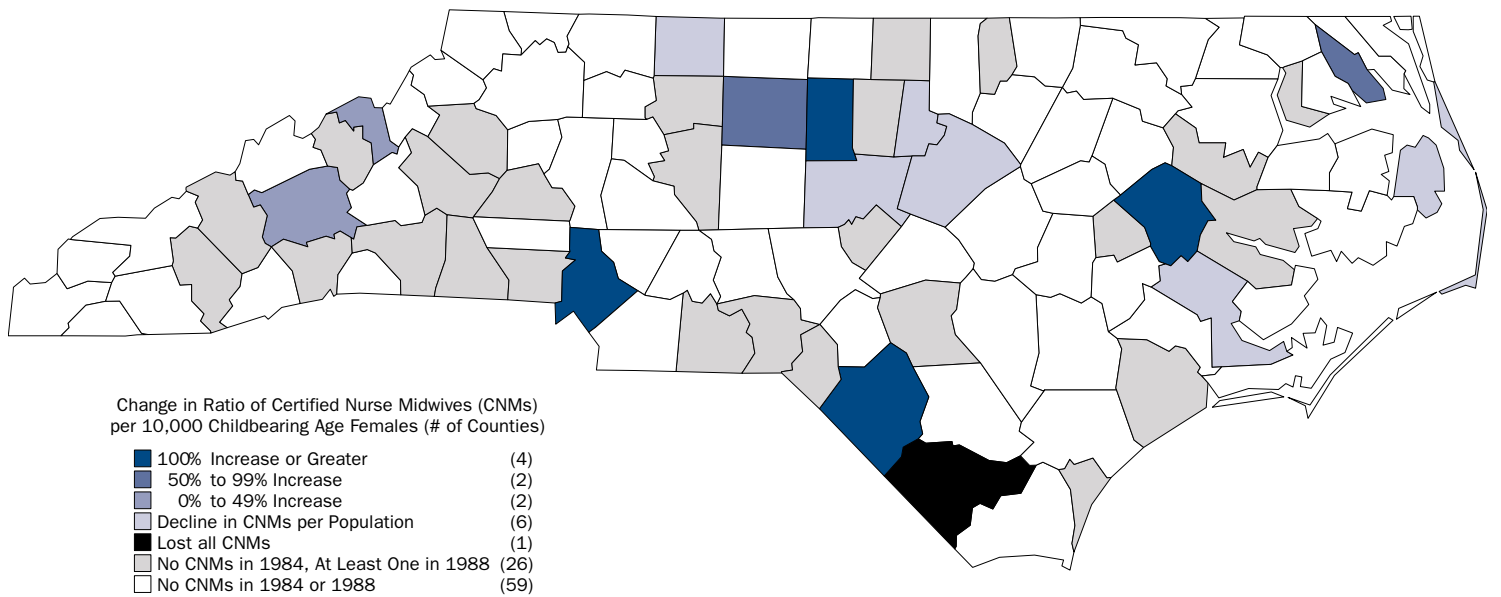


\*Childbearing Age: 15-44 years

Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center, Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Figure 54. Percent Change in Ratio of Active Certified Nurse Midwives per 10,000 Childbearing Age\* Females from 1989 to 1998**



\*Childbearing Age: 15-44 years

Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center, Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Licensed practical nurses (LPNs)** provide hands-on care to patients by implementing health care plans developed by a physician, registered nurse or other authorized person. The required educational preparation is a one-year (four quarters) licensed practical nurse program at an accredited community college/technical institute or other approved institution.

The supply of LPNs has fluctuated over the 20-year period from 1979-1998, both nationally and in North Carolina. Despite these yearly fluctuations, the number of LPNs per 10,000 people in North Carolina has consistently exceeded the national ratio. The 20-year trend in the national practitioner-to-population ratio has shown a slight decrease; in contrast, North Carolina has experienced a slight increase from 1979-1998. (Figure 55).

Since 1990, nonmetropolitan counties have had higher LPN per 10,000 population ratios than metropolitan counties (Figure 57). In 1979, the LPN supply in non-PHPSA counties was nearly double that of whole county PHPSA counties; however, the difference between the two has been narrowing since 1991 (Figure 58).

The trend in the supply of LPNs across the state has not been uniform; 16 counties more than doubled their LPN-to-population ratio since 1989, and 35 saw their ratios decline (Figure 60).

**Table 9: Summary Statistics for Licensed Practical Nurses in North Carolina**

**Licensed Practical Nurses (LPNs) per 10,000 Population**

1979: 20.9  
1989: 22.6  
1998: 23.4

**Total Active LPNs**

12,164  
14,878  
17,665

**Number of Licensed Practical Nurses per 10,000 Population in 1998**

Metropolitan Areas: 22.20  
Nonmetropolitan Areas: 25.86

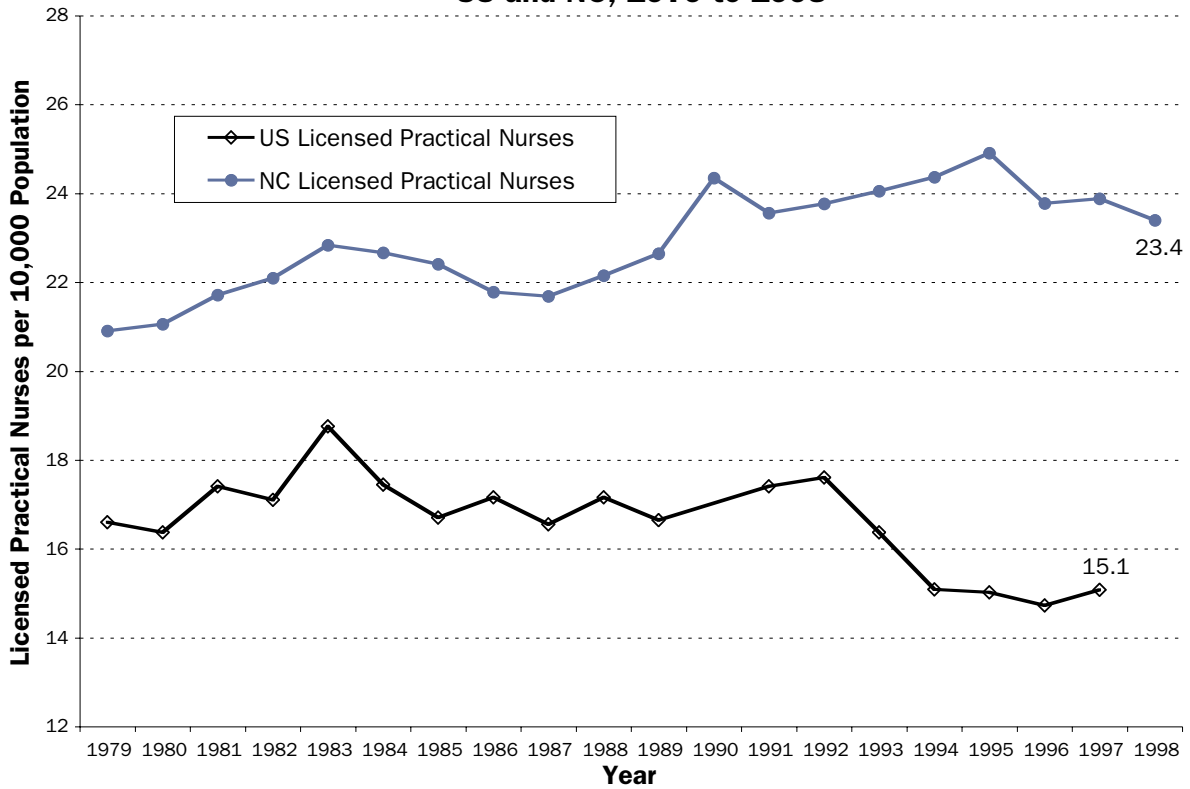
For the 21 counties designated as whole county PHPSAs\*: 20.50  
For the 23 counties designated as part county PHPSAs\*: 22.36  
For the 56 counties not designated as PHPSAs\*: 24.67

**County Level Data**

# of counties increasing LPN supply 1989-1998: 65  
# of counties decreasing LPN supply 1989-1998: 35  
# of counties with no LPNs in 1998: 0

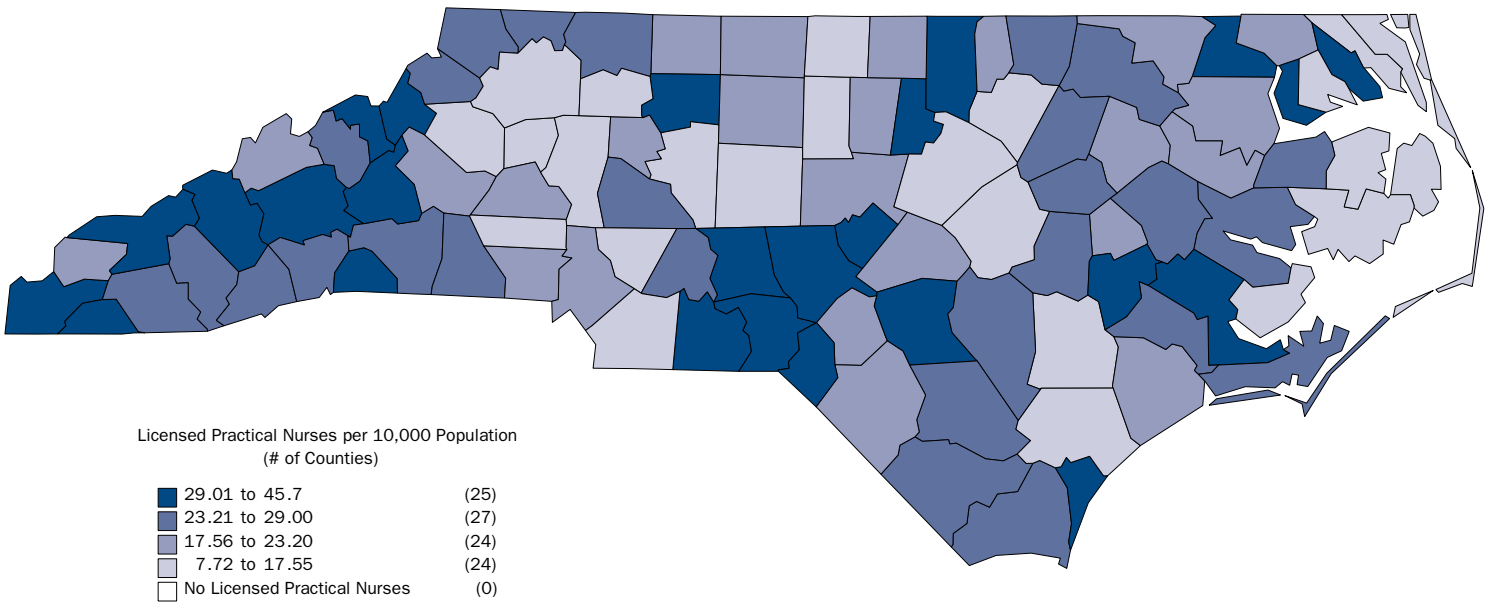
\*Persistent Health Professional Shortage Area

**Figure 55. Licensed Practical Nurses per 10,000 Population, US and NC, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; HRSA, Bureau of Health Professions; US Bureau of the Census; North Carolina Office of State Planning  
 Figures include all licensed active licensed practical nurses

**Figure 56. Active Licensed Practical Nurses per 10,000 Population, 1998**

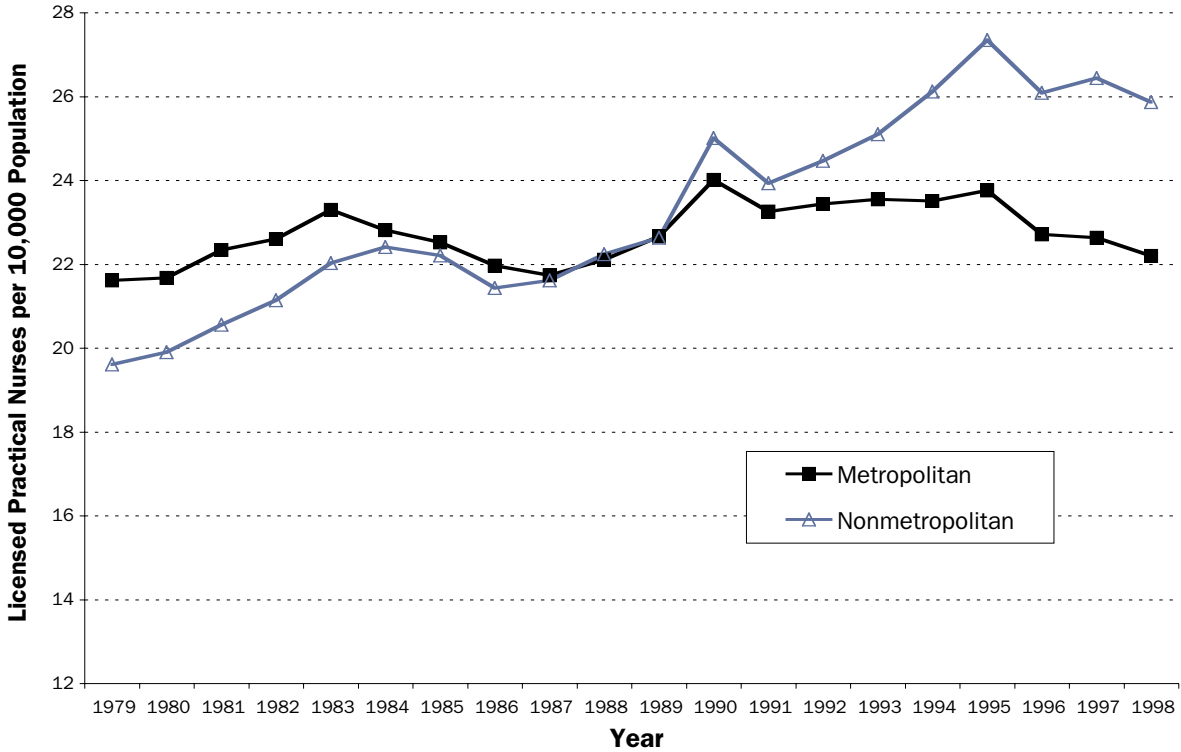


Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center, Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.



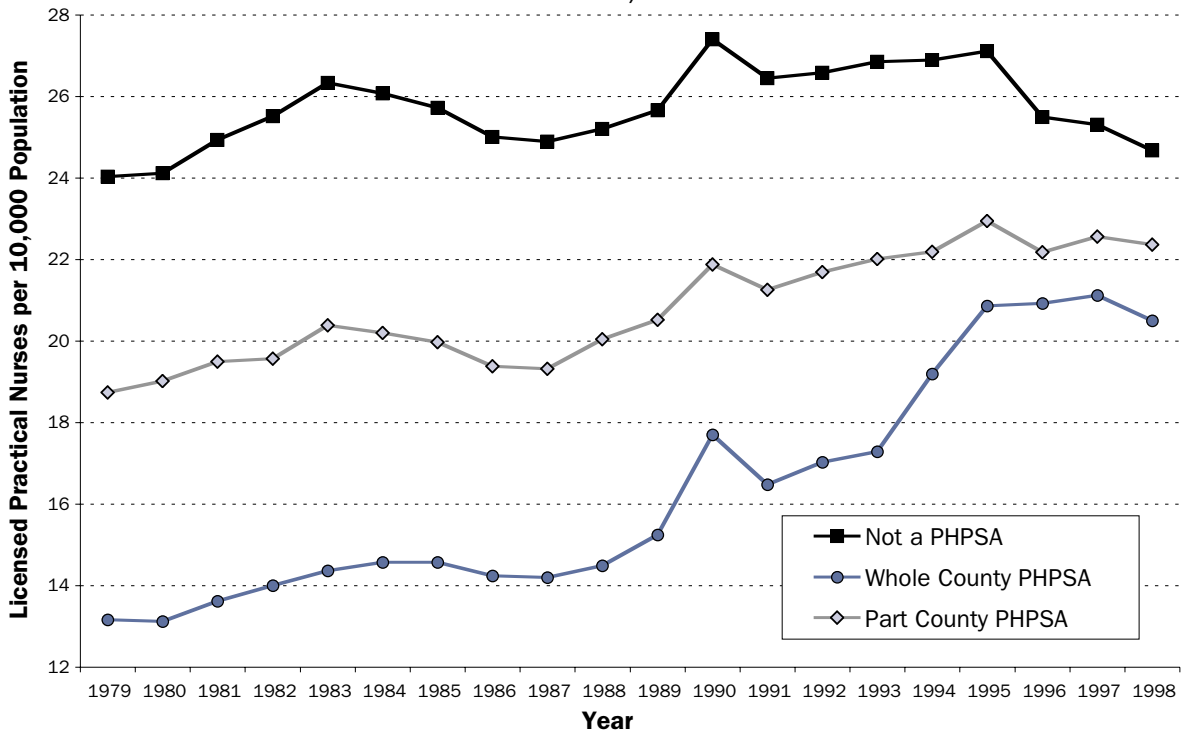
**Figure 57. Licensed Practical Nurses per 10,000 Population by Metropolitan and Nonmetropolitan Counties, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state licensed practical nurses

Source for Metropolitan-Nonmetropolitan definition: Office of Management and Budget, 1993.

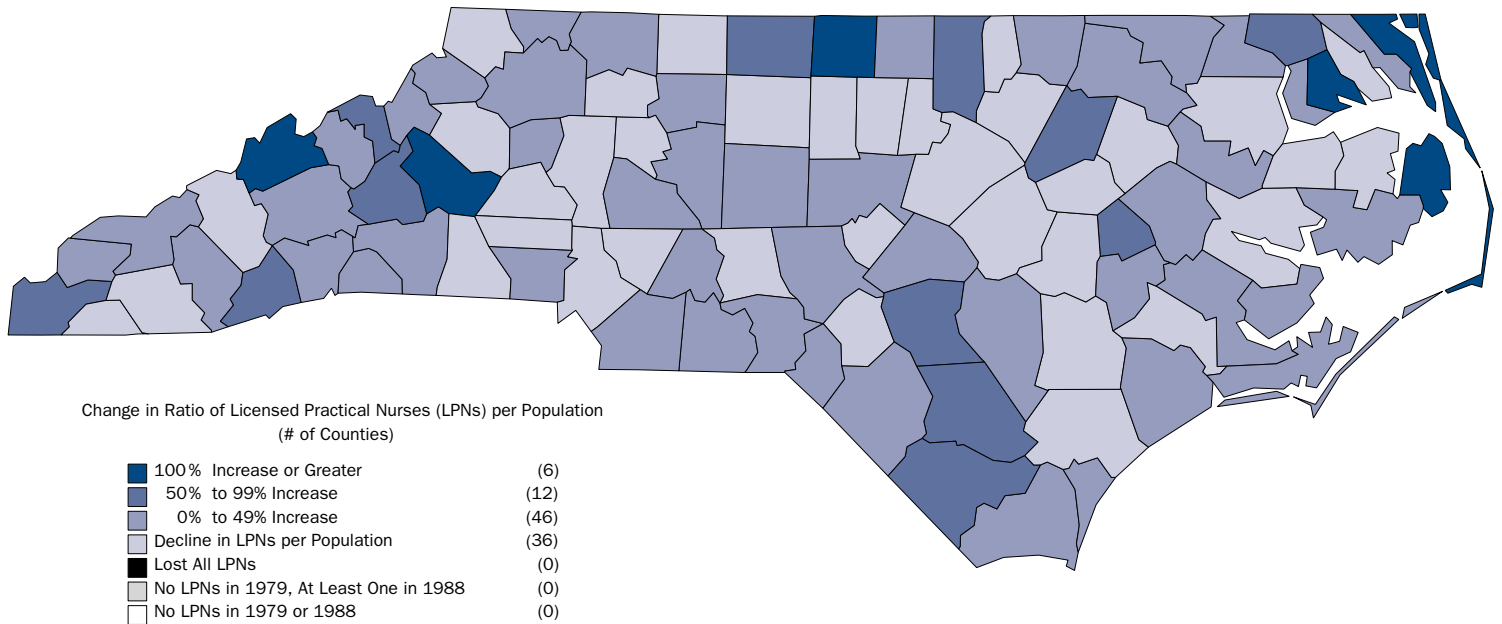
**Figure 58. Licensed Practical Nurses per 10,000 Population by Persistent Health Professional Shortage Area (PHPSA) Status, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state licensed practical nurses

Source for Health Professional Shortage Areas: Area Resource File, HRSA, Department of Health and Human Services, 1998  
 Persistent HPSAs are those designated as HPSAs by HRSA from 1993 through 1997, or in 6 of the last 7 releases of HPSA definitions

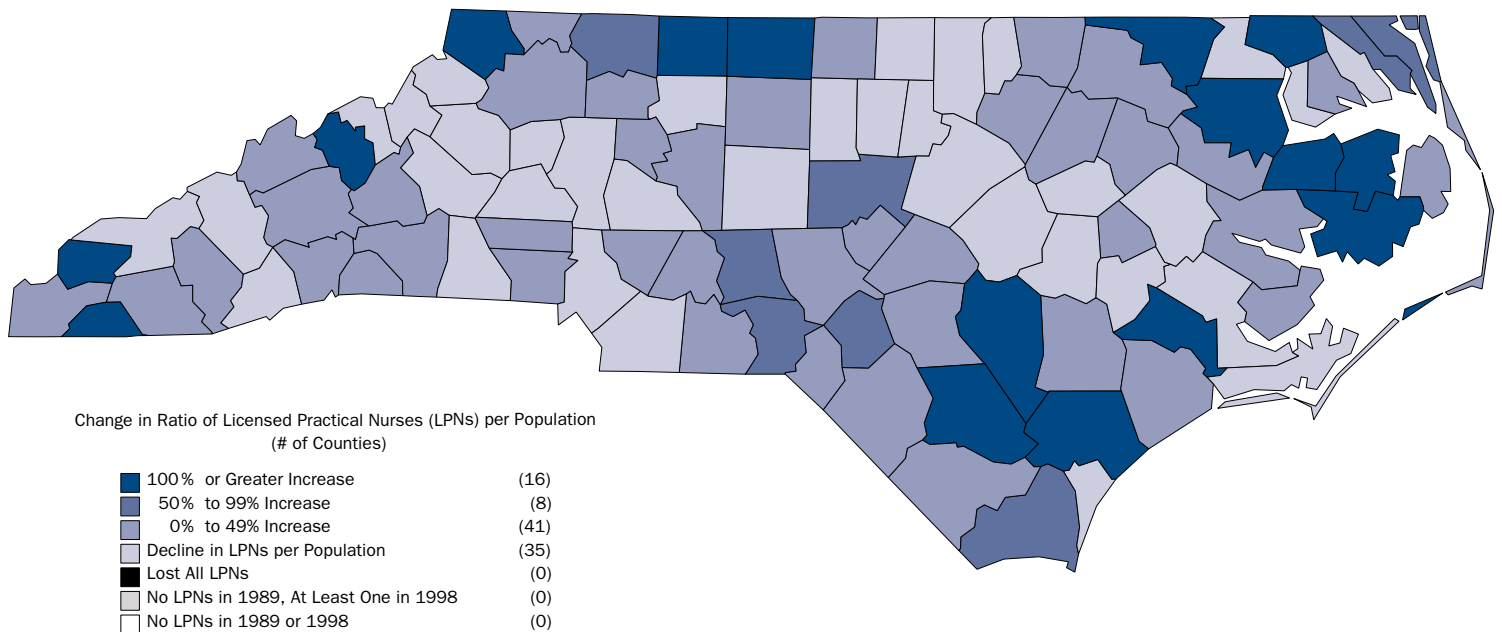
**Figure 59. Percent Change in Ratio of Active Licensed Practical Nurses per 10,000 Population from 1979 to 1988**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Figure 60. Percent Change in Ratio of Active Licensed Practical Nurses per 10,000 Population from 1989 to 1998**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Dentists** are concerned with the prevention, diagnosis and treatment of oral problems affecting the teeth, gums, tongue, lip and jaws. Dentists must have three to four years of education at an approved liberal arts college before being eligible for admission into a four-year dentistry program at an accredited university or college. Two to five additional years of training are required for specialty practice, such as orthodontics or oral surgery. The state has one school of dentistry located at the University of North Carolina at Chapel Hill.

North Carolina began to experience a decline in the number of dentists per person in 1988, while national figures did not begin to drop until 1992 (Figure 61). At the county level, the decline in providers has accelerated in the past 10 years. Between 1979-1988, 41 counties experienced a decline in the number of dentists per person (Figure 65); between 1989-1998, 64 counties saw a decline in the number of dentists per person (Figure 66). In 1998, Tyrell, Jones, Hyde and Camden counties had no active dentists (Figure 62).

Dentists are concentrated in metropolitan counties in the state (Figure 63), although in the most recent two years practitioner-to-population ratios in part county PHPSAs have exceeded that of non-PHPSAs. In contrast, whole county PHPSAs have consistently lagged behind both part and non-PHPSA counties with about half the number dentists per 10,000 people (Figure 64).

**Table 10: Summary Statistics for Dentists in North Carolina**

<b>Dentists per 10,000 Population</b>	<b>Total Active Dentists</b>
1979: 3.8	2,207
1989: 4.1	2,663
1998: 4.0	3,037

**Number of Dentists per 10,000 Population in 1998**

Metropolitan Areas: 4.52  
 Nonmetropolitan Areas: 3.00

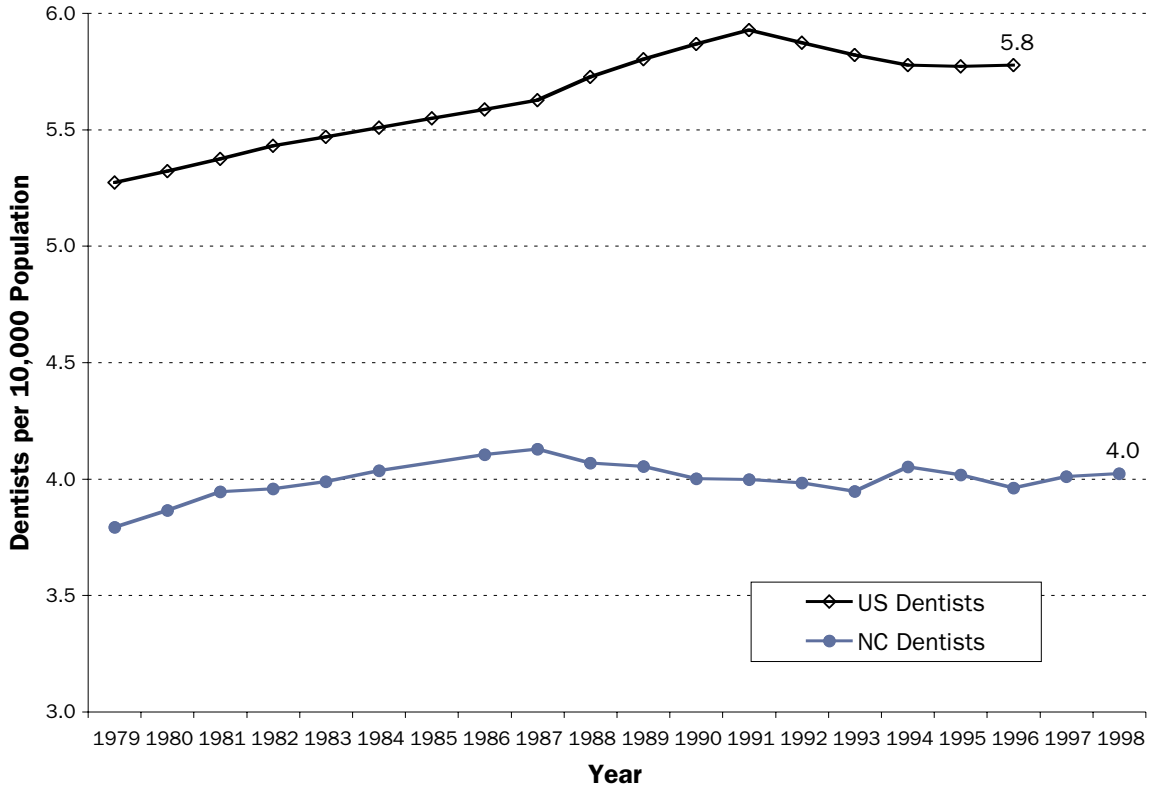
For the 21 counties designated as whole county PHPSAs\*: 2.26  
 For the 23 counties designated as part county PHPSAs\*: 4.35  
 For the 56 counties not designated as PHPSAs\*: 4.19

**County Level Data**

# of counties increasing dentist supply 1989-1998: 33  
 # of counties decreasing dentist supply 1989-1998: 64  
 # of counties with no dentists in 1998: 4

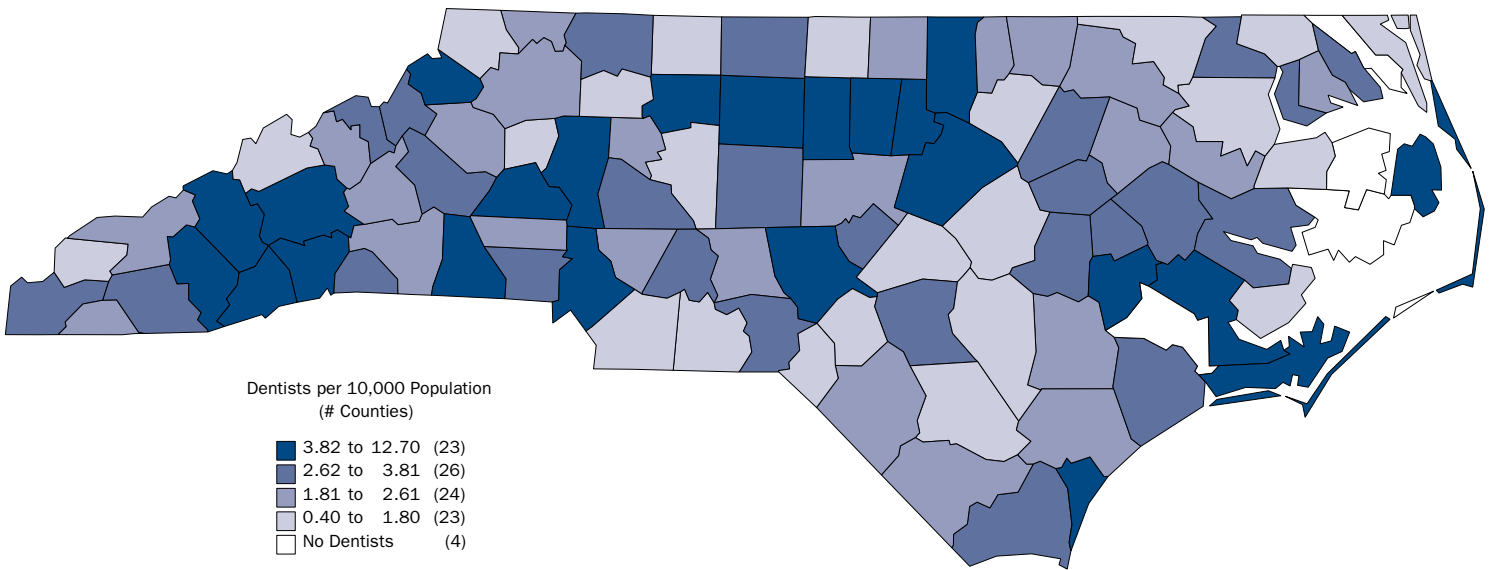
\*Persistent Health Professional Shortage Area

**Figure 61. Dentists per 10,000 Population, US and NC, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998;  
 HRSA, Bureau of Health Professions; US Bureau of the Census;  
 North Carolina Office of State Planning  
 Figures include all licensed active dentists

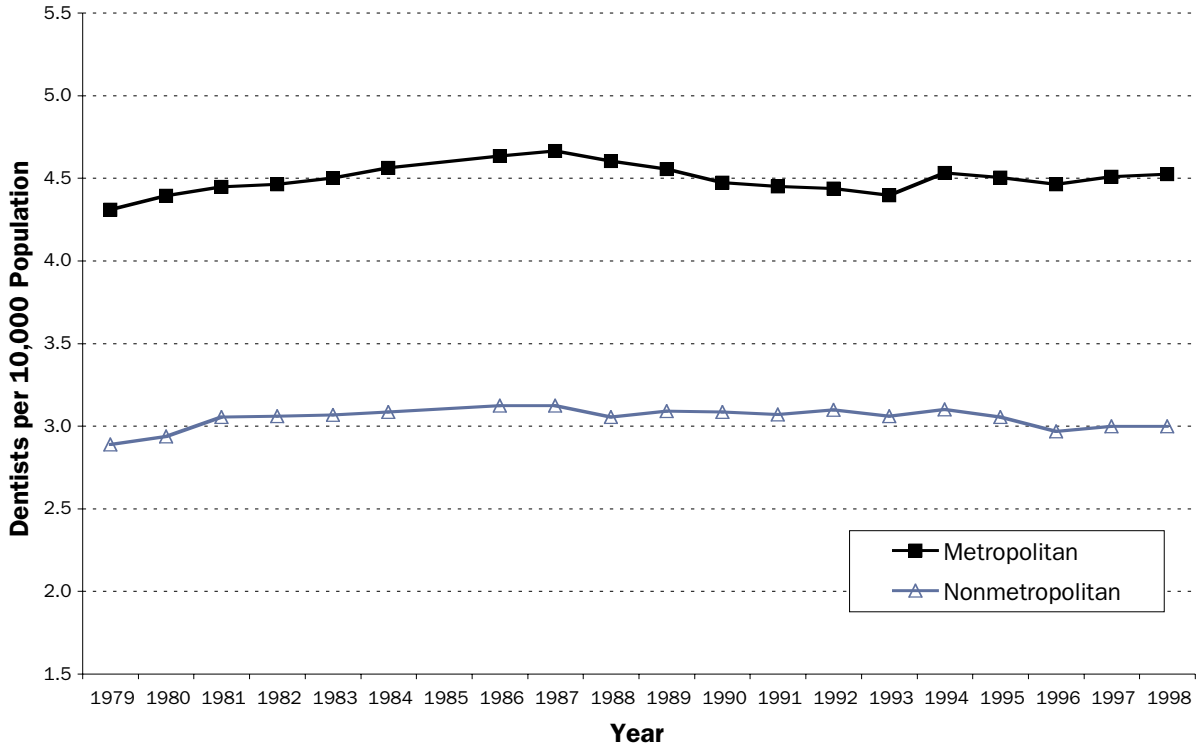
**Figure 62. Active Dentists per 10,000 Population, 1998**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
 Cecil G. Sheps Center for Health Services Research,  
 University of North Carolina at Chapel Hill.

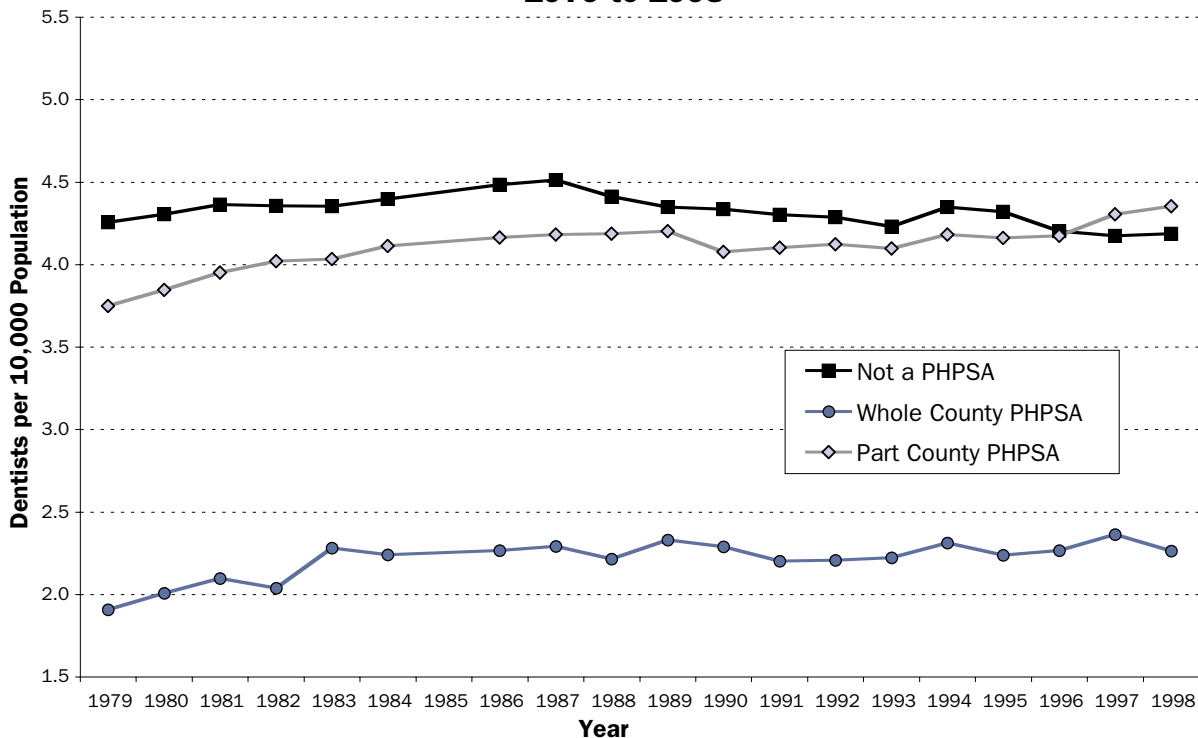
**Figure 63. Dentists per 10,000 Population by Metropolitan and Nonmetropolitan Counties, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state dentists

Source for Metropolitan-Nonmetropolitan definition: Office of Management and Budget, 1993.

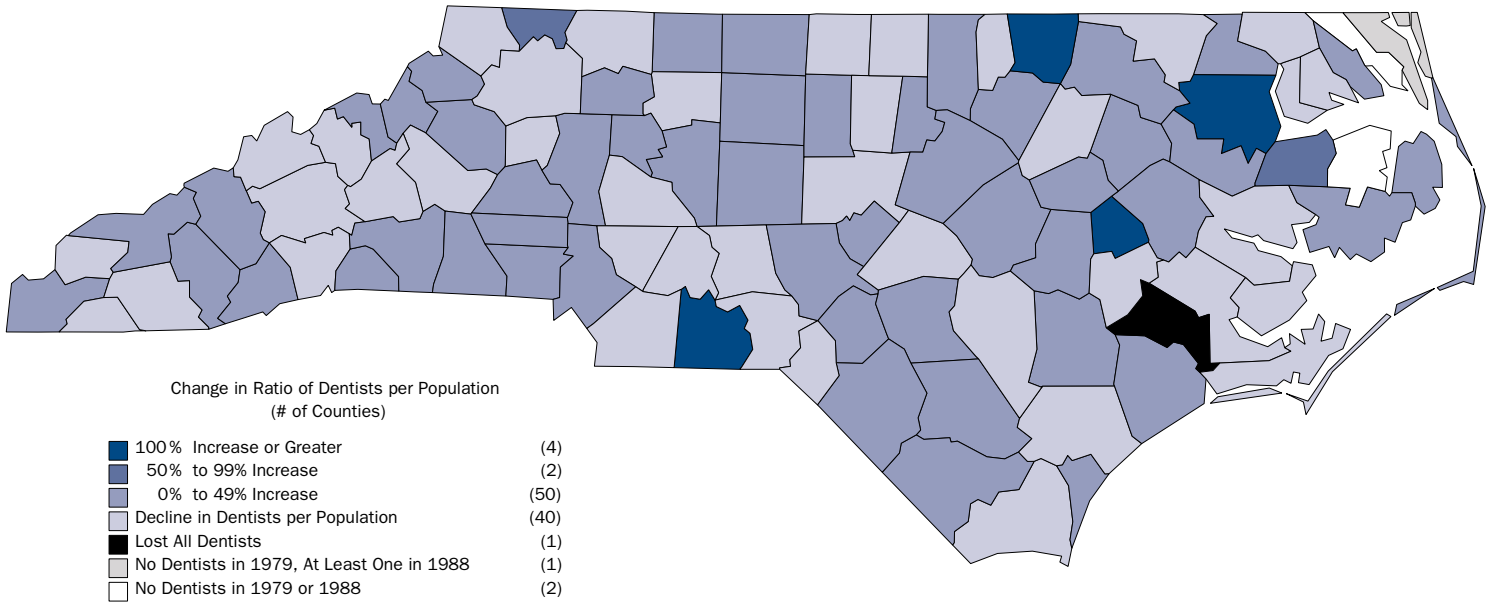
**Figure 64. Dentists per 10,000 Population by Persistent Health Professional Shortage Area (PHPSA) Status, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state dentists

Source for Health Professional Shortage Areas: Area Resource File, HRSA, Department of Health and Human Services, 1998  
 Persistent HPSAs are those designated as HPSAs by HRSA from 1993 through 1997, or in 6 of the last 7 releases of HPSA definitions

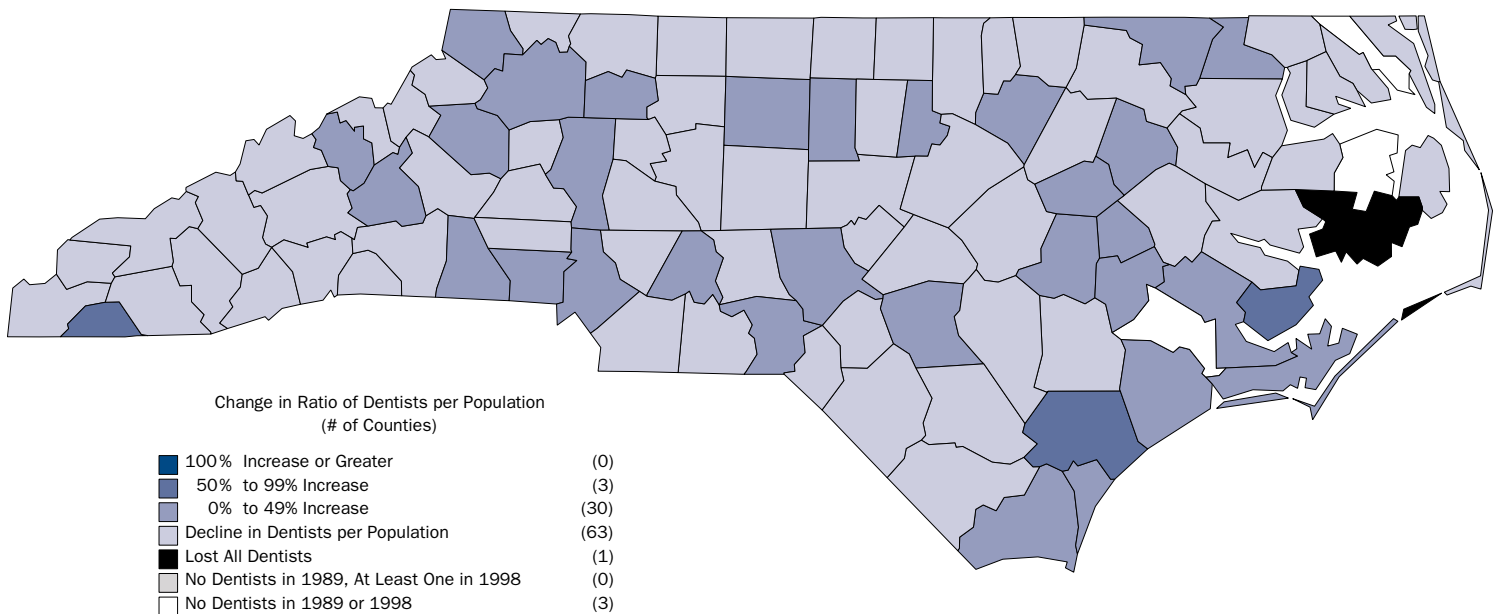
**Figure 65. Percent Change in Ratio of Active Dentists per 10,000 Population from 1979 to 1988**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Figure 66. Percent Change in Ratio of Active Dentists per 10,000 Population from 1989 to 1998**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Dental hygienists** work under the direct supervision of dentists. A licensed dentist must be physically present in the same locale as the hygienist and must order or approve all procedures performed. Dental hygienists collect information from patient histories, examine teeth and gums, perform dental cleaning, and apply medicines to aid in stopping dental decay. Dental hygienists are eligible for licensure after graduating from a community college (two-year program) or from a three- or four-year university program. There are currently eight associate degree programs, one certificate, one bachelors and one masters program in dental hygiene offered in North Carolina.

The number of dental hygienists per person has steadily increased in North Carolina and since the late-1980s, there have been more dental hygienists per person in NC than in the US (Figure 67). Due to the fact that dental hygienists must practice with a supervising dentist, their geographic distribution is linked to that of dentists. Dental hygienists tend to practice in metropolitan areas (Figure 69). Between 1989-1998, 15 counties witnessed a decline in their provider-to-population ratios while on the other end of the spectrum, nine counties more than doubled the number of practicing dental hygienists per person (Figure 72). In 1998, there were no dental hygienists practicing in Camden, Tyrrell, Hyde, Jones or Gates counties (Figure 68).

**Table 11: Summary Statistics for Dental Hygienists in North Carolina**

<b>Dental Hygienists per 10,000 Population</b>	<b>Total Active Dental Hygienists</b>
1979: 2.4	1,368
1989: 3.3	2,190
1998: 4.5	3,395

**Number of Dental Hygienists per 10,000 Population in 1998**

Metropolitan Areas: 5.03  
 Nonmetropolitan Areas: 3.39

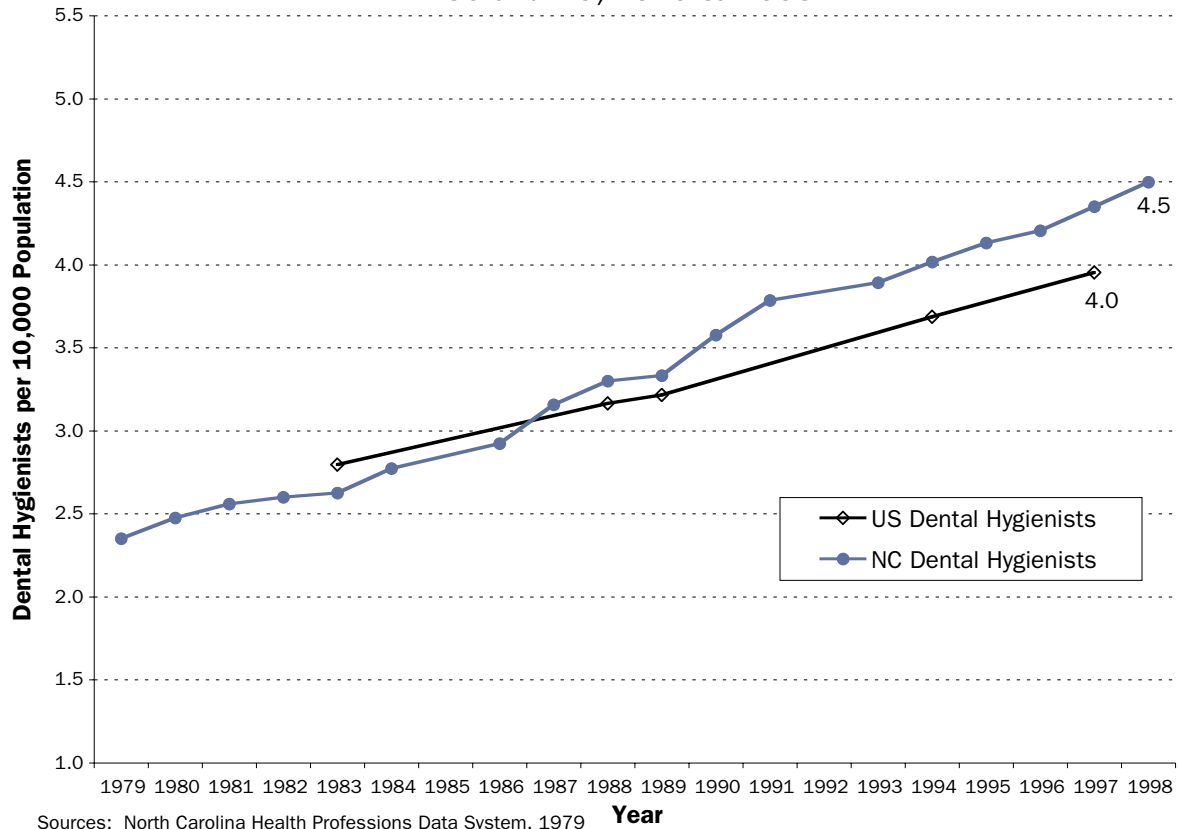
For the 21 counties designated as whole county PHSAs\*: 2.89  
 For the 23 counties designated as part county PHSAs\*: 4.94  
 For the 56 counties not designated as PHSAs\*: 4.56

**County Level Data**

# of counties increasing dental hygienist supply 1989-1998: 80  
 # of counties decreasing dental hygienist supply 1989-1998: 15  
 # of counties with no dental hygienists in 1998: 5

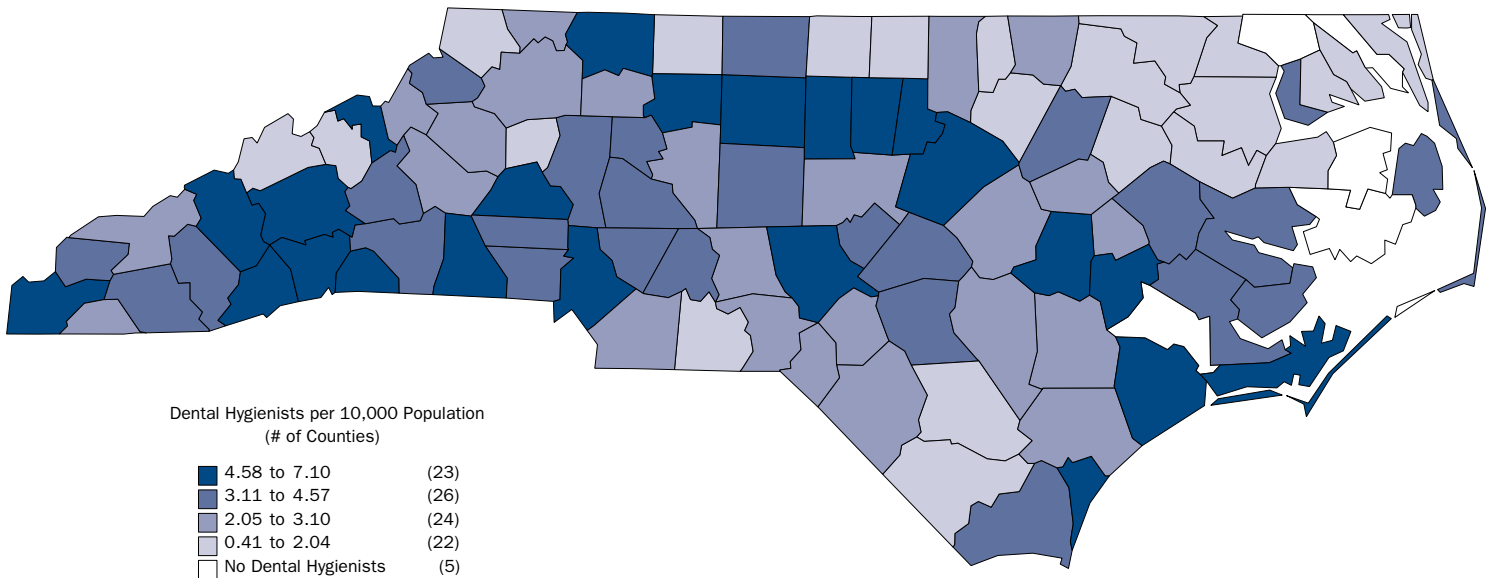
\*Persistent Health Professional Shortage Area

**Figure 67. Dental Hygienists per 10,000 Population, US and NC, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; HRSA, Bureau of Health Professions; US Bureau of the Census; North Carolina Office of State Planning  
 Figures include all licensed active dental hygienists

**Figure 68. Active Dental Hygienists per 10,000 Population, 1998**

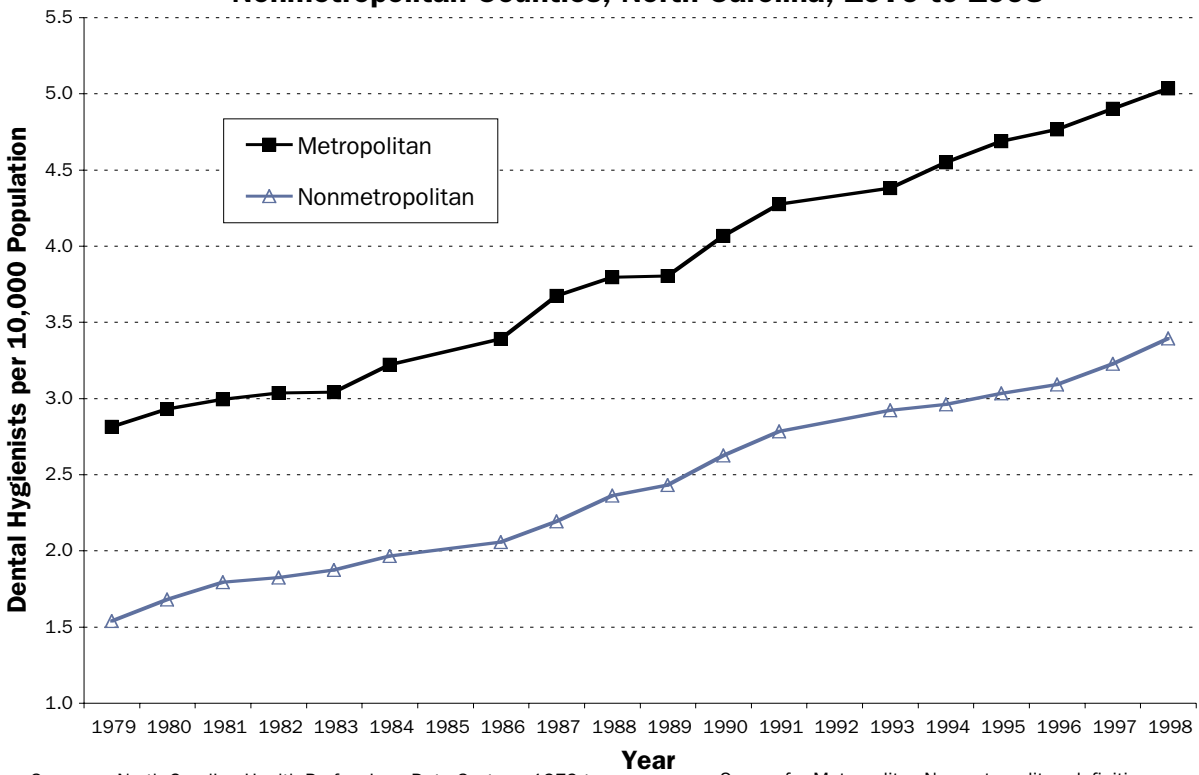


Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
 Cecil G. Sheps Center for Health Services Research,  
 University of North Carolina at Chapel Hill.



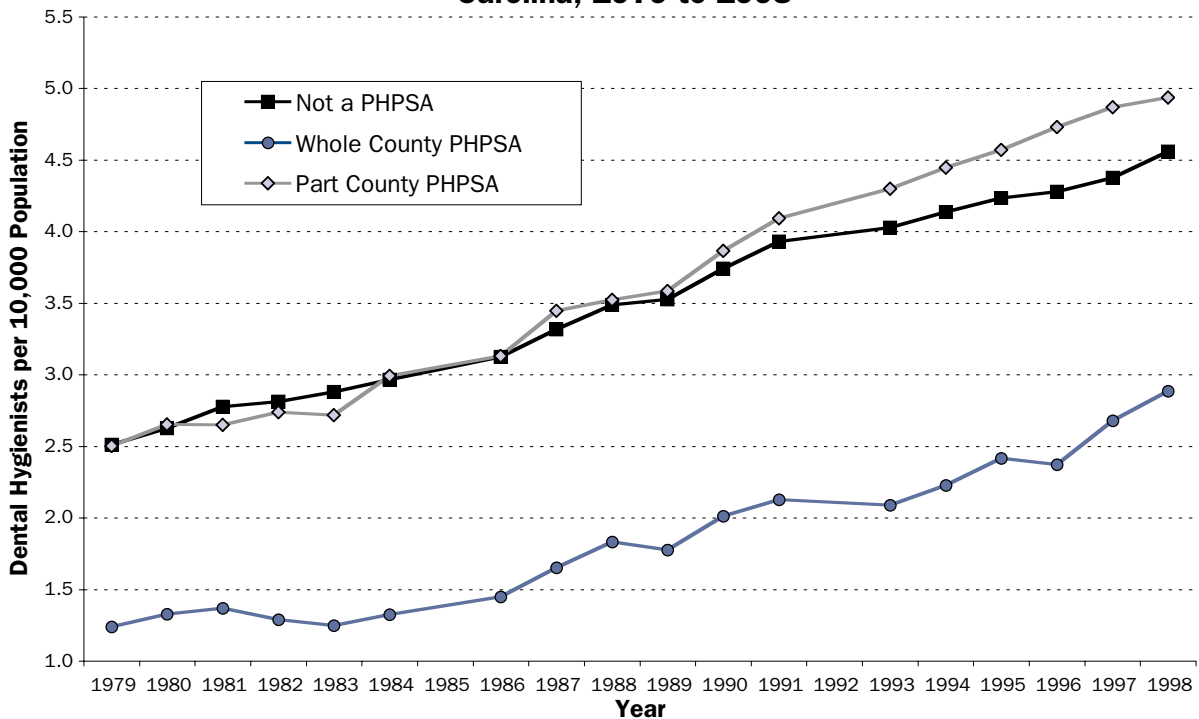
**Figure 69. Dental Hygienists per 10,000 Population by Metropolitan and Nonmetropolitan Counties, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state psychological associates

Source for Metropolitan-Nonmetropolitan definition: Office of Management and Budget, 1993.

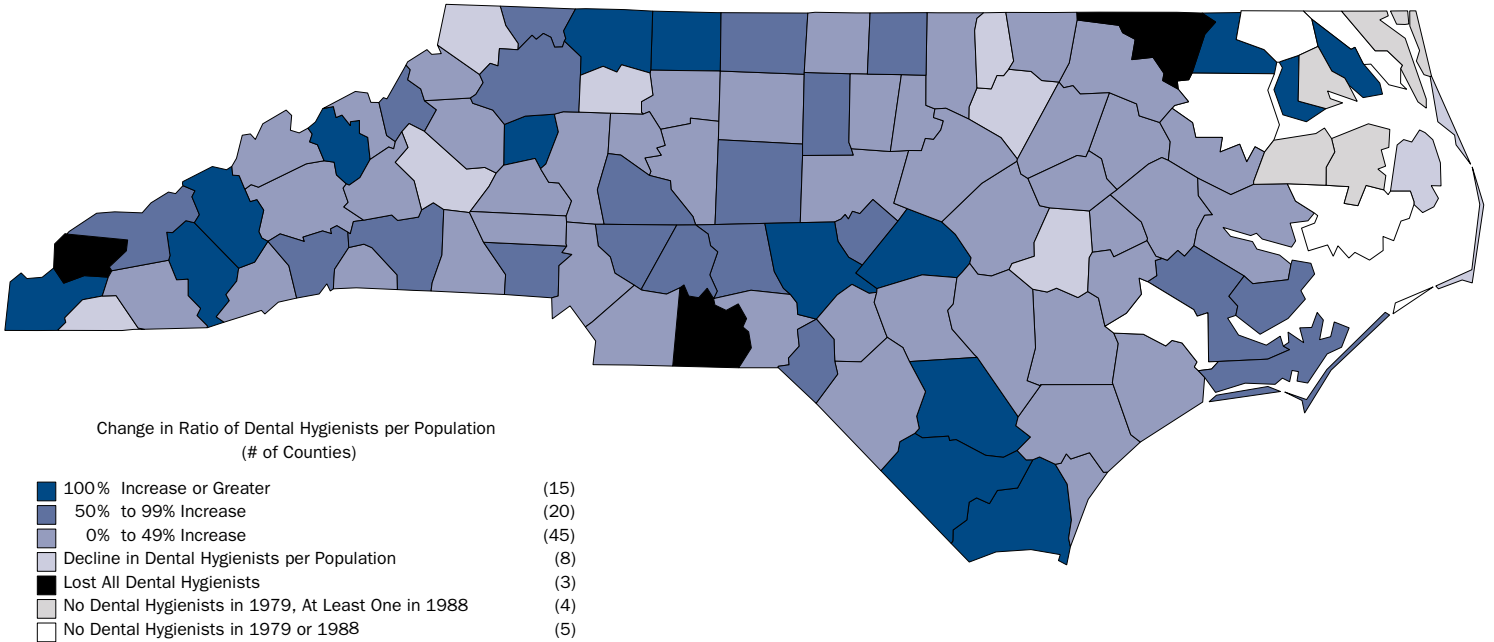
**Figure 70. Dental Hygienists per 10,000 Population by Persistent Health Professional Shortage Area (PHPSA) Status, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state dental hygienists

Source for Health Professional Shortage Areas: Area Resource File, HRSA, Department of Health and Human Services, 1998  
 Persistent HPSAs are those designated as HPSAs by HRSA from 1993 through 1997, or in 6 of the last 7 releases of HPSA definitions

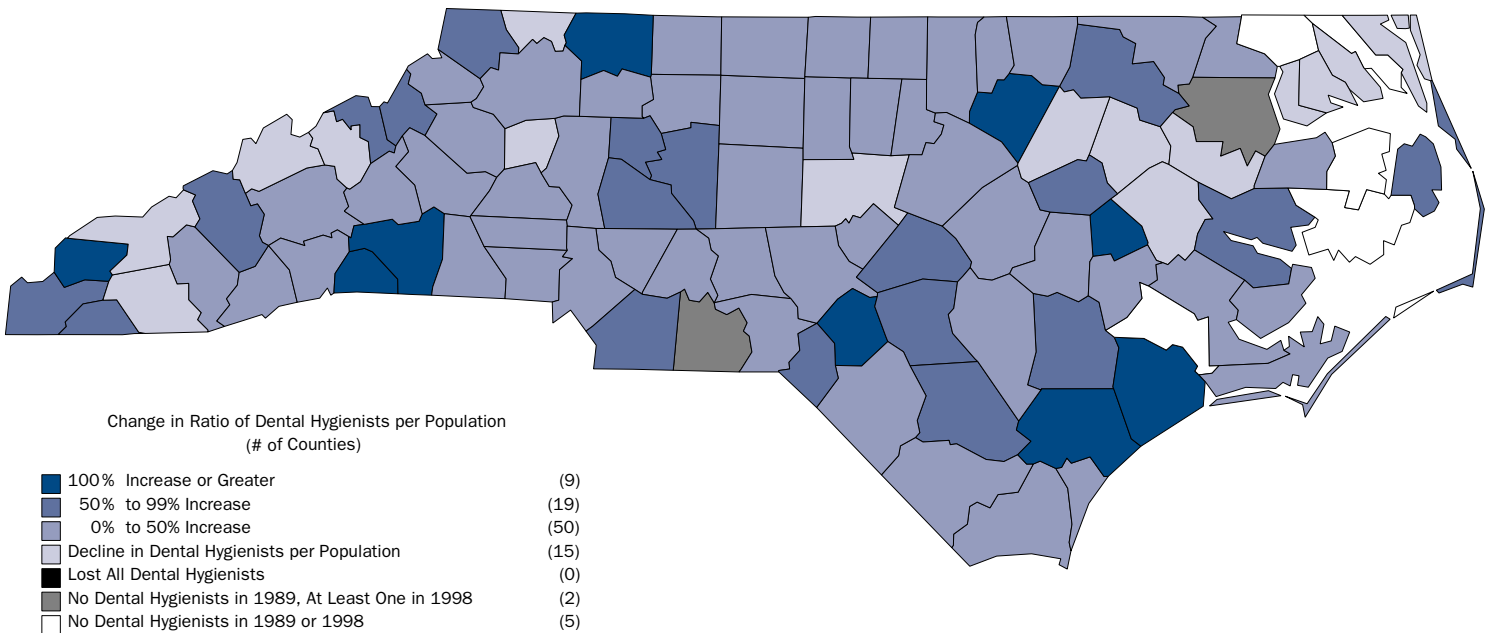
**Figure 71. Percent Change in Ratio of Active Dental Hygienists per 10,000 Population from 1979 to 1988**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Figure 72. Percent Change in Ratio of Active Dental Hygienists per 10,000 Population from 1989 to 1998**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Optometrists** (Doctors of Optometry) are primary health care providers who diagnose, manage and treat conditions and diseases of the human eye.

Optometrists may prescribe a wide range of treatments ranging from ophthalmic drugs, visual training, eyeglasses and contact lenses. Doctors of Optometry must complete a four-year accredited program at a college of optometry after graduating from an undergraduate program that included two years of pre-optometry study. There are no optometry schools in North Carolina.

The national supply of optometrists relative to the population has exceeded that of North Carolina over the 20-year period from 1979-1998. However, the supply of optometrists in the state grew much faster than the national supply from 1979 to 1989 (Figure 73). Since 1990, the supply of optometrists in North Carolina has been increasing at a slower rate. Unlike many other health professions, optometrists show a relatively even distribution between metropolitan and nonmetropolitan counties (Figure 75). The supply of optometrists in whole county PHPSAs lags behind that of counties designated as part or non-county PHPSAs and this gap has been widening since 1989 (Figure 76).

There were no optometrists in 12 counties in the state in 1998; most of the counties with no providers are clustered in the eastern and northeastern parts of the state (Figure 74). More counties saw a decline in their provider-to-population ratios between 1989-1998 (45 counties) compared to the previous decade (25 counties) (Figures 77 and 78).

**Table 12: Summary Statistics for Optometrists in North Carolina**

**Optometrists per 10,000 Population                      Total Active Optometrists**

1979:	0.70	410
1989:	0.97	640
1998:	1.05	794

**Number of Optometrists per 10,000 Population in 1998**

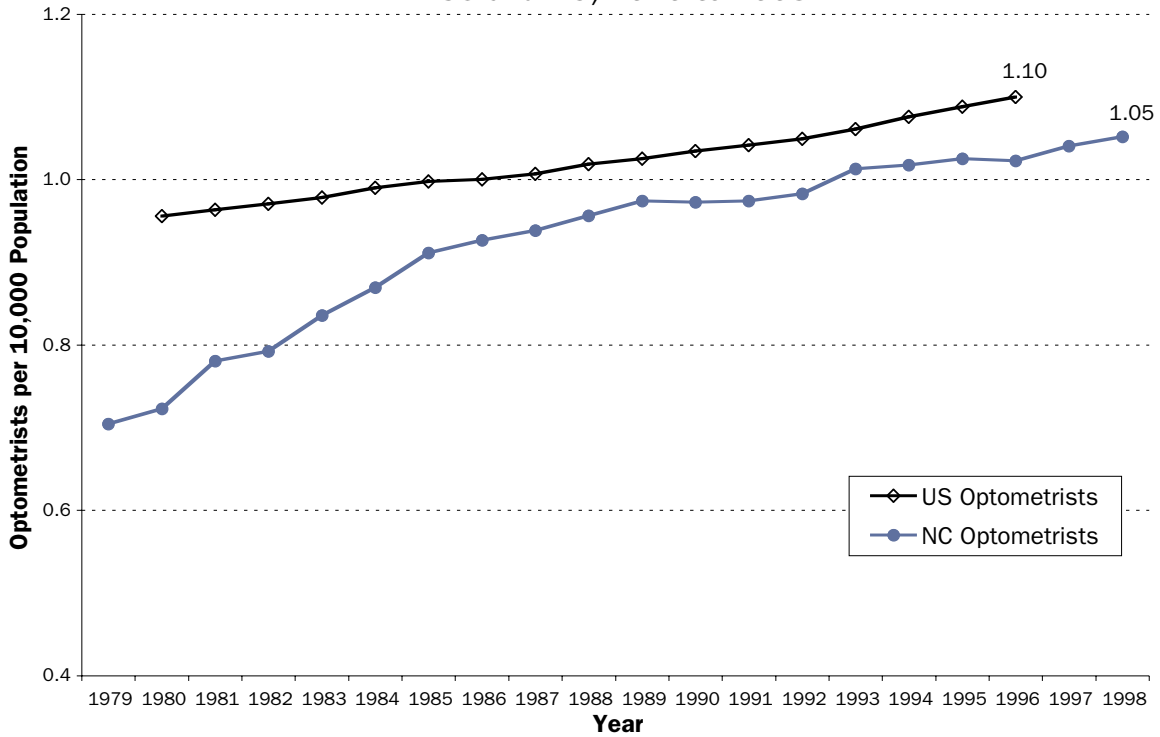
Metropolitan Areas:	1.07
Nonmetropolitan Areas:	1.02
For the 21 counties designated as whole county PHPSAs*:	.68
For the 23 counties designated as part county PHPSAs*:	1.08
For the 56 counties not designated as PHPSAs*:	1.11

**County Level Data**

- # of counties increasing optometrist supply 1989-1998: 43
- # of counties decreasing optometrist supply 1989-1998: 45
- # of counties with no optometrists in 1998: 12

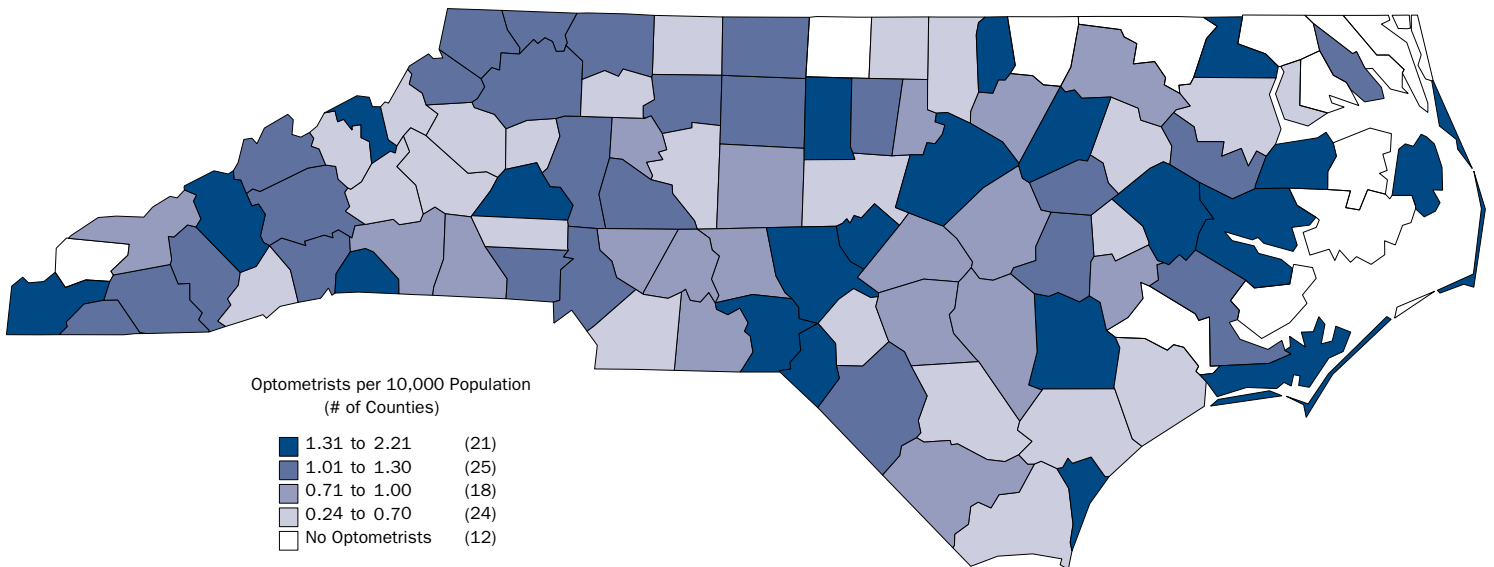
\*Persistent Health Professional Shortage Area

**Figure 73. Optometrists per 10,000 Population, US and NC, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; HRSA, Bureau of Health Professions; US Bureau of the Census  
 North Carolina Office of State Planning  
 Figures include all licensed active optometrists

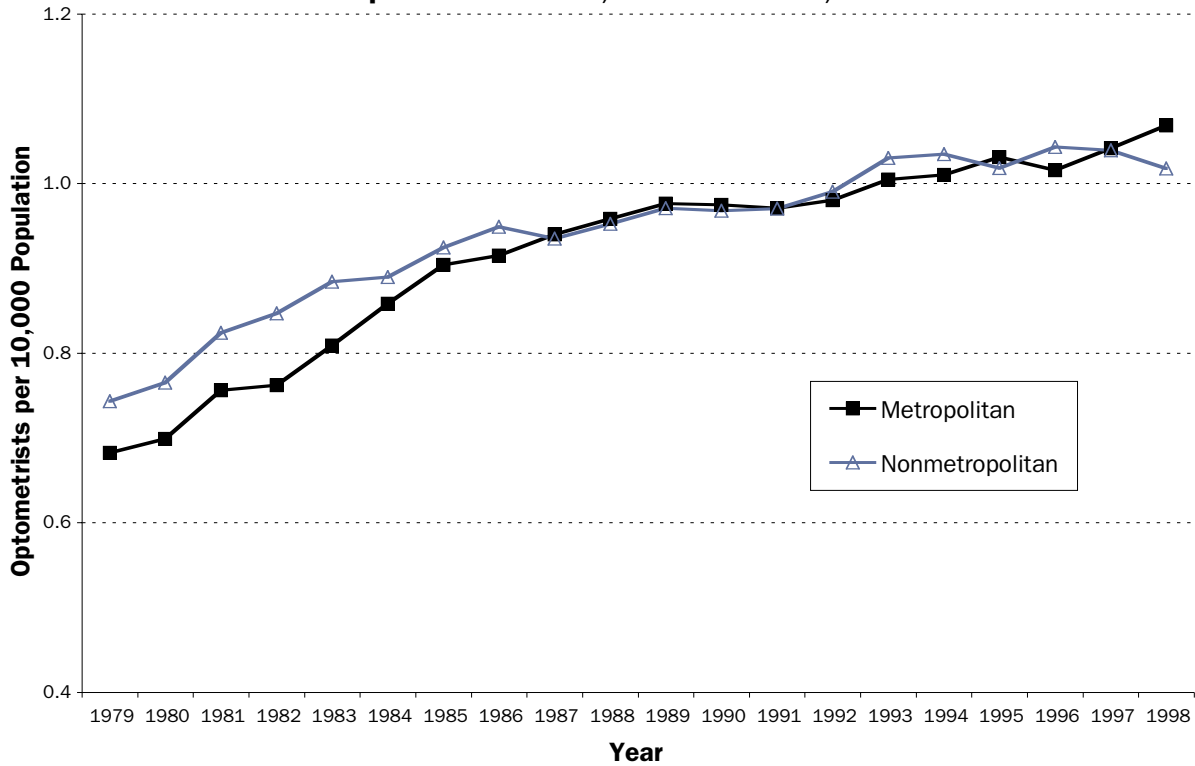
**Figure 74. Active Optometrists per 10,000 Population, 1998**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
 Cecil G. Sheps Center for Health Services Research,  
 University of North Carolina at Chapel Hill.

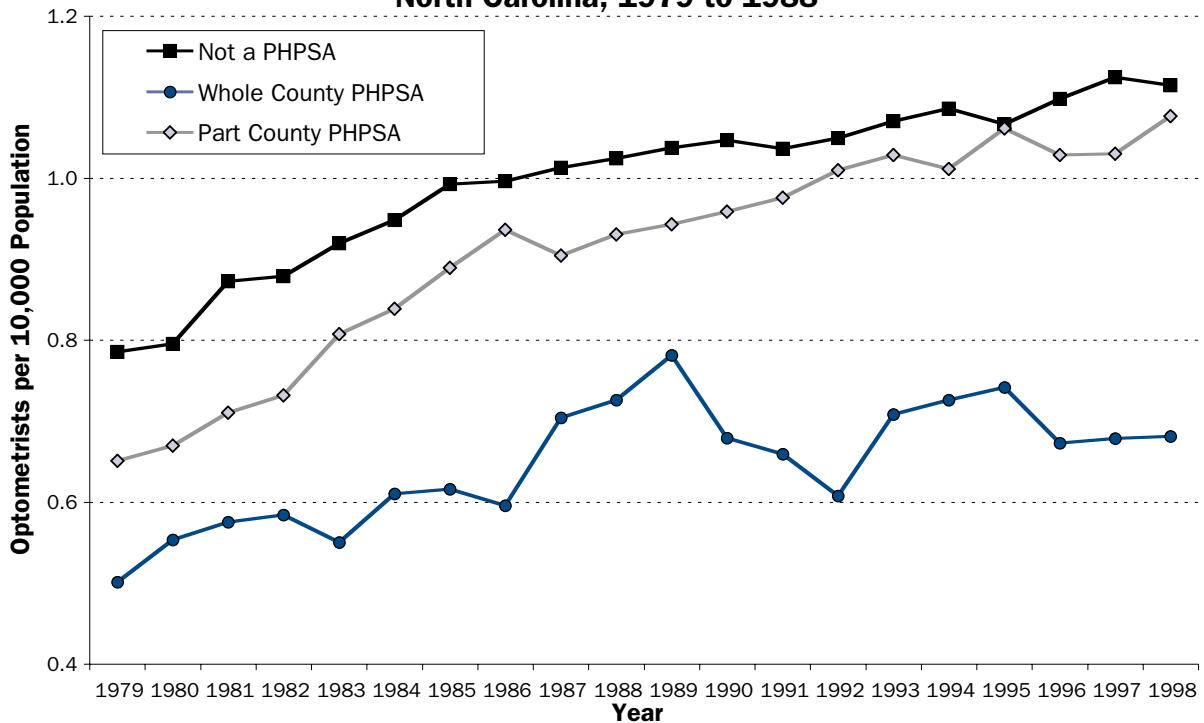
**Figure 75. Optometrists per 10,000 Population by Metropolitan and Nonmetropolitan Counties, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state optometrists

Source for Metropolitan-Nonmetropolitan definition: Office of Management and Budget, 1993.

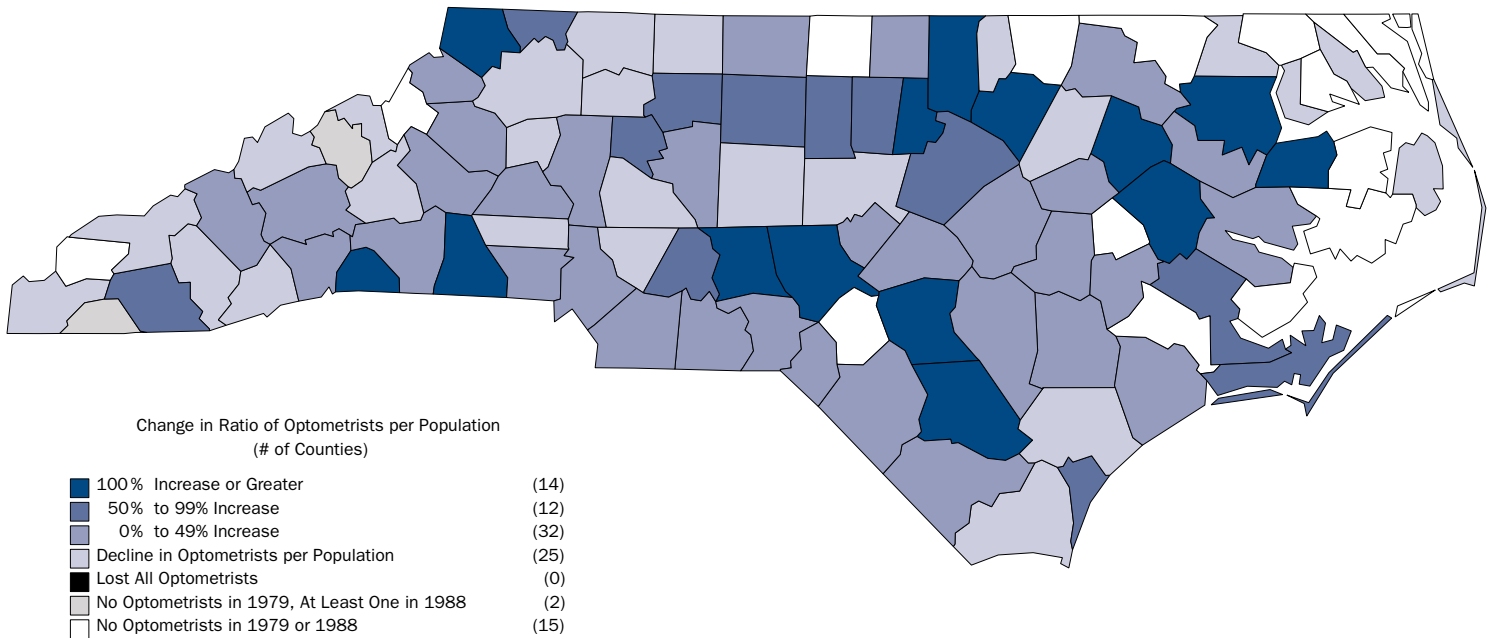
**Figure 76. Optometrists per 10,000 Population by Persistent Health Professional Shortage Area (PHPSA) Status, North Carolina, 1979 to 1988**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state optometrists

Source for Health Professional Shortage Areas: Area Resource File, HRSA, Department of Health and Human Services, 1998  
 Persistent HPSAs are those designated as HPSAs by HRSA from 1993 through 1997, or in 6 of the last 7 releases of HPSA definitions

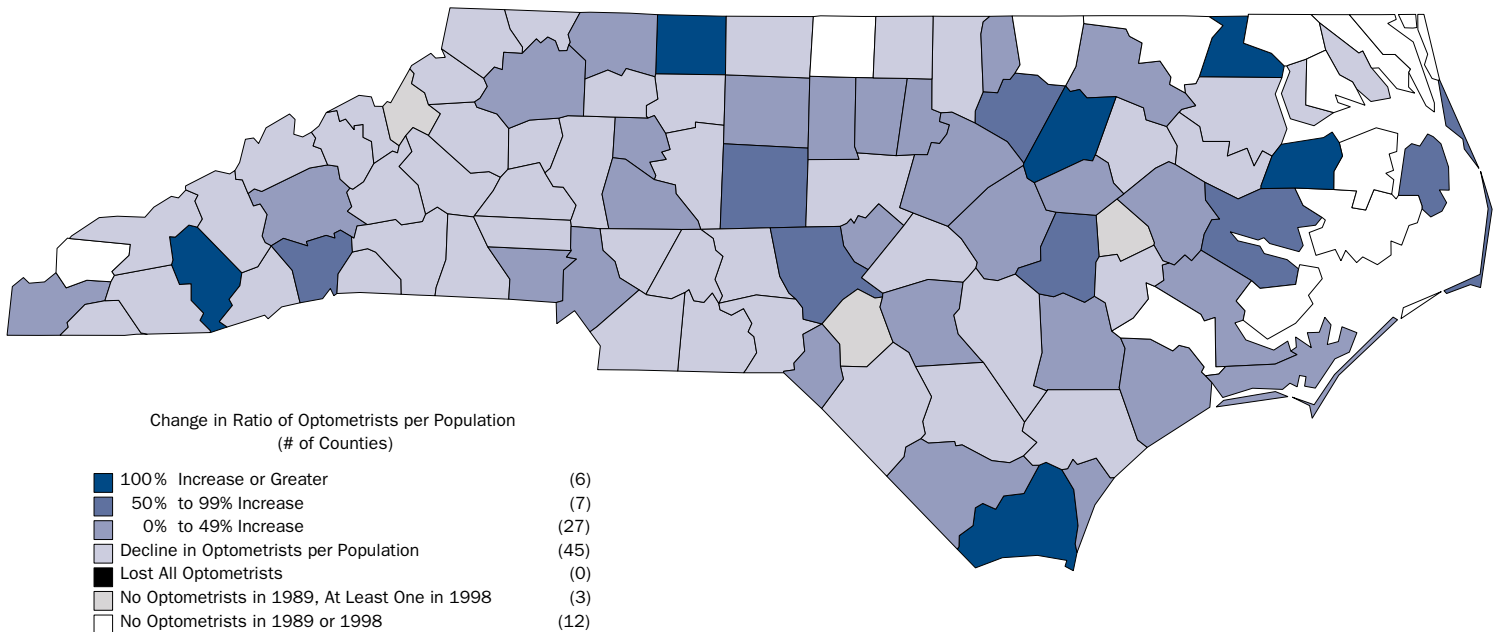
**Figure 77. Percent Change in Ratio of Active Optometrists per 10,000 Population from 1979 to 1988**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Figure 78. Percent Change in Ratio of Active Optometrists per 10,000 Population from 1989 to 1998**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Pharmacists** are experts in the medicines used to treat or prevent diseases or symptoms. They work with physicians, dentists and other health professionals who are authorized to write prescriptions. Pharmacists interpret and evaluate medication orders; compound, dispense and administer drugs; and advise health professionals and patients regarding the best use of medications for specific problems. Pharmacists also educate patients about medicines and help them make informed choices. To become licensed to practice pharmacy, an individual must graduate from a school or college of pharmacy that is accredited by the American Council on Pharmaceutical Education, complete an internship and pass an examination given by the State Board of Pharmacy. North Carolina has two Pharm.D. programs, one at the University of North Carolina at Chapel Hill and the other at Campbell University.

From 1983-1990 the state experienced a sharp increase in the number of pharmacists and by 1987, the supply of pharmacists relative to the population in North Carolina overtook the national rate. In recent years, the rate of growth in the supply of pharmacists in North Carolina has mirrored national trends (Figure 79). Pharmacists tend more often to practice in metropolitan areas and the supply of pharmacists has grown at a faster rate in the more urban counties than in nonmetropolitan ones (Figure 81). The supply of pharmacists in non-PHPsAs and part county PHPsAs has grown steadily over the 20-year period, while supply in whole county PHPsAs has been relatively flat (Figure 82).

In 1998, Camden was the only county in North Carolina without a pharmacist (Figure 80). Fifteen counties experienced a decline in the number of pharmacists relative to the population between 1979-1988 (Figure 83); between 1989-1998 the number of counties experiencing a decline in their supply increased to 40 (Figure 84).

**Table 13: Summary Statistics for Pharmacists in North Carolina**

**Pharmacists per 10,000 Population                      Total Active Pharmacists**

1979: 5.2	3,003
1989: 7.3	4,809
1998: 8.6	6,497

**Number of Pharmacists per 10,000 Population in 1998**

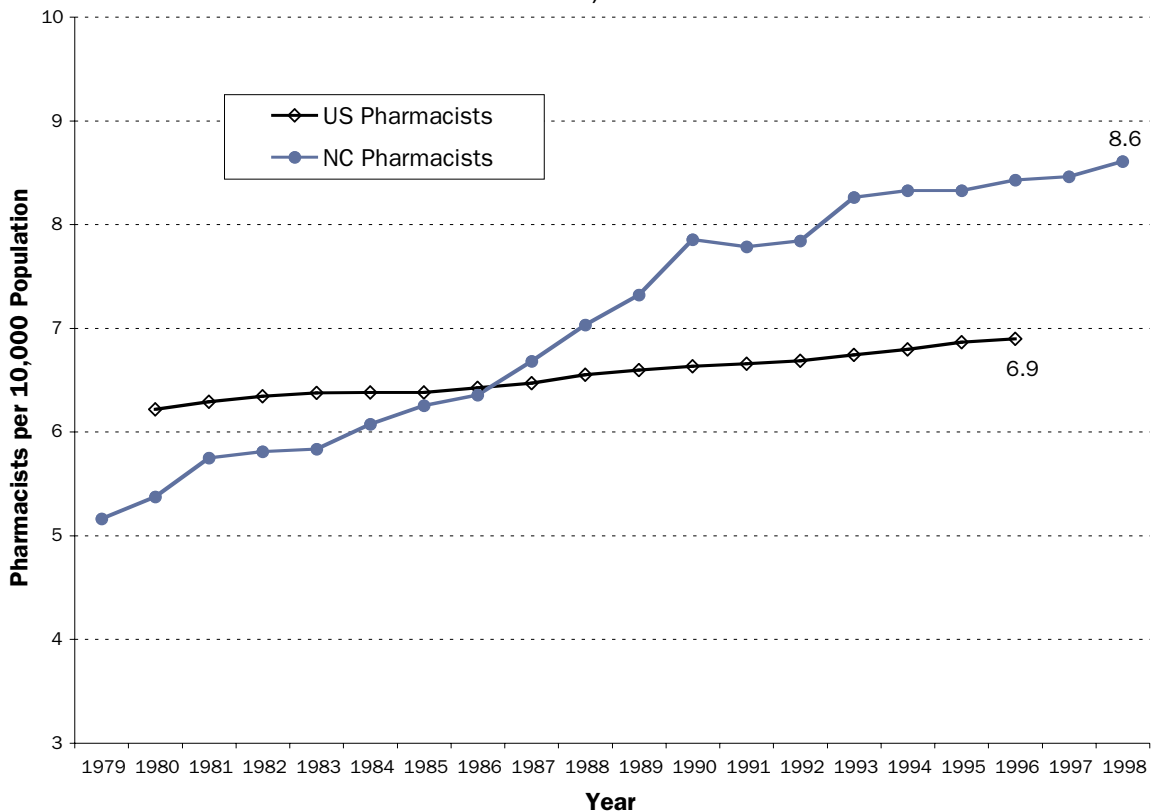
Metropolitan Areas:	9.59
Nonmetropolitan Areas:	6.60
For the 21 counties designated as whole county PHPsAs*:	4.61
For the 23 counties designated as part county PHPsAs*:	8.34
For the 56 counties not designated as PHPsAs*:	9.63

**County Level Data**

- # of counties increasing pharmacist supply 1989-1998: 60
- # of counties decreasing pharmacist supply 1989-1998: 40
- # of counties with no pharmacists in 1998: 1

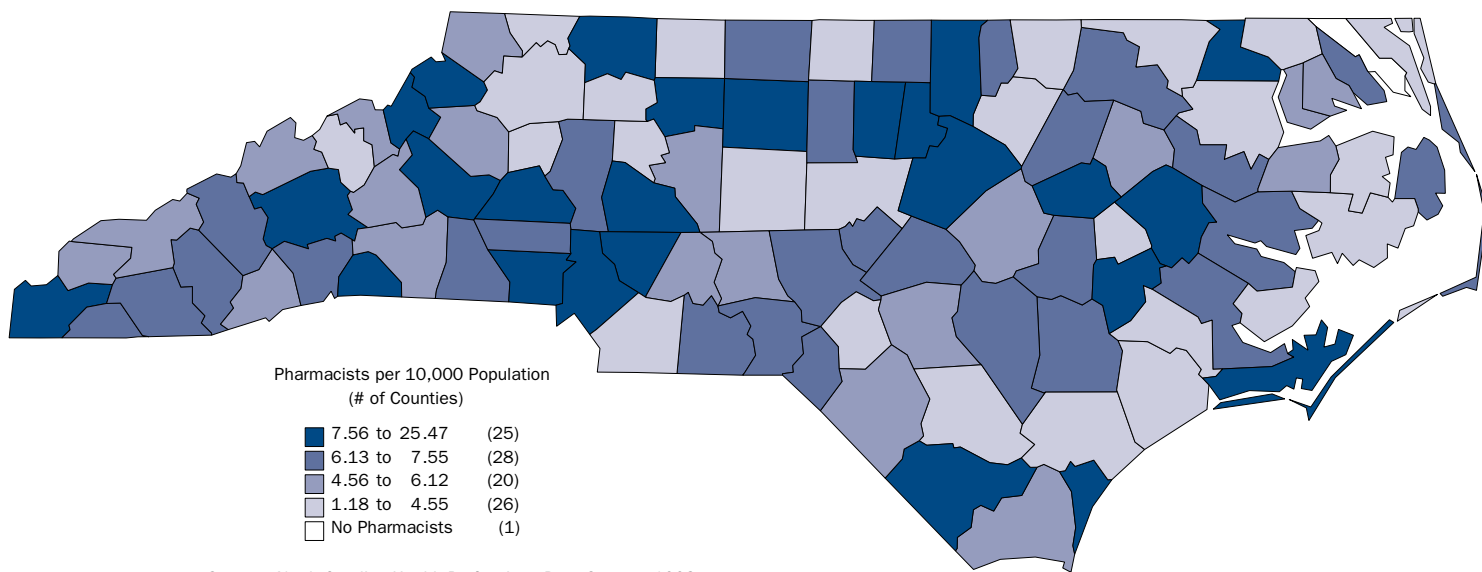
\*Persistent Health Professional Shortage Area

**Figure 79. Pharmacists per 10,000 Population, US and NC, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; HRSA, Bureau of Health Professions; US Bureau of the Census; North Carolina Office of State Planning  
 Figures include all licensed active pharmacists

**Figure 80. Active Pharmacists per 10,000 Population, 1998**

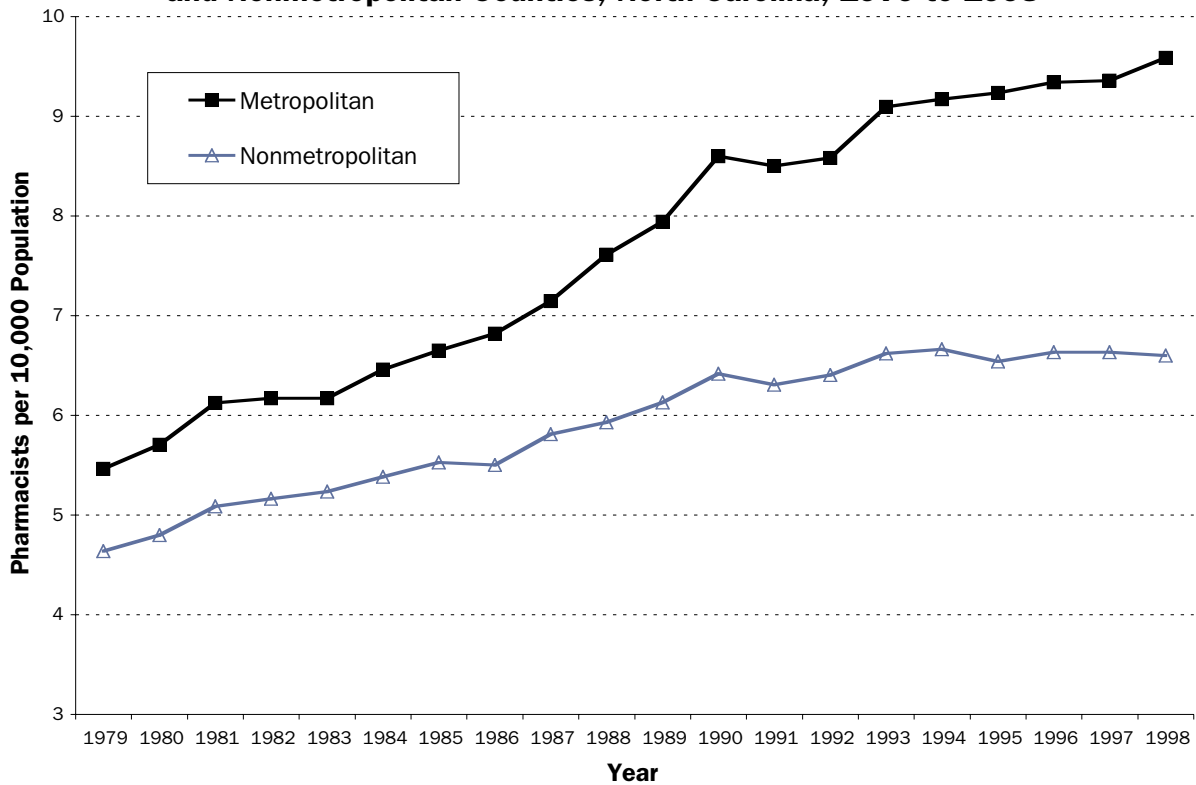


Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
 Cecil G. Sheps Center for Health Services Research,  
 University of North Carolina at Chapel Hill.



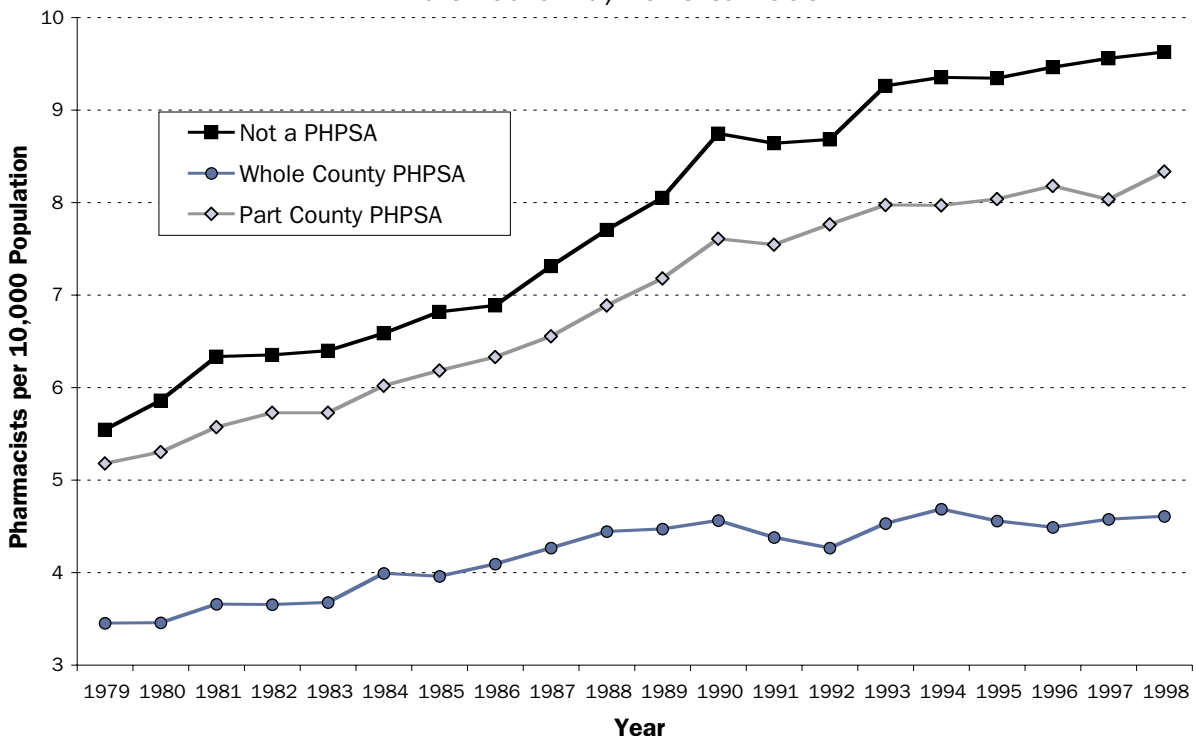
**Figure 81. Pharmacists per 10,000 Population by Metropolitan and Nonmetropolitan Counties, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state pharmacists

Source for Metropolitan-Nonmetropolitan definition: Office of Management and Budget, 1993.

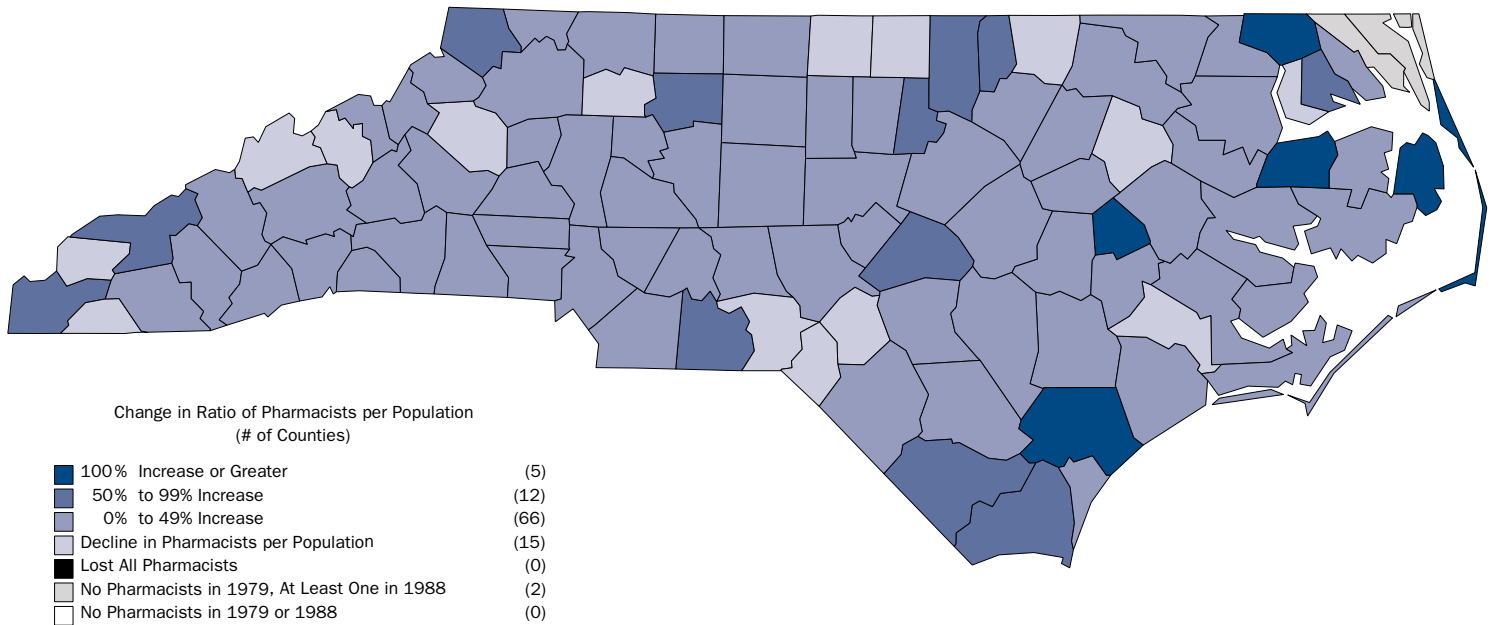
**Figure 82. Pharmacists per 10,000 Population Grouped by Persistent Health Professional Shortage Area (PHPSA) Status, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state pharmacists

Source for Health Professional Shortage Areas: Area Resource File, HRSA, Department of Health and Human Services, 1998  
 Persistent HPSAs are those designated as HPSAs by HRSA from 1993 through 1997, or in 6 of the last 7 releases of HPSA definitions

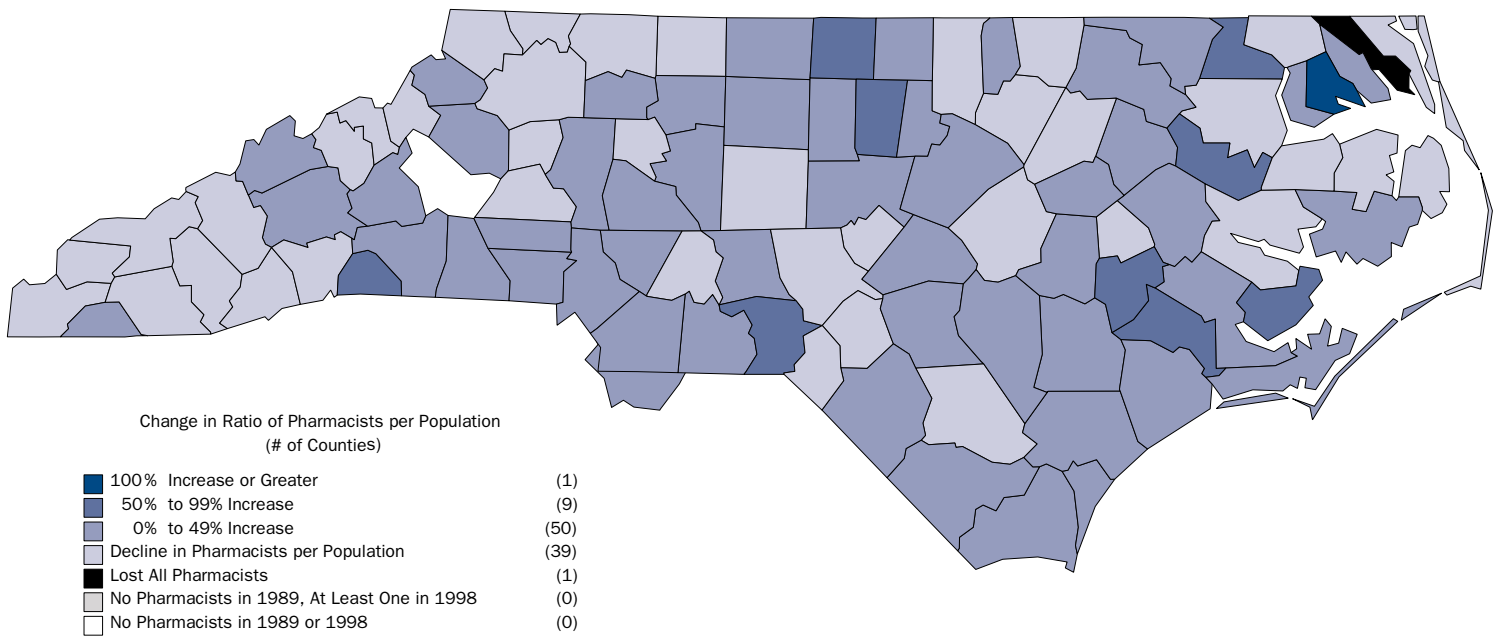
**Figure 83. Percent Change in Ratio of Active Pharmacists per 10,000 Population from 1979 to 1988**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Figure 84. Percent Change in Ratio of Active Pharmacists per 10,000 Population from 1989 to 1998**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Physical therapists (PTs)** help patients who are disabled by illness or an accident or who were born with a development disability. Physical therapists plan and carry out programs to help these individuals gain strength, flexibility, endurance, coordination and overall physical functioning. They also provide programs to lessen pain and to prevent injury. Currently licensed physical therapists can have a clinical entry-level degree at the bachelor's, master's or doctoral level. There are seven physical therapy educational programs in the state.

The national data illustrate a fluctuation in the supply of physical therapists in recent years and a downward trend since 1996. In contrast, North Carolina shows a steady increase in the number of PTs per 10,000 population (Figure 85). Physical therapists tend to practice in metropolitan areas of the state (Figure 87). Despite recent gains in the supply of PTs in whole county PHPSAs, part county and non-PHPSA counties have had, on average over the 20-year period, three to four times the numbers of physical therapists per 10,000 people than whole county PHPSAs (Figure 88).

Forty-three counties more than doubled their supply of physical therapists relative to their population from 1989 to 1998 and 13 counties without any PTs in 1989 had gained at least one provider by 1998 (Figure 90). Four counties in the state—Northampton, Gates, Camden, and Tyrell—had no PTs in 1998 (Figure 86).

**Table 14: Summary Statistics for Physical Therapists  
in North Carolina**

<b>Physical Therapists per 10,000 Population</b>	<b>Total Active Physical Therapists</b>
--	---

1979: 1.2	677
1989: 2.0	1,335
1998: 3.7	2,815

**Number of Physical Therapists per 10,000 Population in 1998**

Metropolitan Areas:	4.37
Nonmetropolitan Areas:	2.42

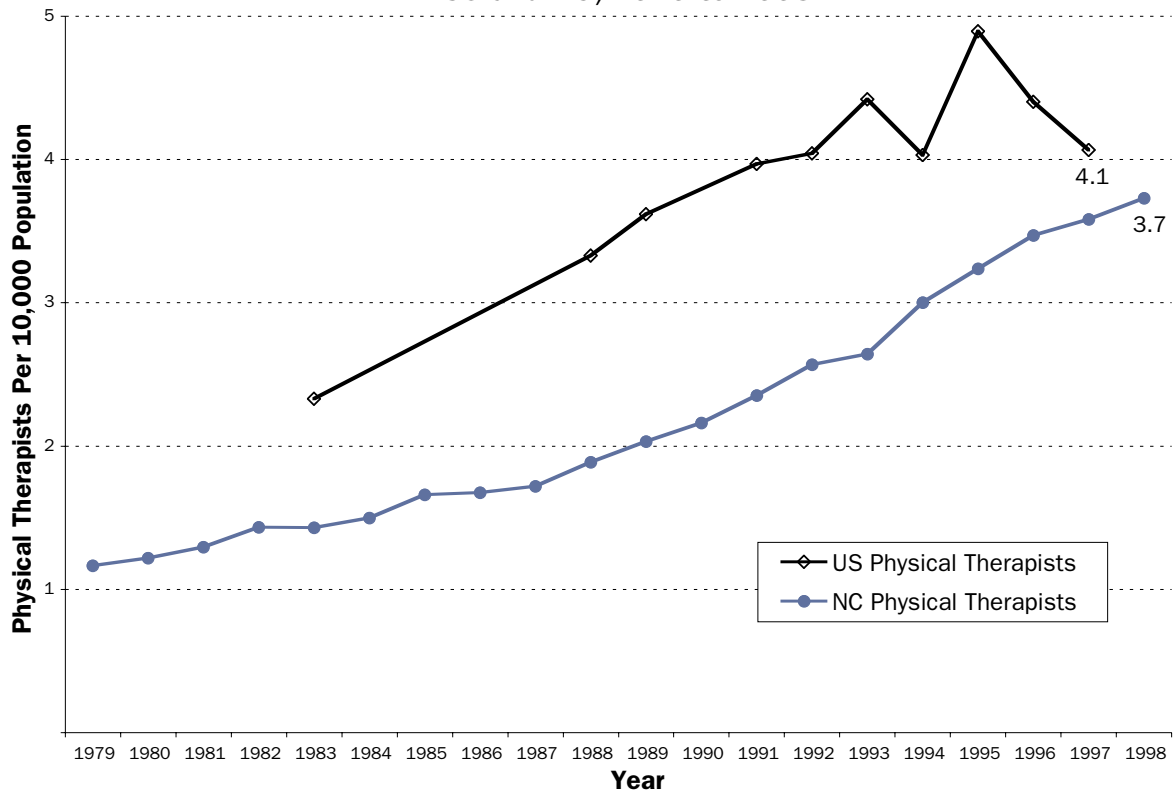
For the 21 counties designated as whole county PHPSAs\*: 1.28  
 For the 23 counties designated as part county PHPSAs\*: 3.85  
 For the 56 counties not designated as PHPSAs\*: 4.17

**County Level Data**

- # of counties increasing physical therapist supply 1989-1998: 90
- # of counties decreasing physical therapist supply 1989-1998: 6
- # of counties with no physical therapists in 1998: 4

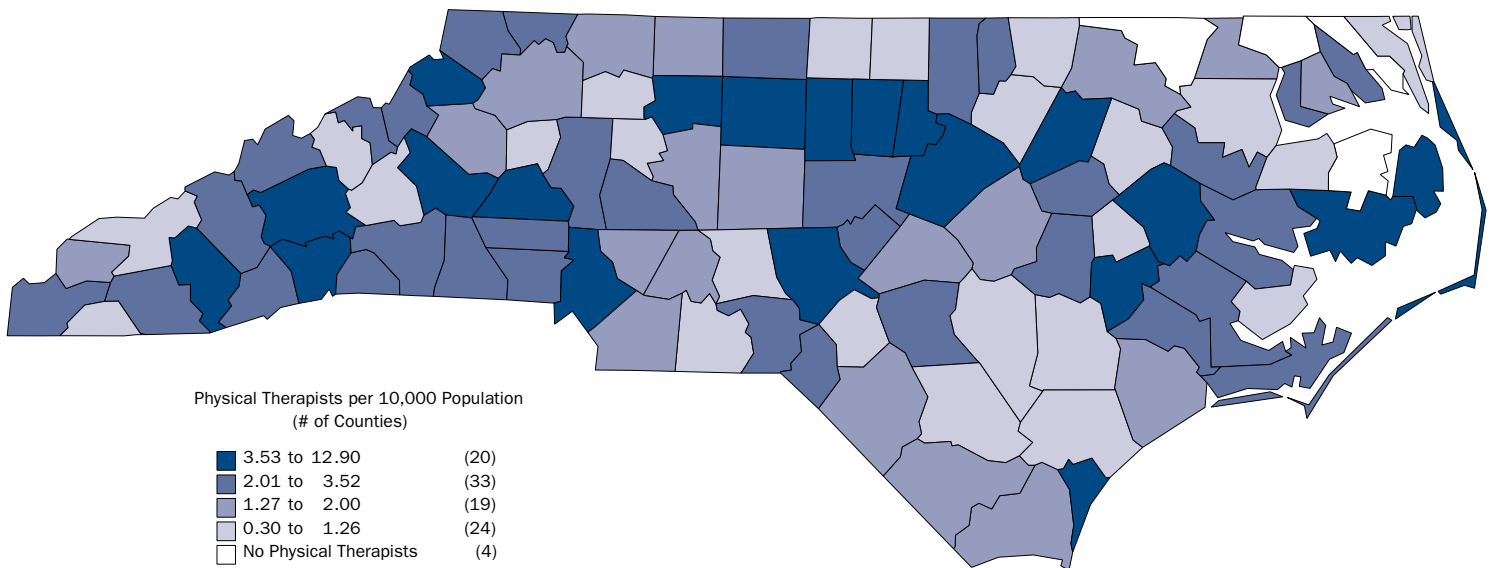
\*Persistent Health Professional Shortage Area

**Figure 85. Physical Therapists per 10,000 Population, US and NC, 1979 to 1998**



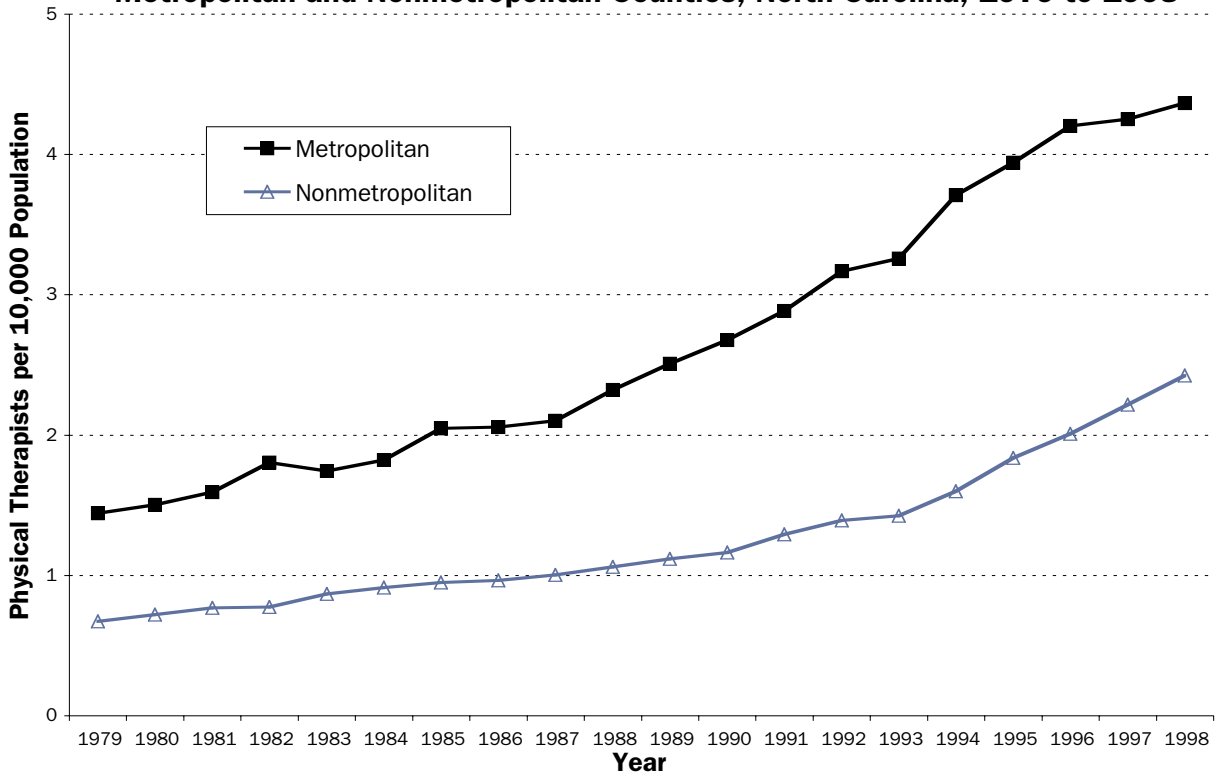
Sources: North Carolina Health Professions Data System, 1979 to 1998; HRSA, Bureau of Health Professions; US Bureau of the Census; North Carolina Office of State Planning  
 Figures include all licensed active physical therapists

**Figure 86. Active Physical Therapists per 10,000 Population, 1998**



Source: North Carolina Health Professions Data System, 1998.  
 Produced By: North Carolina Rural Health Research and Policy Analysis Center, Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

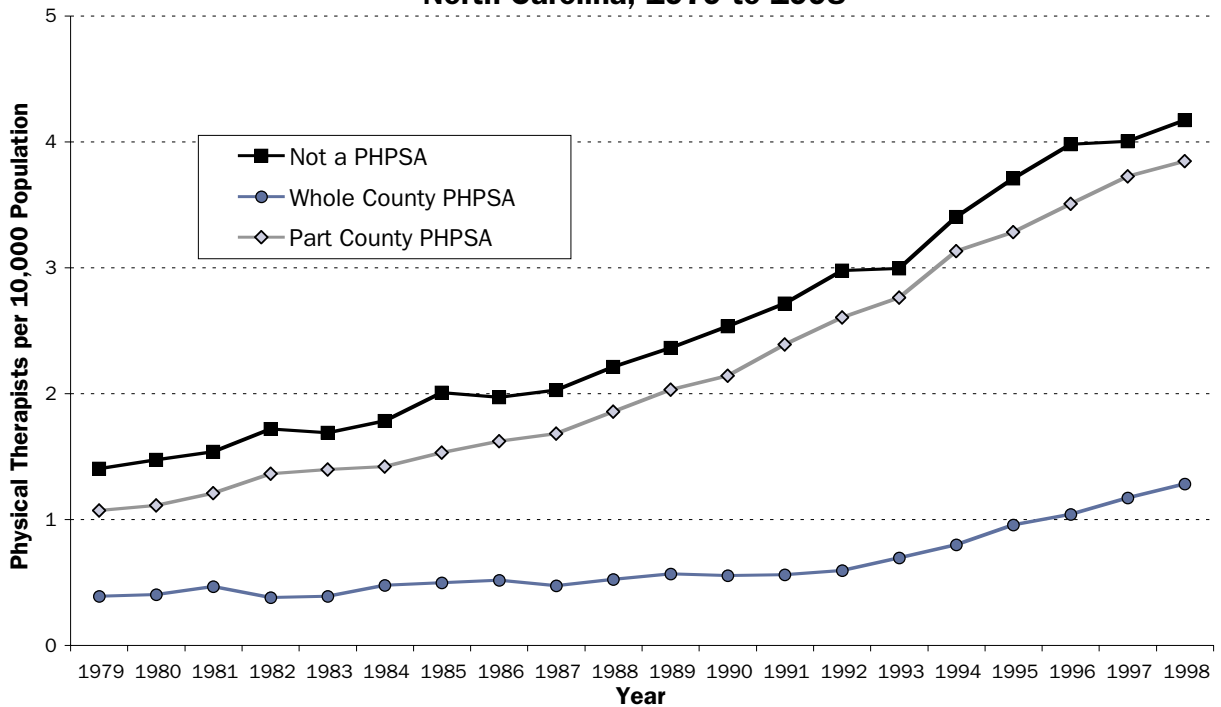
**Figure 87. Physical Therapists per 10,000 Population by Metropolitan and Nonmetropolitan Counties, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state physical therapists

Source for Metropolitan-Nonmetropolitan definition: Office of Management and Budget, 1993.

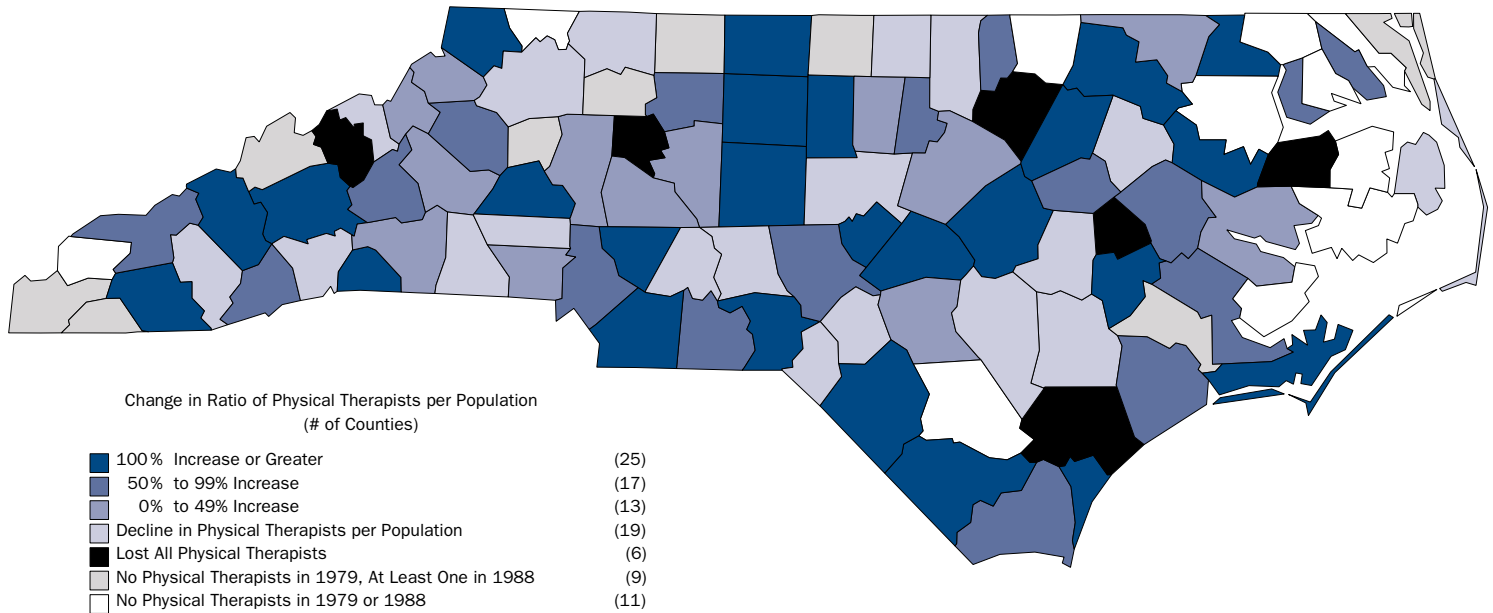
**Figure 88. Physical Therapists per 10,000 Population by Persistent Health Professional Shortage Area (PHPSA) Status, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state physical therapists

Source for Health Professional Shortage Areas: Area Resource File, HRSA, Department of Health and Human Services, 1998  
 Persistent HPSAs are those designated as HPSAs by HRSA from 1993 through 1997, or in 6 of the last 7 releases of HPSA definitions

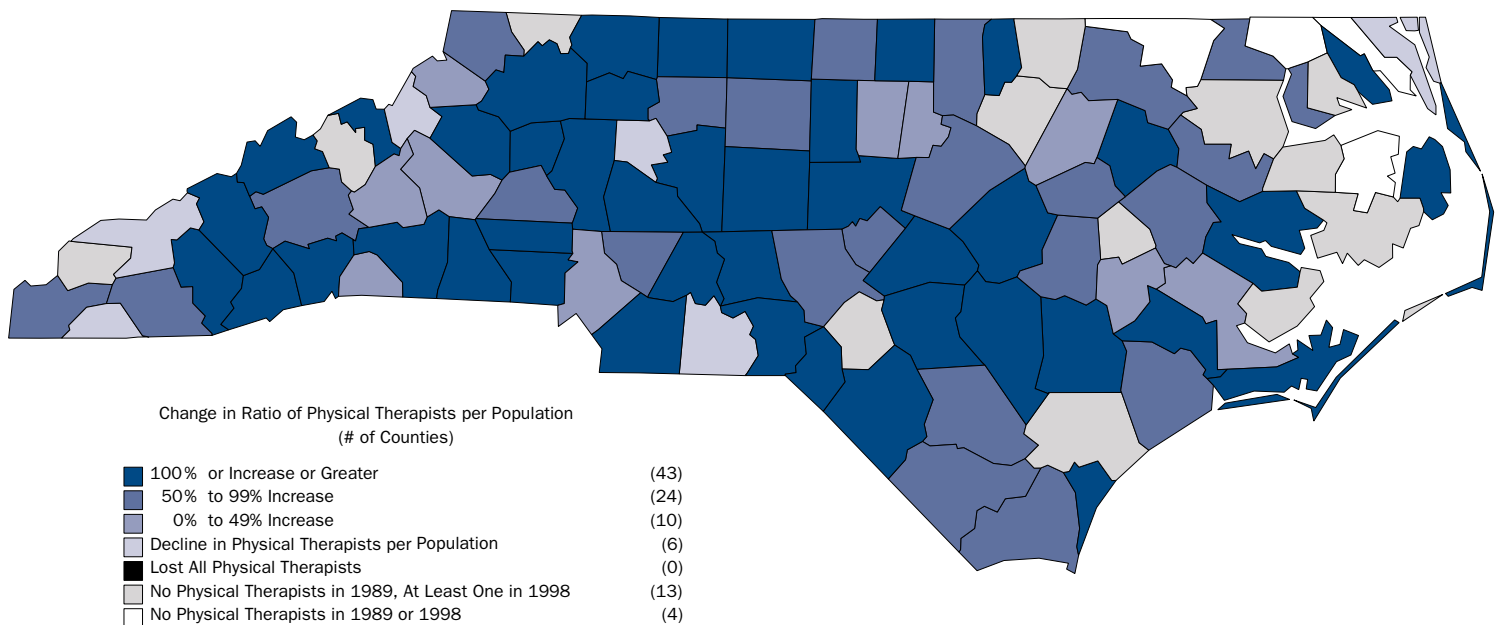
**Figure 89. Percent Change in Ratio of Active Physical Therapists per 10,000 Population from 1979 to 1988**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Figure 90. Percent Change in Ratio of Active Physical Therapists per 10,000 Population from 1989 to 1998**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Physical therapist assistants (PTAs)** are skilled technical workers who work under the direction of physical therapists to carry out treatments for patients who have physical impairments from disease or injury. Physical therapist assistants must have a high school diploma and complete a two-year associate's degree program. Eight community colleges in North Carolina offer a physical therapist assistant program; in addition, several other community colleges offer physical therapist assistant training through cooperative agreements with other educational institutions.

National data on the supply of physical therapist assistants are not available. The number of PTAs per person in North Carolina has increased steadily since 1979 and the physical therapist assistant-per-population ratio has more than doubled since 1991 (Figure 91). Traditionally, physical therapist assistants, like physical therapists, have worked in greater numbers in the state's metropolitan areas; however, since 1997, the physical therapist assistant-to-population ratio in nonmetropolitan areas has exceeded that of metropolitan areas (Figure 93).

The ratio of physical therapist assistants-to-population is highest in part county PHPSAs; these areas experienced rapid growth rates in the supply of physical therapist assistants from the late 1980's until 1996. The ratio of physical therapist assistants-to-population has also increased sharply in non-PHPSA counties since 1993. Whole county PHPSAs continue to lag behind part county and non-PHPSA in the supply of physical therapist assistants per person. The supply of physical therapist assistants in these counties increased rapidly from 1993-1997 but has been flat in the most recent year of data (Figure 94).

Twenty-seven counties had no providers in 1989 but had gained one or more physical therapist assistants by 1998. Thirty-eight counties more than doubled their number of physical therapist assistants per person during the same period (Figure 96). In 1998, six counties—Gates, Camden, Tyrell, Dare, Hyde and Greene—did not have any active physical therapist assistants (Figure 92).

## PHYSICAL THERAPY PROFESSIONS

### Physical Therapist Assistants

**Table 15: Summary Statistics for Physical Therapist Assistants in North Carolina**

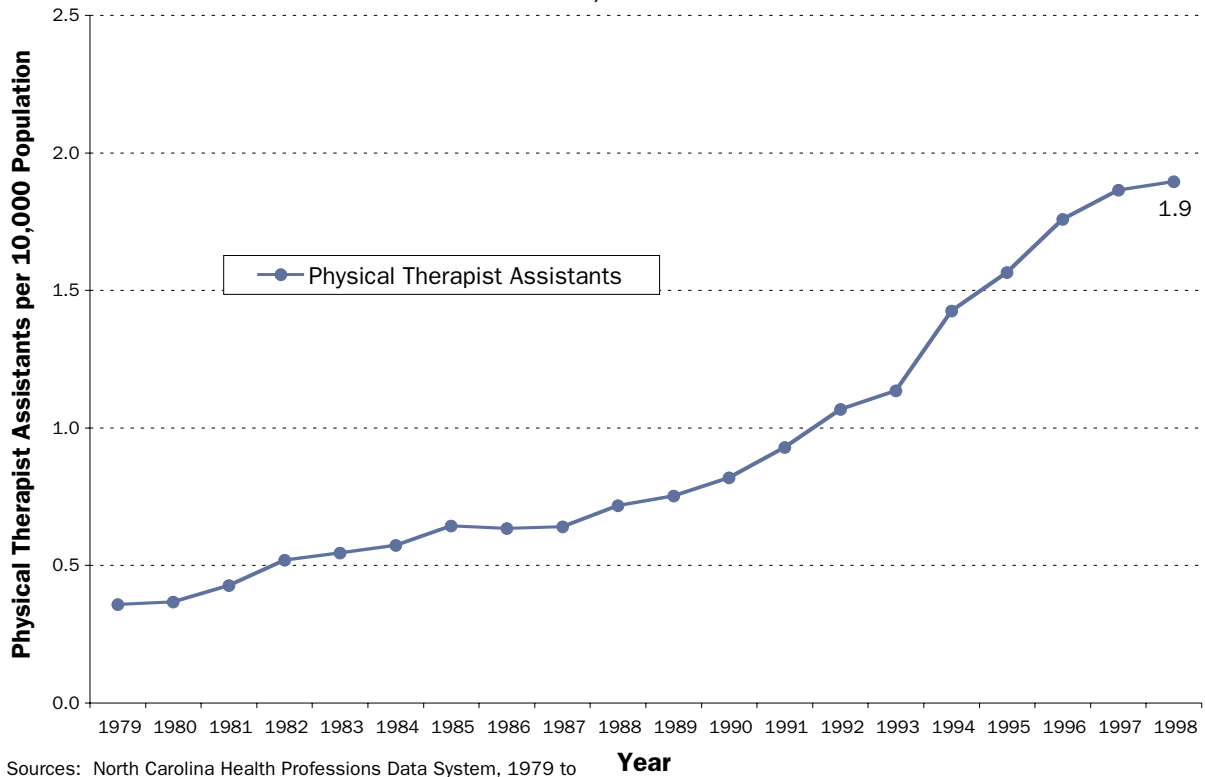
Physical Therapist Assistants per 10,000 Population	Total Active Physical Therapist Assistants
1979: 0.4	208
1989: 0.8	494
1998: 1.9	1,430
<b>Number of Physical Therapist Assistants per 10,000 Population in 1998</b>	
Metropolitan Areas:	1.84
Nonmetropolitan Areas:	2.02
For the 21 counties designated as whole county PHPSAs*:	1.13
For the 23 counties designated as part county PHPSAs*:	2.24
For the 56 counties not designated as PHPSAs*:	1.84

**County Level Data**

- # of counties increasing physical therapist assistant supply 1989-1998: 91
- # of counties decreasing physical therapist assistant supply 1989-1998: 3
- # of counties with no physical therapist assistants in 1998: 6

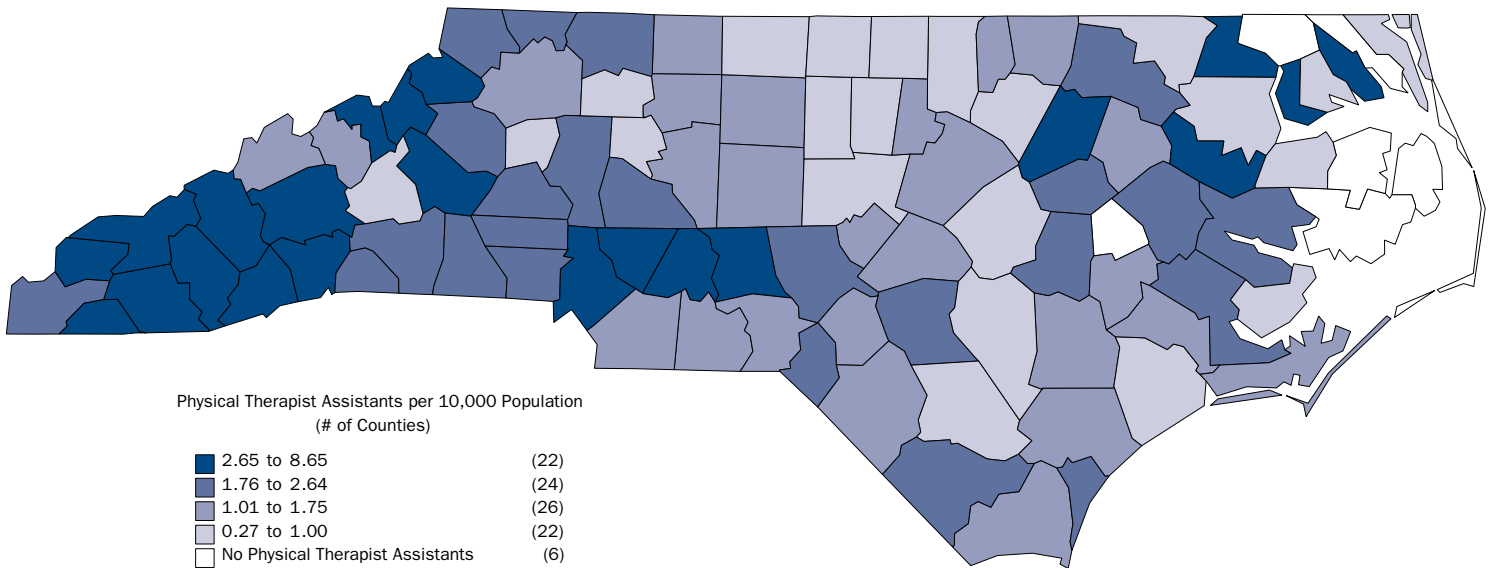
\*Persistent Health Professional Shortage Area

**Figure 91. Physical Therapist Assistants per 10,000 Population, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state physical therapist assistants

**Figure 92. Active Physical Therapist Assistants per 10,000 Population, 1998**

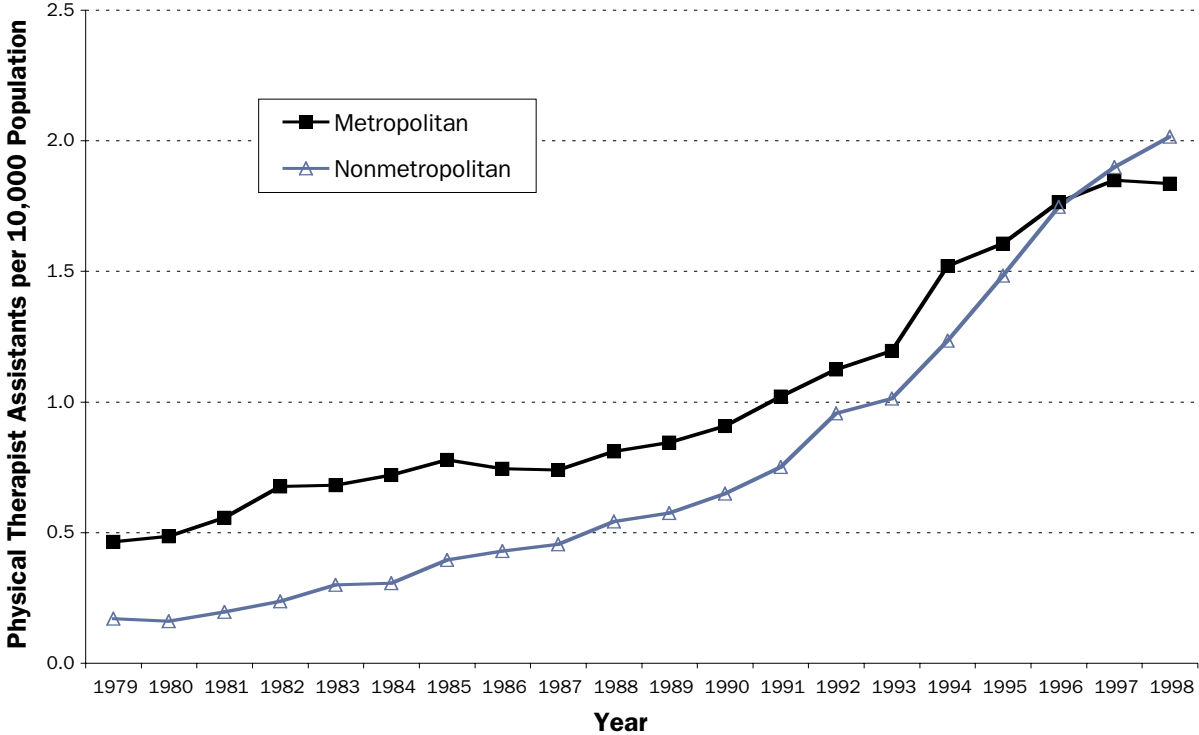


Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
 Cecil G. Sheps Center for Health Services Research,  
 University of North Carolina at Chapel Hill.



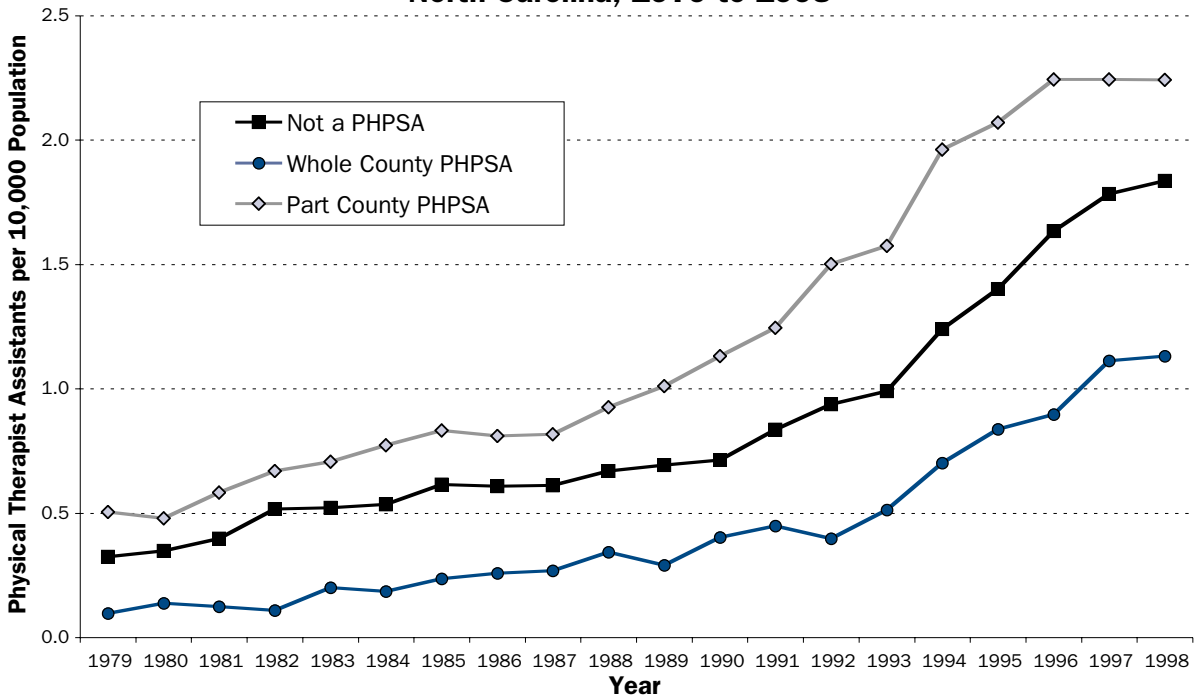
**Figure 93. Physical Therapist Assistants per 10,000 Population by Metropolitan and Nonmetropolitan Counties, North Carolina, 1979-1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state physical therapist assistants

Source for Metropolitan-Nonmetropolitan definition: Office of Management and Budget, 1993.

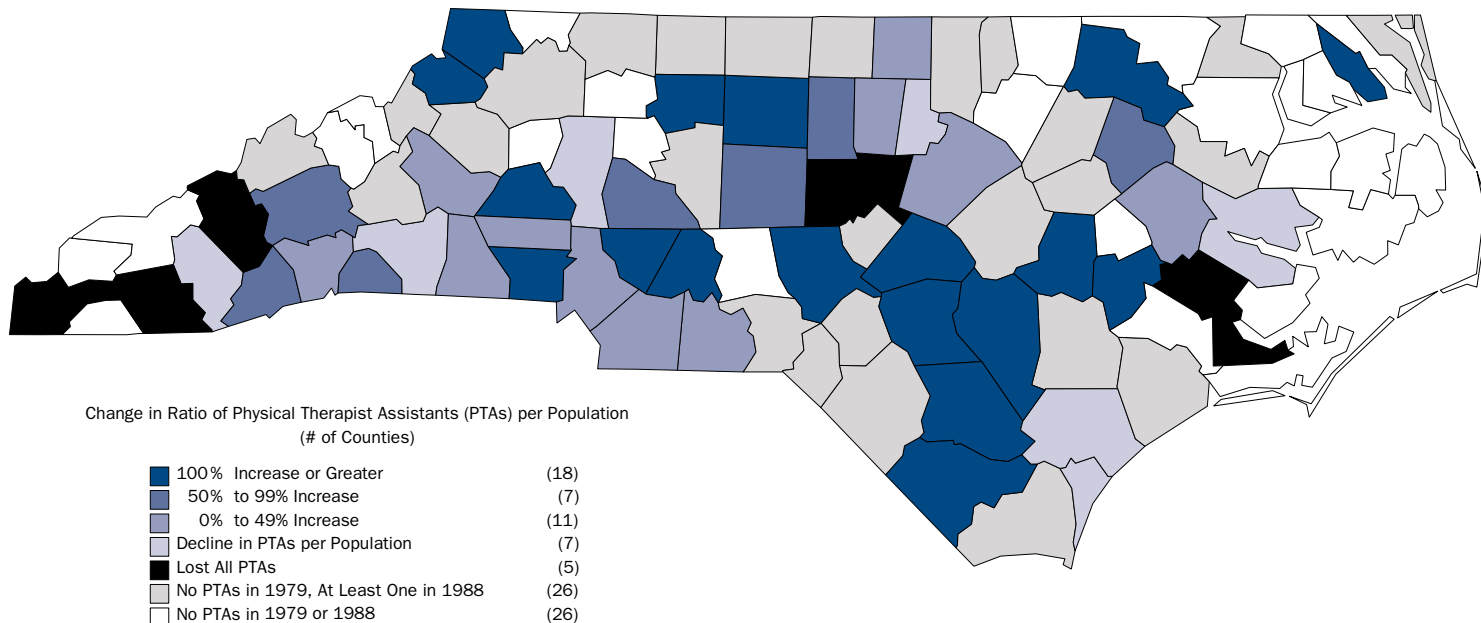
**Figure 94. Physical Therapist Assistants per 10,000 Population by Persistent Health Professional Shortage Area (PHPSA) Status, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state physical therapist assistants

Source for Health Professional Shortage Areas: Area Resource File, HRSA, Department of Health and Human Services, 1998  
 Persistent HPSAs are those designated as HPSAs by HRSA from 1993 through 1997, or in 6 of the last 7 releases of HPSA definitions

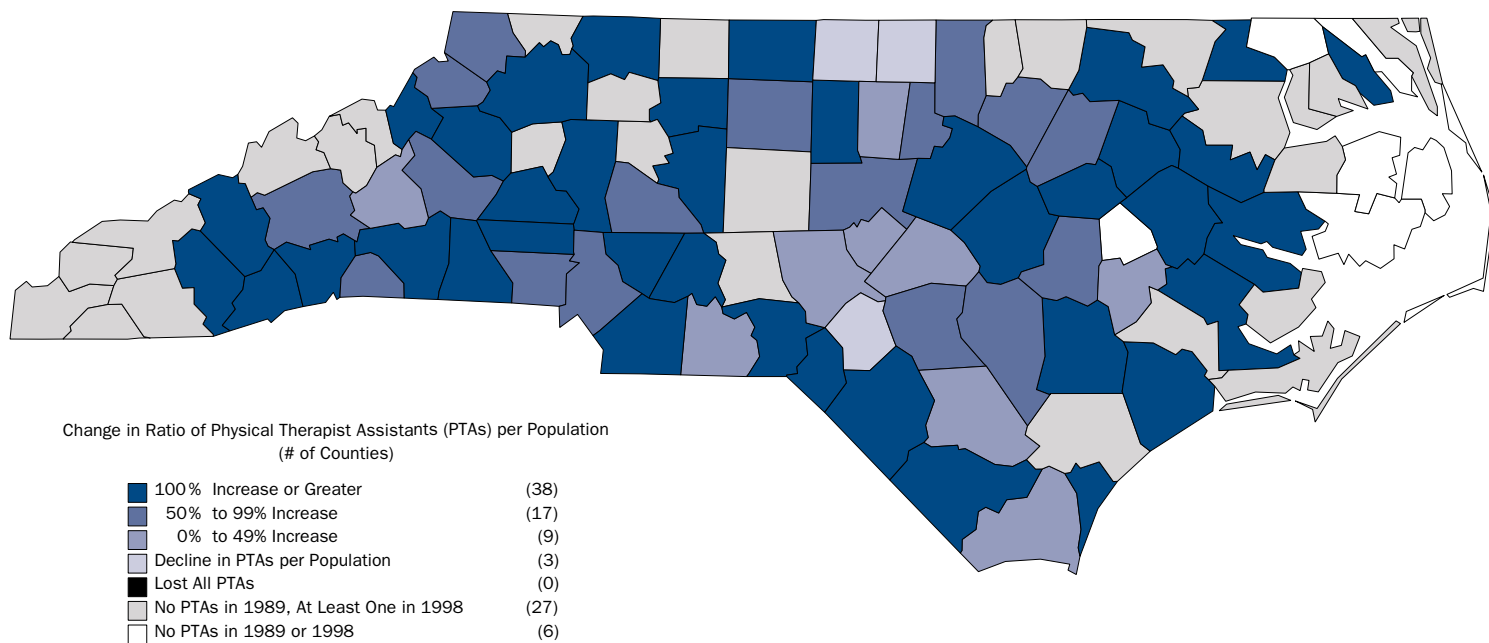
**Figure 95. Percent Change in Ratio of Active Physical Therapist Assistants per 10,000 Population from 1979 to 1988**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Figure 96. Percent Change in Ratio of Active Physical Therapist Assistants per 10,000 Population from 1989 to 1998**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Psychologists** study the behavior, emotions and thinking processes of individuals and groups to better understand their behavior. They work directly with patients using diagnostic tests and intervention techniques to help them deal with their problems. Licensed psychologists hold a doctoral degree. Most doctoral programs in psychology and clinical psychology require four to five years of study beyond the bachelors degree. Two years of supervised experience, one of which must be obtained at the post-doctoral level, is required. There are four Ph.D. psychology programs in North Carolina.

The number of psychologists per person is considerably higher nationally than in North Carolina (i.e. nearly five times as large in the US than in NC in 1998) (Figure 97). The supply of psychologists in metropolitan North Carolina is greater than in non-metropolitan areas and this gap has been widening (Figure 99). The difference in supply by persistent health professional shortage area reflects this trend. In 1998 there were nearly 2.5 psychologists per 10,000 people in non-PHPSA counties, only 1.5 per 10,000 in part county PHPSAs and less than 0.5 per 10,000 in whole county PHPSAs (Figure 100).

Eleven counties that had no psychologists in 1989 had gained at least one provider by 1998 (Figure 102). Despite these gains, 32 counties experienced a decline in their psychologist-per-person ratio between 1989-1998 (Figure 102) and 31 counties in the state had no psychologists in 1998 (Figure 98).

**Table 16: Summary Statistics for Psychologists in North Carolina**

<b>Psychologists per 10,000 Population</b>	<b>Total Active Psychologists</b>
1979: 0.9	519
1989: 1.6	1,062
1998: 1.9	1,434

**Number of Psychologists per 10,000 Population in 1998**

Metropolitan Areas: 2.44  
 Nonmetropolitan Areas: 0.79

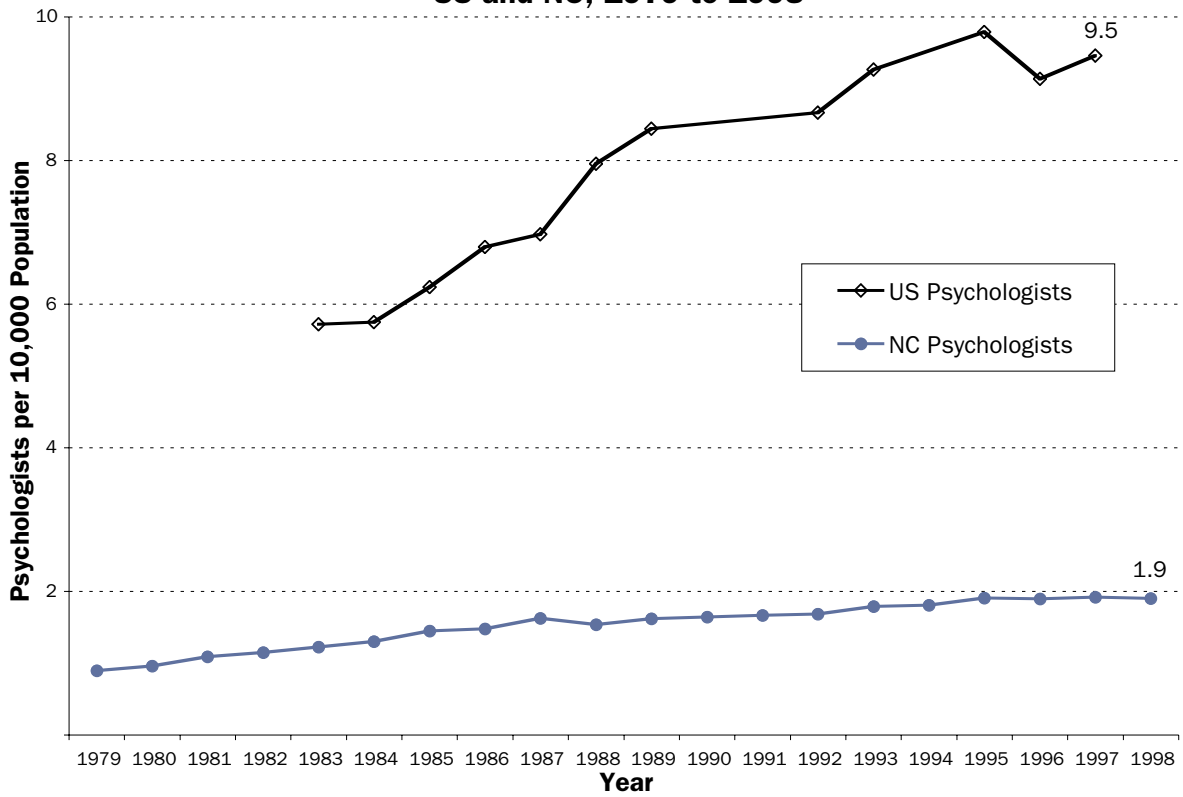
For the 21 counties designated as whole county PHPSAs\*: .42  
 For the 23 counties designated as part county PHPSAs\*: 1.57  
 For the 56 counties not designated as PHPSAs\*: 2.42

**County Level Data**

# of counties increasing psychologist supply 1989-1998: 46  
 # of counties decreasing psychologist supply 1989-1998: 32  
 # of counties with no psychologists in 1998: 31

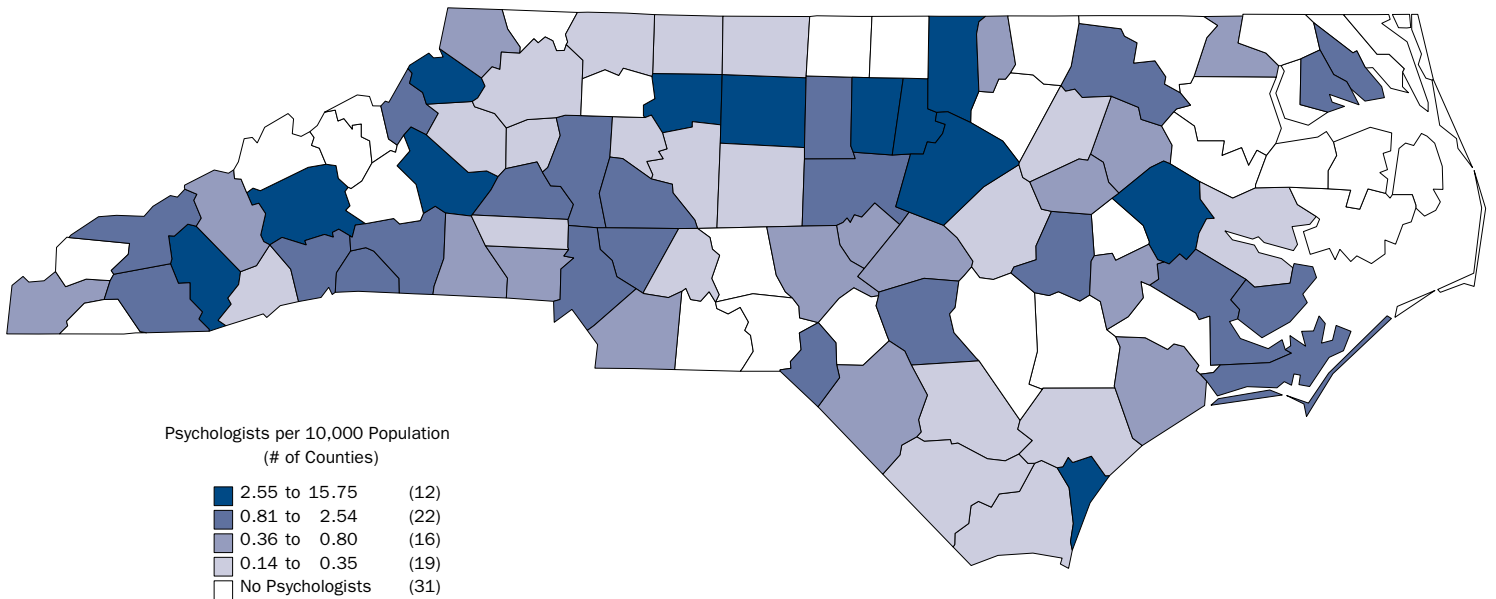
\*Persistent Health Professional Shortage Area

**Figure 97. Psychologists per 10,000 Population, US and NC, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; HRSA, Bureau of Health Professions; US Bureau of the Census; North Carolina Office of State Planning  
 Figures include all licensed active psychologists

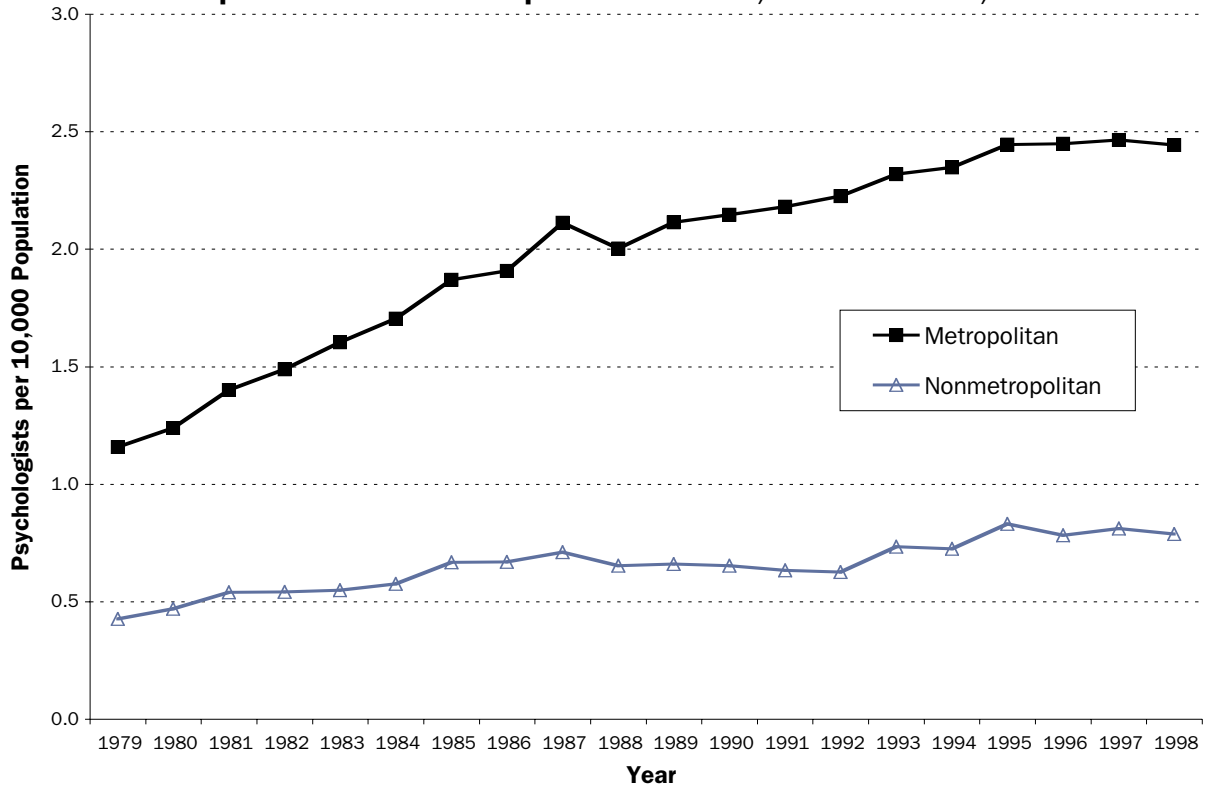
**Figure 98. Active Psychologists per 10,000 Population, 1998**



Source: North Carolina Health Professions Data System, 1998.

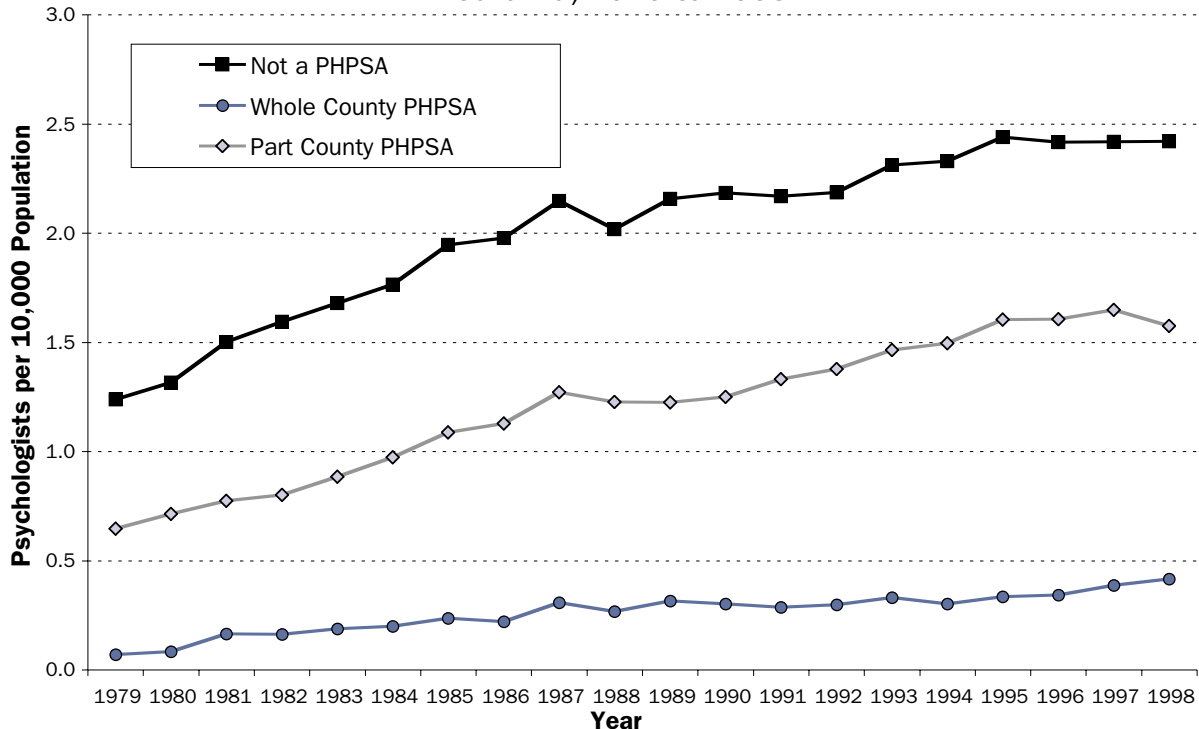
Produced By: North Carolina Rural Health Research and Policy Analysis Center, Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Figure 99. Psychologists per 10,000 Population by Metropolitan and Nonmetropolitan Counties, North Carolina, 1979-1998**



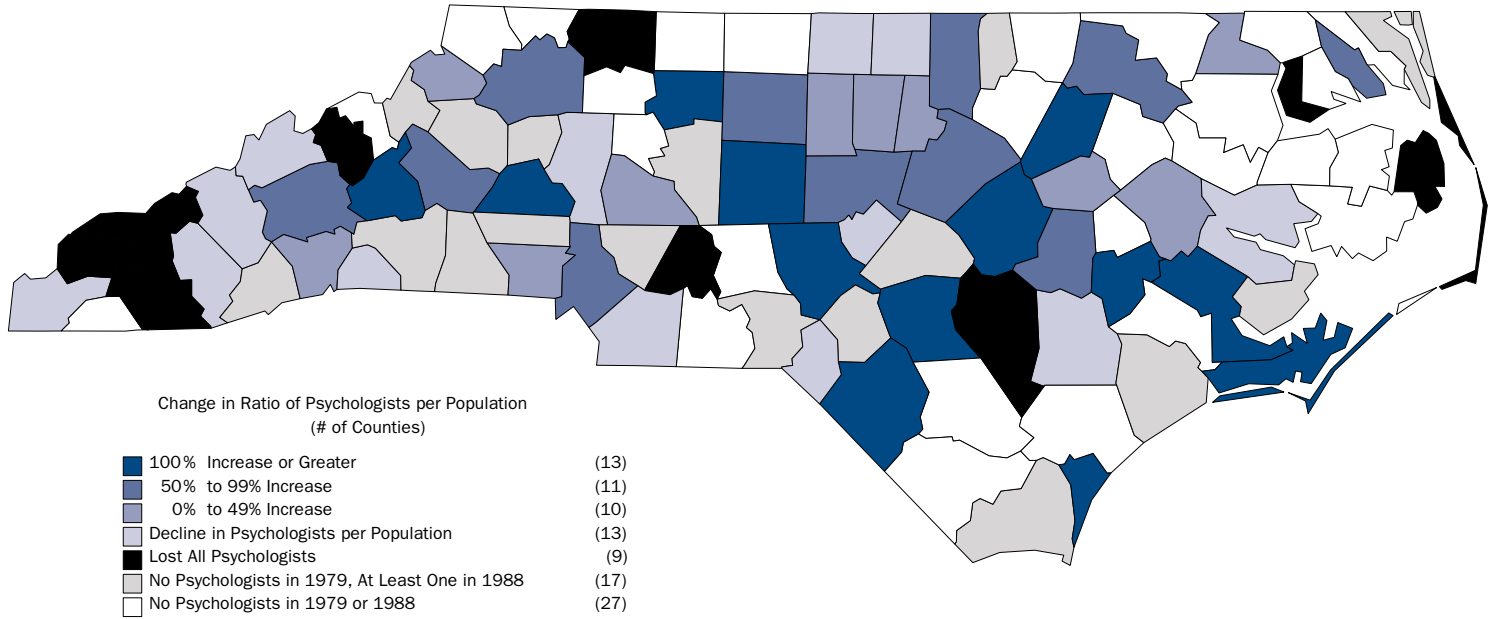
Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Source for Metropolitan-Nonmetropolitan definition: Office of Management and Budget, 1993  
 Figures include all licensed active in-state practicing psychologists

**Figure 100. Psychologists per 10,000 Population by Persistent Health Professional Shortage Area (PHPSA) Status, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Source for Health Professional Shortage Areas: Area Resource File, HRSA, Department of Health and Human Services, 1998  
 Persistent HPSAs are those designated as HPSAs by HRSA from 1993 through 1997, or in 6 of the last 7 releases of HPSA definitions  
 Figures include all licensed active in-state practicing psychologists

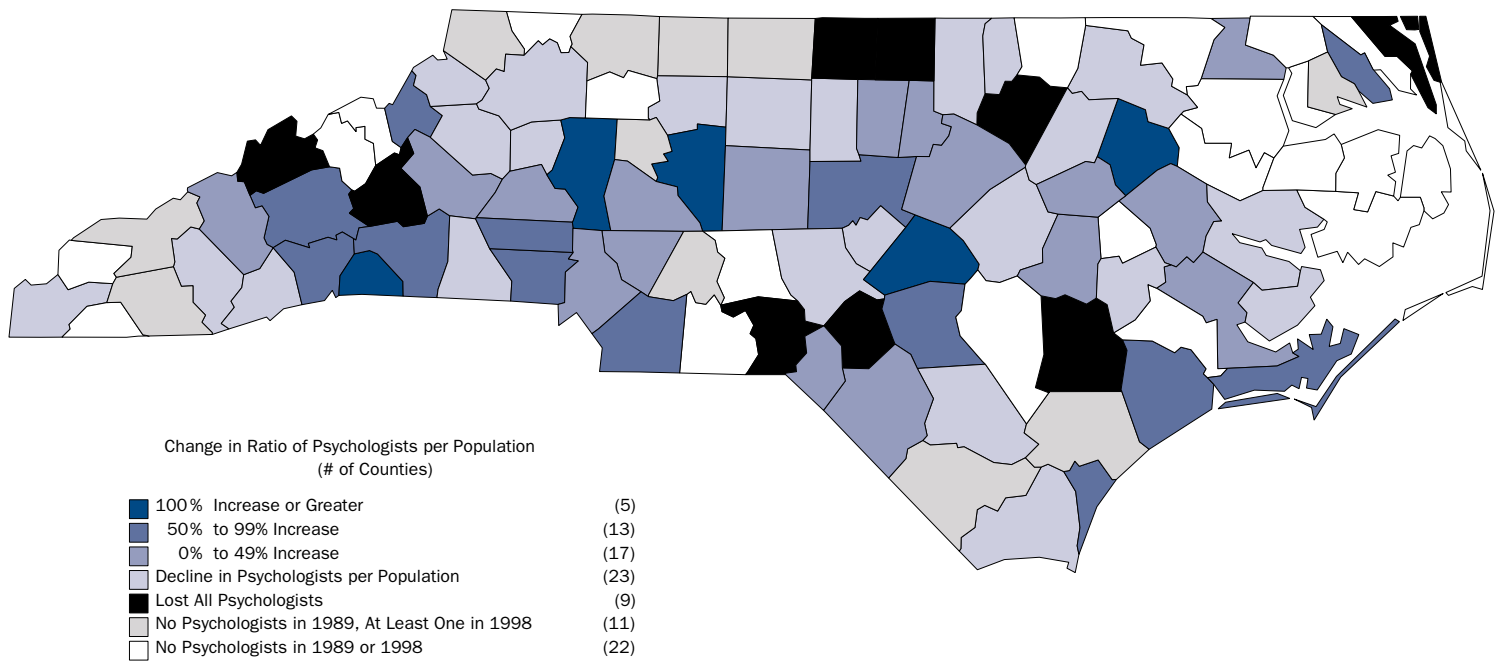
**Figure 101. Percent Change in Ratio of Active Psychologists per 10,000 Population from 1979 to 1988**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Figure 102. Percent Change in Ratio of Active Psychologists per 10,000 Population from 1989 to 1998**



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

**Psychological associates** provide professional psychological services such as interviewing, administering and interpreting tests of mental abilities, interests, aptitudes and personality characteristics for the purposes of psychological evaluation, educational or vocational selection, personnel selection, guidance or placement. With qualified supervision, psychological associates are allowed to render the same services as a licensed psychologist. Psychological associates must have a masters degree or specialist degree in psychology from an accredited university or college.

Trends in the supply of psychological associates per person in the state during the 20-year period from 1979-1998 have been variable and are best described by analyzing four distinct periods. Growth in the supply of psychological associates relative to the population was rapid until 1985, held steady between 1985-1992, increased from 1992-1995 and has been declining since then (Figure 103). Psychological associates tend to work in metropolitan areas; however, the provider-to-population ratios in metropolitan and nonmetropolitan areas appear to be converging in recent years (Figure 105). Non- and part county PHPSA counties have been experiencing a decline in the ratio of psychological associates per 10,000 people since 1995. The supply of psychological associates in whole county PHPSAs did not start to decline until 1997 and supply in these counties still lags behind counties with good supplies of health providers (Figure 106).

Thirty counties experienced declines in their numbers of psychological associates per person from 1989 to 1998 (Figure 108), and there were no psychological associates in 13 counties in the state in 1998 (Figure 104).

**Table 17: Summary Statistics for Psychological Associates in North Carolina**

<b>Psychological Associates per 10,000 Population</b>	<b>Total Active Psychological Associates</b>
1979: 0.39	228
1989: 1.06	694
1998: 1.24	938

**Number of Psychological Associates per 10,000 Population in 1998**

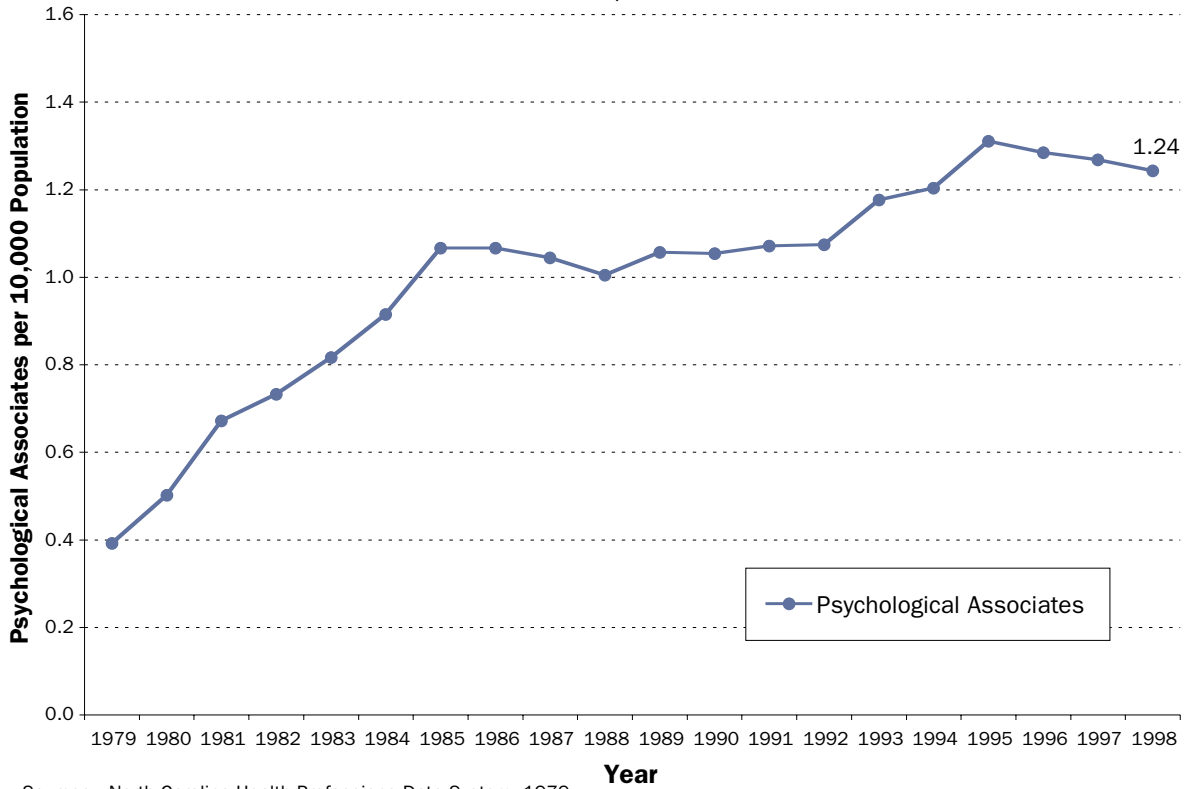
Metropolitan Areas: 1.30  
 Nonmetropolitan Areas: 1.12  
 For the 21 counties designated as whole county PHPSAs\*: 0.69  
 For the 23 counties designated as part county PHPSAs\*: 1.23  
 For the 56 counties not designated as PHPSAs\*: 1.37

**County Level Data**

# of counties increasing psychological associate supply 1989-1998: 61  
 # of counties decreasing psychological associate supply 1989-1998: 30  
 # of counties with no psychological associates in 1998: 13

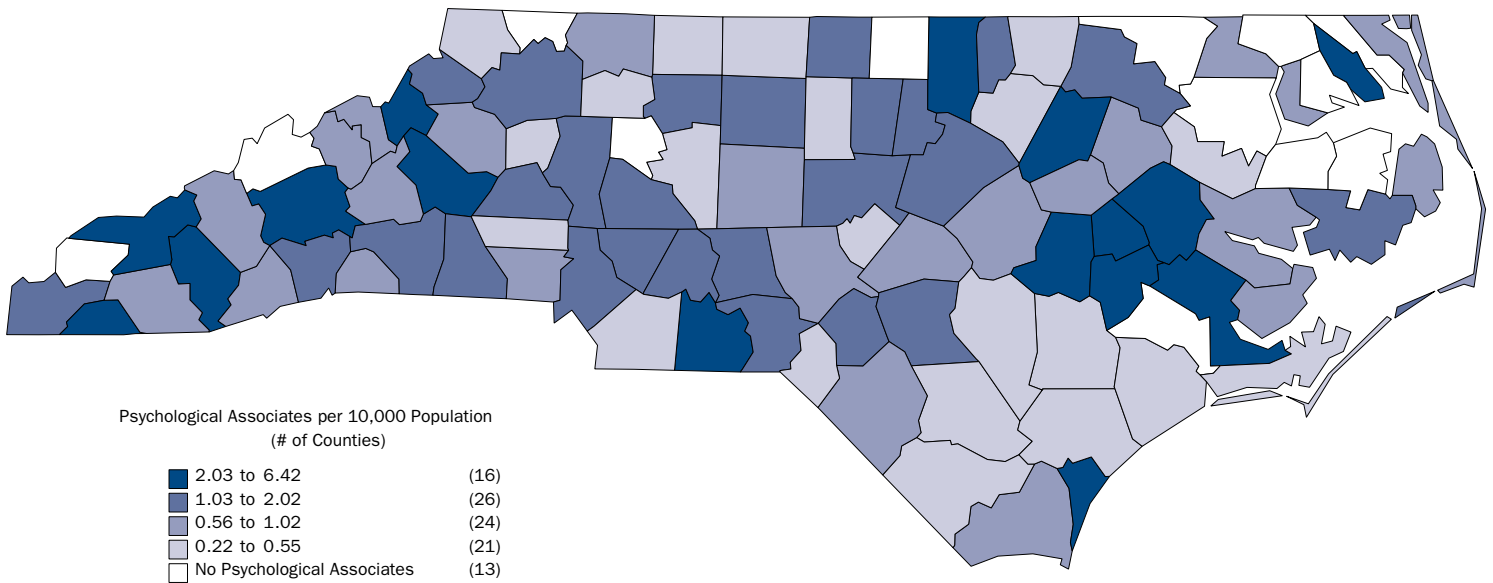
\*Persistent Health Professional Shortage Area

**Figure 103. Psychological Associates per 10,000 Population, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state psychological associates

**Figure 104. Active Psychological Associates per 10,000 Population, 1998**

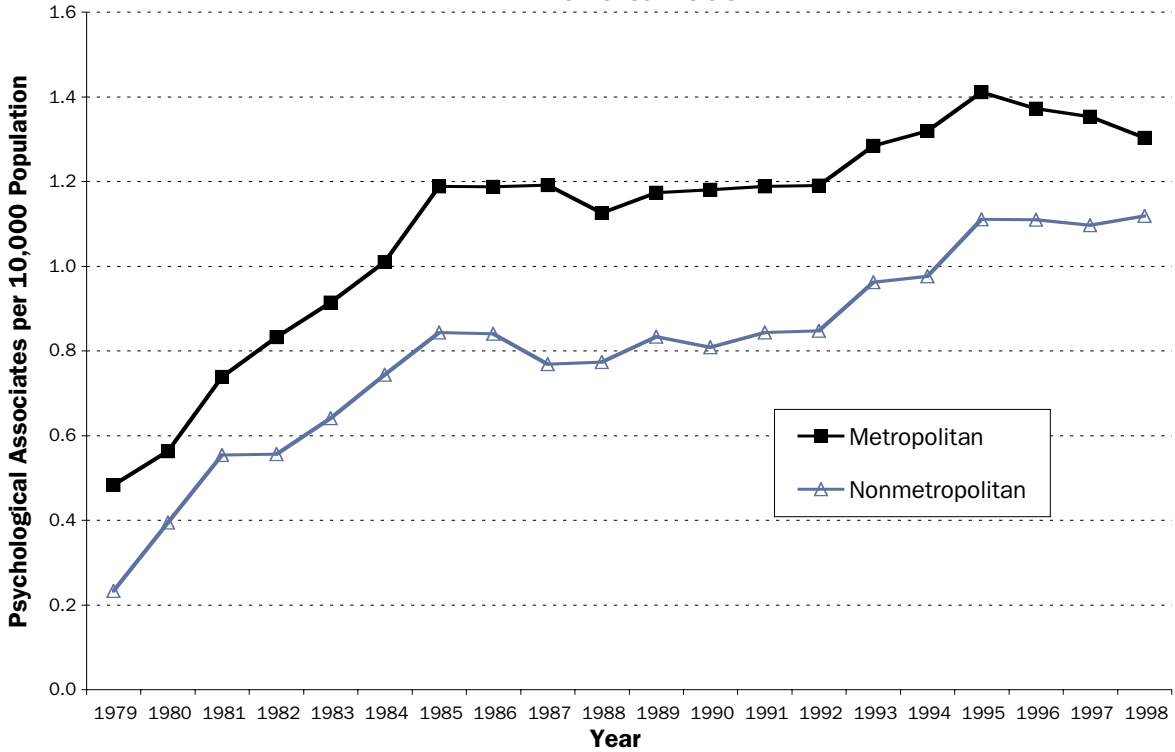


Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
 Cecil G. Sheps Center for Health Services Research,  
 University of North Carolina at Chapel Hill.



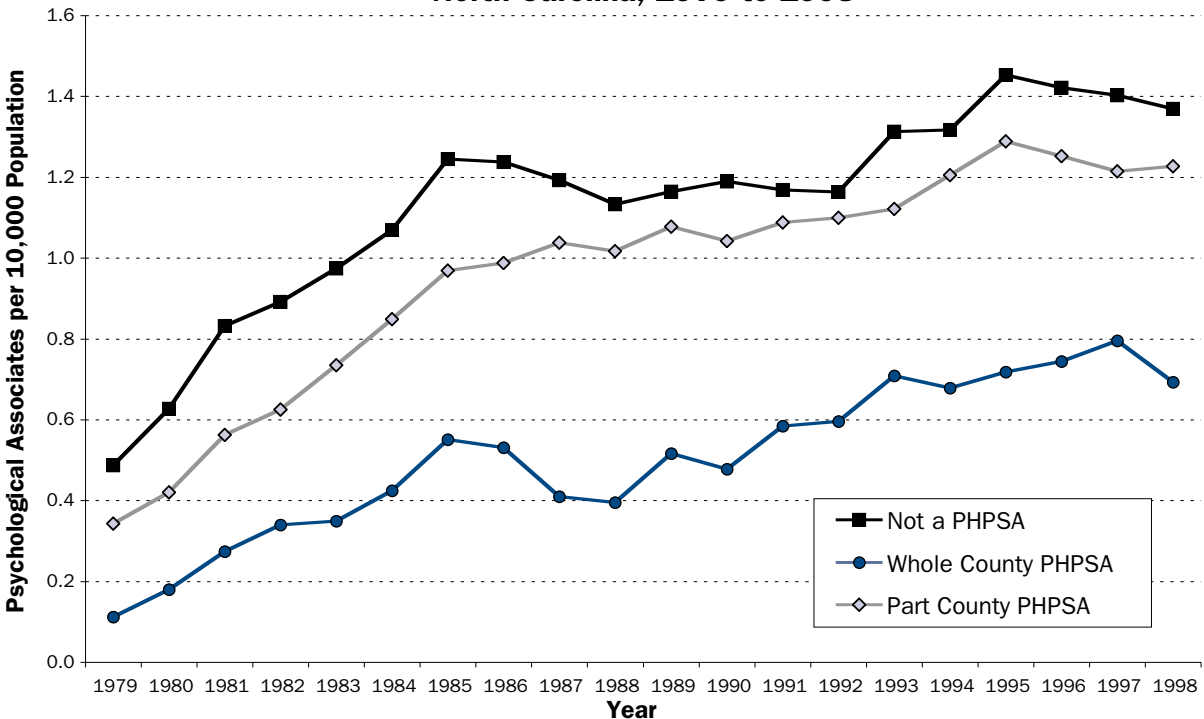
**Figure 105. Psychological Associates per 10,000 Population by Metropolitan and Nonmetropolitan Counties, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state psychological associates

Source for Metropolitan-Nonmetropolitan definition: Office of Management and Budget, 1993.

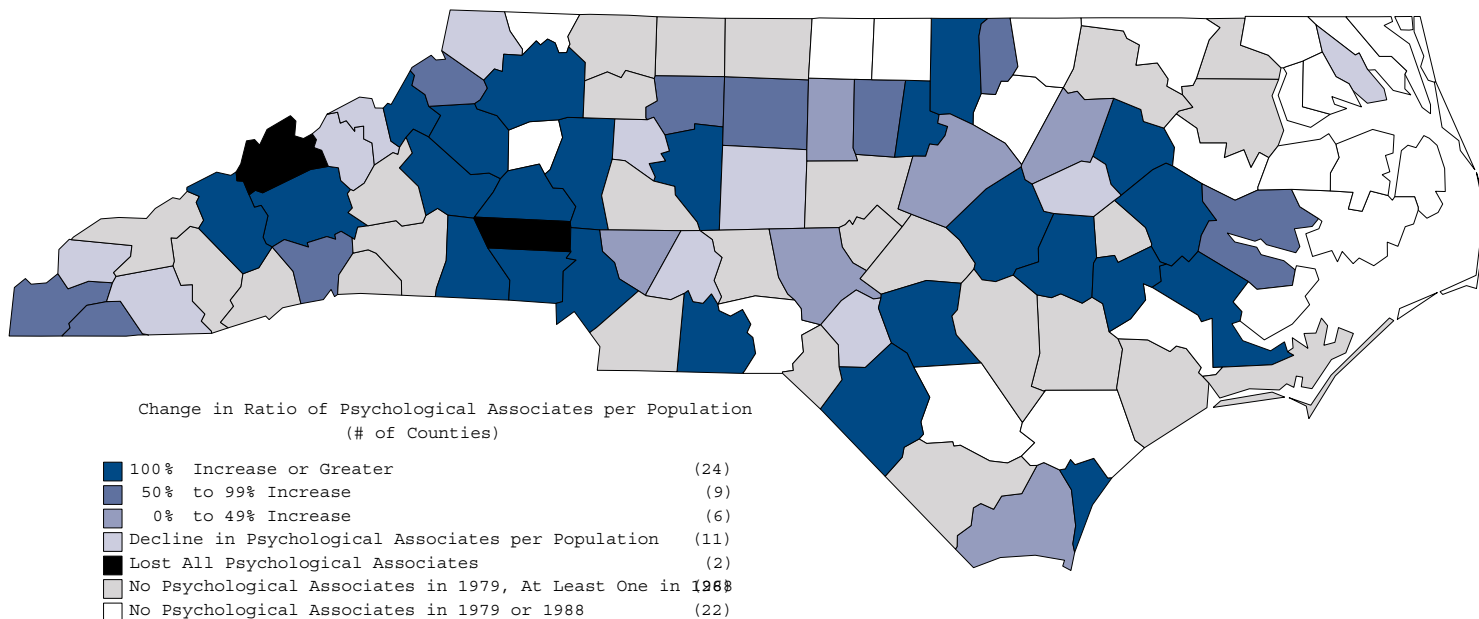
**Figure 106. Psychological Associates per 10,000 Population by Persistent Health Professional Shortage Area (PHPSA) Status, North Carolina, 1979 to 1998**



Sources: North Carolina Health Professions Data System, 1979 to 1998; North Carolina Office of State Planning  
 Figures include all licensed active in-state psychological associates

Source for Health Professional Shortage Areas: Area Resource File, HRSA, Department of Health and Human Services, 1998  
 Persistent HPSAs are those designated as HPSAs by HRSA from 1993 through 1997, or in 6 of the last 7 releases of HPSA definitions

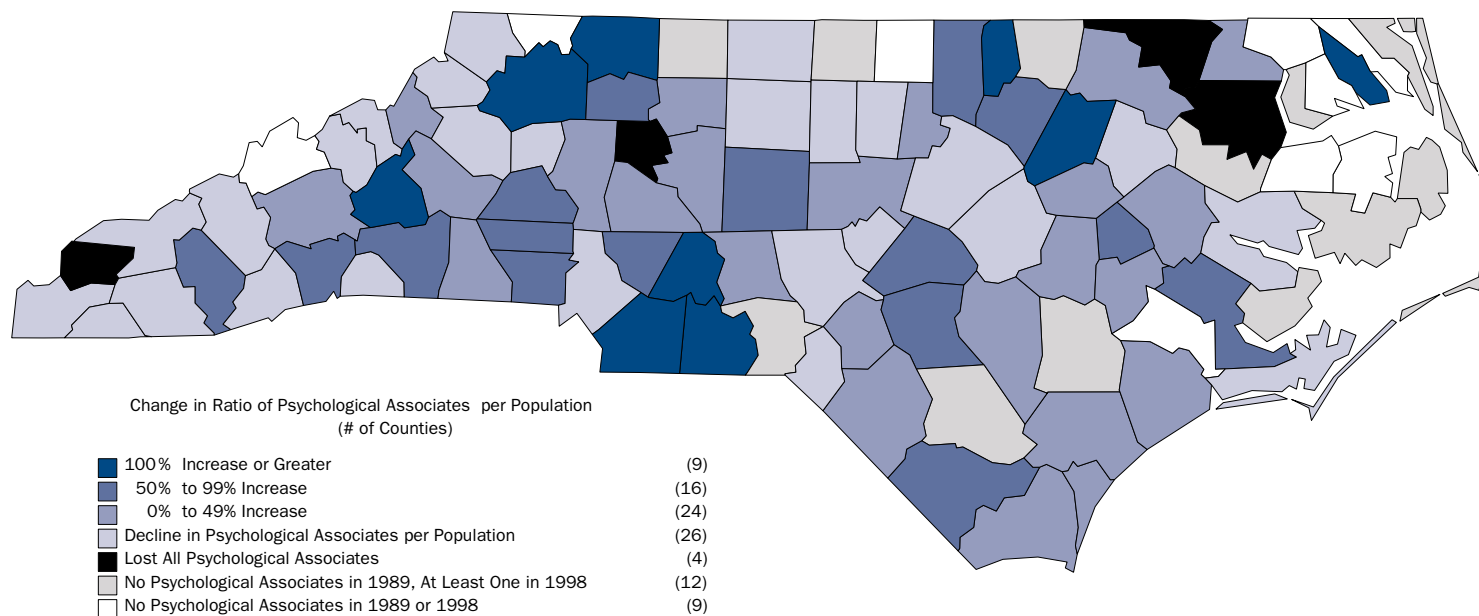
Figure 107. Percent Change in Ratio of Active Psychological Associates per 10,000 Population from 1979 to 1988



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

Figure 108. Percent Change in Ratio of Active Psychological Associates per 10,000 Population from 1989 to 1998



Source: North Carolina Health Professions Data System, 1998.

Produced By: North Carolina Rural Health Research and Policy Analysis Center,  
Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

# Appendix

## HISTORY OF THE NORTH CAROLINA HEALTH PROFESSIONS DATA SYSTEM

*Compiled by Priscilla A. Guild and Gordon H. DeFriese*

In 1973, the Division of Education and Research in Community Medical Care of the UNC-CH School of Medicine approached the Cecil G. Sheps Center for Health Services Research of the University of North Carolina at Chapel Hill with a request that the Center begin efforts to compile a statewide database on physician personnel practicing in North Carolina. Funds were made available to the Center from the School of Medicine to facilitate the compilation of data from the Physician Masterfile of the American Medical Association and the North Carolina State Board of Medical Examiners (now the North Carolina Medical Board). Then, in 1974, the National Center for Health Statistics (NCHS) solicited proposals from every state for the development of various components of the Cooperative Health Statistics System, with a statewide health manpower statistics component being one of these subsystems. The North Carolina State Center for Health Statistics asked the Sheps Center staff to assist with the preparation of the several proposals required for North Carolina to participate in this national program. The Sheps Center took the lead in preparing both the Health Manpower and the Health Care Facilities components of the North Carolina application. Both components, in addition to the Vital Statistics component prepared by the State Center, were funded. The Sheps Center then undertook to work with the 14 independent health professional licensure boards to establish a common data set on all 20 licensed health professions in North Carolina.

In this same period of time, the North Carolina Area Health Education Centers Program was being created through the award of federal funds from the Federal Bureau of Health Professions. Subsequently, the North Carolina General Assembly appropriated state funds for the further support of the North Carolina AHEC Program, and in this appropriation were funds for the development and maintenance of a statewide information system by which the supply and distribution of licensed health personnel could be tracked. It was these funds made available through the initial state appropriation to the AHEC Program which first made possible the annual analysis and dissemination of health manpower data. Thus, the funds from the Cooperative Health Statistics System, plus the AHEC funds for analysis and dissemination, were combined to enable the North Carolina health manpower information system to become a reality. This system, from the beginning, has been a joint effort of the Sheps Center, the NC State Center for Health Statistics, and the North Carolina Area Health Education Centers Program.

Federal funding from the Cooperative Health State Statistics System ended in 1981. For the first year after this funding ended the North Carolina State Health Planning and Development Agency supplemented the AHEC dollars to continue the collection and dissemination of the health manpower data and the responsibility for the health facilities data went back to the North Carolina Division of Facility Services in the Department of Human Resources. During this time, the North Carolina Hospital Association took the initiative to ask the Duke Endowment to facilitate the continuation of this system for a two-year period so that alternative funding arrangements could be explored. The Duke Endowment made the necessary funds available, through the North Carolina Hospital Foundation, to support the continuation of efforts of the manpower statistics system. During this two-year period, a special change budget request through the University of North Carolina General Administration was approved which

permanently established a unit for Health Policy Analysis within the Cecil G. Sheps Center for Health Services Research at UNC-Chapel Hill, a major function of which was the annual accumulation of statistical data on licensed health professionals in the state. It is this continuing funding, plus the ongoing support of the North Carolina Area Health Education Centers Program, which enables the current system of health professional statistics for North Carolina to be available for health planning and program development purposes. Through these efforts of the independent professional licensure boards, key state governmental agencies, the University of North Carolina, the North Carolina Hospital Association, and the Duke Endowment, our state has one of the most comprehensive and longest term systems of health professional data in the nation. All of these organizations deserve our appreciation for making certain that this valuable informational resource is available and accessible to all individuals and organizations who need this information for planning or program development purposes.