



HEALTH CARE IN WEST VIRGINIA



August
2017

A Workforce Supply and Demand Analysis Report



A Special Thank You to Our Funder

The West Virginia Rural Health Association (WVRHA) is grateful for the generous financial contributions from the following workforce project funder:

Claude Worthington Benedum Foundation

Commissioned by the West Virginia Rural Health Association, this report focuses upon the current and future healthcare needs of the citizens of West Virginia and the impact the needs currently have upon the healthcare providers and the communities they serve. This report was created in cooperation with the National Center for the Analysis of Healthcare Data.

Table of Contents

INTRODUCTION..... 4

POSTIVE CHANGES IN WEST VIRGINIA..... 6

OUR COMMITMENT 6

WEST VIRGINIA RURAL HEALTH DATA PORTAL..... 7

BASELINE 10

GRANDPARENTS RAISING GRANDCHILDREN 14

ACCESS TO FOOD – IMPACT UPON HEALTH..... 16

RESULTS OF HEALTHCARE WORKFORCE PLANNING 21

HEALTHCARE WORKFORCE SUPPLY (INSTATE) 26

 Primary Care Workforce37

HEALTHCARE WORKFORCE SUPPLY (CONTIGUOUS STATES’ COUNTIES) 40

HEALTHCARE WORKFORCE TREND ANALYSIS..... 45

HEALTHCARE WORKFORCE DEMAND 51

 Primary Care Workforce51

 Aging Primary Care Workforce52

 Specialty Care Workforce.....57

 Economic Impact of Primary Care Physician Mal-distribution58

DATA SOURCES..... 60

LIMITATIONS 60

WEST VIRGINIA RURAL HEALTH ASSOCIATION 61

2017 BOARD OF DIRECTORS 61

REFERENCES 63

APPENDIX A – NCAHD NATIONAL DATA COLLECTION PROCESS 65

Health Care in West Virginia

A WORKFORCE SUPPLY AND DEMAND ANALYSIS REPORT

INTRODUCTION

The West Virginia Rural Health Association (WVRHA) is a non-profit 501(c)(3) organization with a volunteer Board of Directors (BOD) elected from healthcare organizations and individuals from around the state.

(For a list of board members, please visit: <http://www.wvrha.org/index.php?nav=board>). The mission of the West Virginia Rural Health Association is to unite people, communities and organizations to strengthen rural health in West Virginia.

WVRHA membership includes a variety of people and organizations that are interested in the health of rural West Virginia by working together to identify the health care concerns and find ways to improve services in our communities.

WVRHA identified the need to conduct an environmental assessment of current healthcare workforce supply during WVRHA's 2011 strategic planning process. This assessment was completed in October 2012, with a report created by the West Virginia Rural Health Research Center.

In June of 2013, WVRHA moved forward with the next phase of the process, with the development of a demand report as a partner to the supply report – Health Care Demand Report. The National Center for the Analysis of Healthcare Data (NCAHD) was contacted to generate a report that would provide data and visualizations (maps). The report is to inform West Virginia rural health stakeholders, citizens, policy and decision-makers on the where and how their health care demands were affecting the state.

Additionally, the major provisions of the 2010 Patient Protection Affordable Care Act (PPACA) implemented in 2014 and the impact newly eligible citizens have had upon the current healthcare delivery system must be considered. Since the expansion of Medicaid under the Affordable Care Act (ACA), the number of people receiving health insurance through Medicaid and the Children's Health Insurance Program (CHIP) in West Virginia, makes this the second largest expansion in the US. As of May 2017, West Virginia had approximately 561,598 total enrollees in Medicaid and CHIP. Nearly 58 percent of the state's citizens now have health insurance under one of the two programs, according to data compiled by the state and submitted to the federal Centers on Medicare and Medicaid. This is a decrease of 3 percent in Medicaid and CHIP enrollment in West Virginia in the last two years and a 29 percent increase since January of 2014 (Pre-ACA).

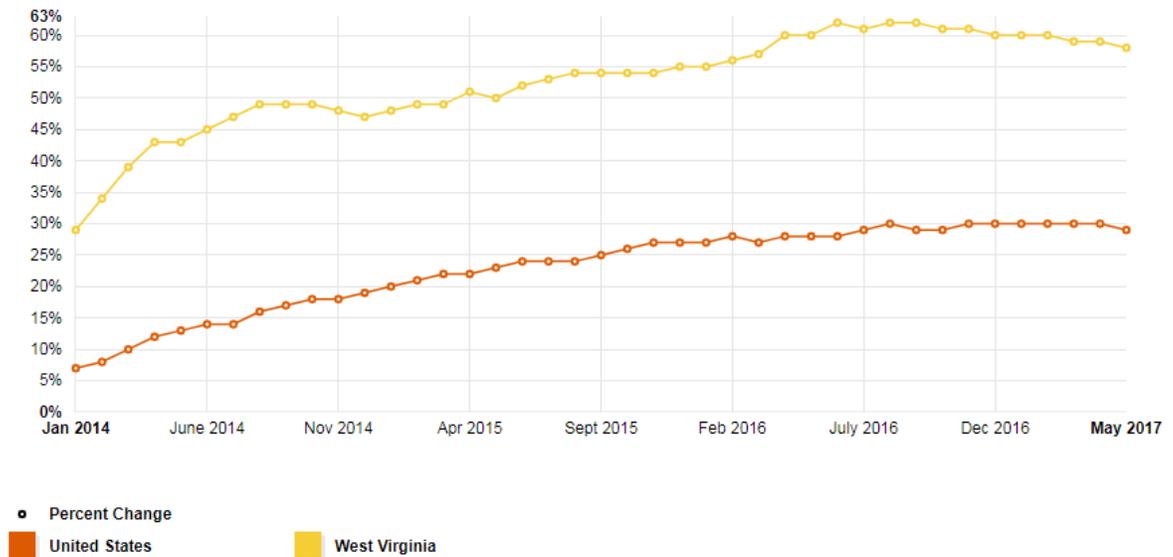


FIGURE 1 - CHANGE IN MEDICAID ENROLLMENT - US TO WEST VIRGINIA COMPARISON

In 2014, to facilitate planning for future workforce needs for health care professionals, the West Virginia Legislature passed H.B. 4245. This bill amended the Code of West Virginia by adding a new section requiring reporting on the anticipated retirement dates, age, gender, percentage of time working direct services, percentage of time working administration, and county of practice for the membership of six state health care licensing boards. The impacted boards are the West Virginia Board of Medicine, the West Virginia Board of Examiners for Registered Professional Nurses, the West Virginia Board of Examiners for Licensed Practical Nurses, the West Virginia Board of Pharmacy, the West Virginia Board of Dentistry, and the West Virginia Board of Osteopathy.

In 2016, to address the issue of hospital Emergency Department overcrowding, the West Virginia Legislature passed S.B. 195. This bill established up to six community paramedicine projects for the purpose of developing and evaluating a community paramedicine program. “Community paramedicine” means the practice by an emergency medical services provider primarily in an out-of-hospital setting by providing episodic patient evaluation, advice, and care directed at preventing or improving a particular medical condition which may require emergency medical services providers to function outside their customary emergency response and transport roles, specifically requested or directed by a physician, in ways that facilitate more appropriate use of emergency care resources and enhance access to primary care for medically vulnerable populations.

Both of these legislative actions were outcomes of data and education provided by the WV Rural Health Data Portal and a paramedicine white paper developed by the WVRHA Policy Committee.

The WVRHA Policy Committee is currently developing a white paper on the Indicators & Impact of Childhood Metabolic Syndrome & Prediabetes in WV

POSTIVE CHANGES IN WEST VIRGINIA

In the past year, high school graduation increased 5.1% from 81.4% to 86.5% of students. In the past year, public health funding increased 71% from \$120 to \$205 per person through the over \$1.4 Billion in federal assistance through Obamacare. Subsequently, West Virginia continues to rank in the lower quartile of state of citizens without insurance with approximately 29,000 citizens receiving financial assistance for the health coverage. In 2016, West Virginians receiving financial assistance saw their monthly premiums reduced on average of \$388.¹

Trend: Lack of Health Insurance, West Virginia, United States

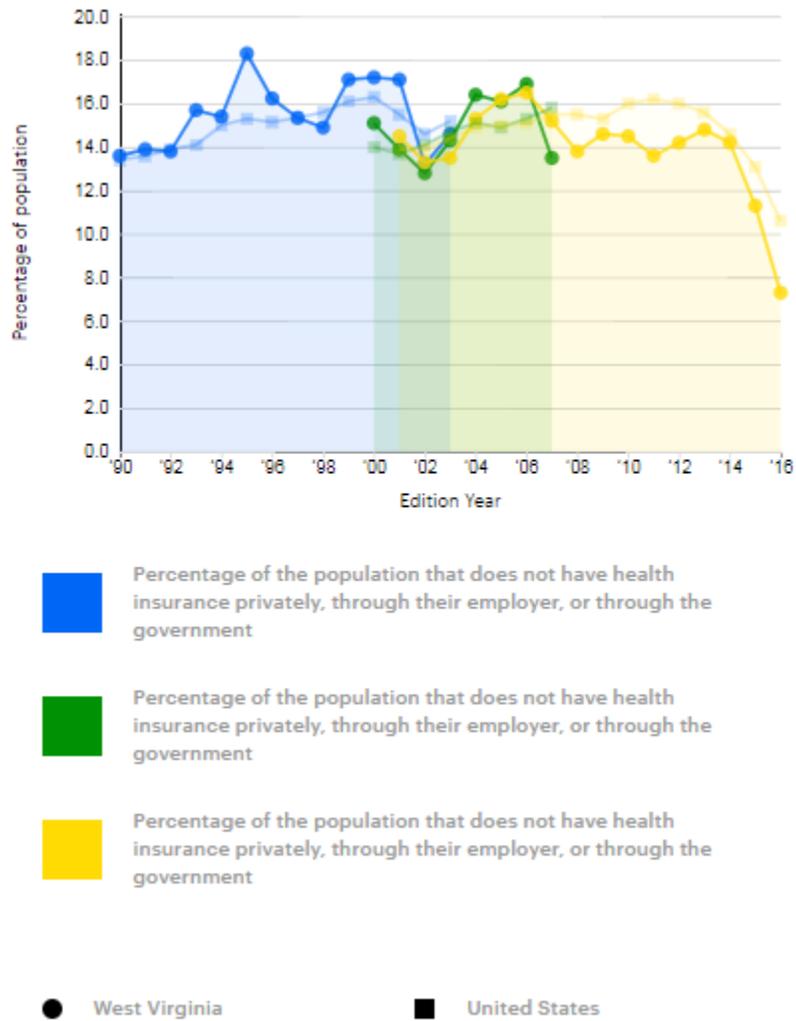


FIGURE 2- WEST VIRGINIA LACK OF HEALTH INSURANCE TREND

OUR COMMITMENT

The WVRHA envisions the WV Health Data Portal as a free resource available to anyone needing current facts about the health workforce in West Virginia and a demonstration of the

impact the healthcare workforce mal-distribution and shortages have upon current and future West Virginians. WVRHA membership is required to access information below the county level. WVRHA is committed to provide yearly updates while adding additional disciplines, specialties, and trend analysis to the portal. This comprehensive information will describe health care shortages in rural areas and serve as an economic development and decision-making tool for all West Virginia stakeholders.

For this phase, NCAHD utilized data collected and processed on May 2017 for the following healthcare providers: Audiologists, Advanced Practice Registered Nurses, Nurse Practitioners, Nurse Anesthetists, Midwives, Certified Nurse Specialists, Chiropractors, Dentists, Dental Hygienists, Optometrists, Allopathic and Osteopathic Physicians, Obstetrics-Gynecology, Orthopaedic Surgeons, Nephrologists, Endocrinologists, Podiatrists, Physician Assistants, Pharmacists, Physical Therapists, Psychologists, Psychiatrists, Speech-Language Pathologists, Social Workers, Dietitians, Paramedics, locations of Family Resource Network sites, County Unemployment Rates, Kids in Poverty (from Kids Count Information), and locations of Diabetic Educators. This information is available through the West Virginia Health Data Portal. You may access this data by going to (<http://portals.ncahd.org/wvhdp/>).

WEST VIRGINIA RURAL HEALTH DATA PORTAL



Portal Address: (<http://portals.ncahd.org/wvhdp/>)

West Virginia's Health Data Portal was launched during the January 2013 Rural Health Workforce Day in Charleston, West Virginia. The entire content from the 2013 West Virginia Workforce Demand report along with supply data from NCAHD's 2013 enhanced state licensure data was integrated into the internet-based interactive web mapping tool. In addition to being

able to view all of the healthcare workforce data in the previously published supply and demand reports, the following functionalities enable the public to perform the following:

- Analyzing Specialty Physician Needs through health outcomes
- Viewing Aging providers in rural and underserved areas
- Drive time distance analysis
- Using buffer tool to determine potential workforce from clinics
- Viewing service region for a healthcare facility based on distance or time
- Determining the workforce/patient demographics in service region

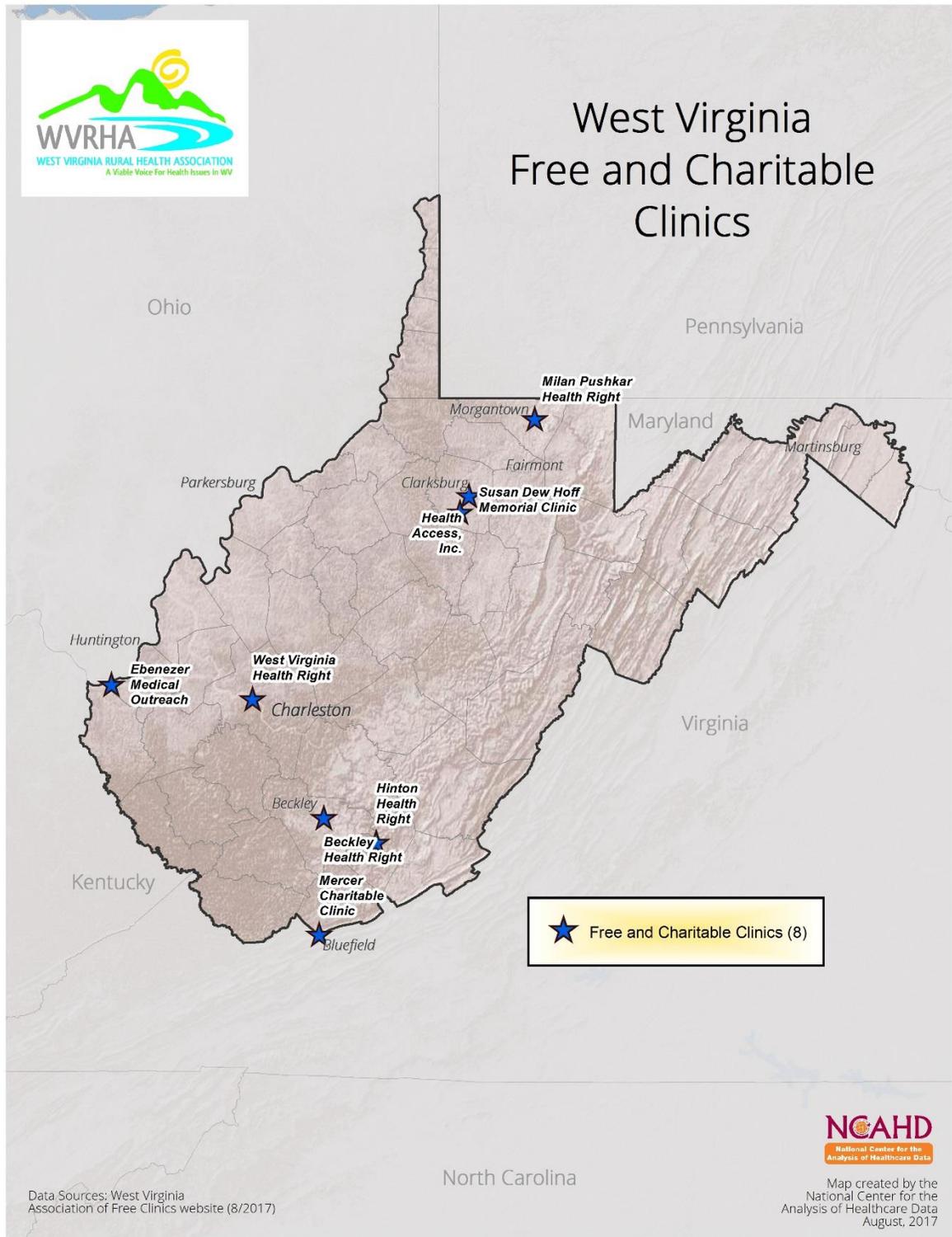
Additionally, the healthcare providers licensed in the adjacent states were added to the portal to help improve understanding about the entire healthcare workforce landscape that impact West Virginia's citizen's access to care. The results of trend analysis by NCAHD to measure the migration of primary care workforce may be found in the Workforce Data Portal.

As a part of the WVRHA's commitment to meeting their mission, thirty (30) **FREE** portal training sessions were provided throughout West Virginia in 2014 – 2016, with several planned for spring 2018. (Important note: Contact Debrin Jenkins if you or your stakeholder group would like to either host or participate in a portal training session.) During the training sessions, participants were given step-by-step guides on how to use the portal and how to answer the following healthcare questions as example of what the portal can provide:

- Is there equitable distribution across all of the professions in rural vs. urban workforce distribution?
- Where the areas are in the state with higher patient populations with multiple chronic diseases?
- Are healthcare training opportunities available in rural areas?
- What is the distance from my clinic to the hospital?
- What is the service area around the hospital/clinic?
- How many people are potentially served within 45 minutes or 45 miles of a healthcare facility?
- How many dentist or dental hygienists are within 25 minutes of my town?

During each of our training sessions and in the multiple dialogues and other correspondences with WV Rural Health Association members, the West Virginia Rural Health Association Board, and WV Health Data Portal webinar participants, additional datasets were suggested to help support the membership, citizens and other entities working together to resolve some of West Virginia most challenging healthcare issues. Therefore, in addition to the new interface for the portal there are the following additional data:

- Free and Charitable Clinics (See **Map 1**, page 9)
- Access to Food and Impact upon citizens health
- Update on statistics on children being raised by Grandparents
- Statistics on the impact of federal shortage designation programs use of the National Provider Index
- Trend analysis of West Virginia's Healthcare workforce upon Medically Underserved Areas

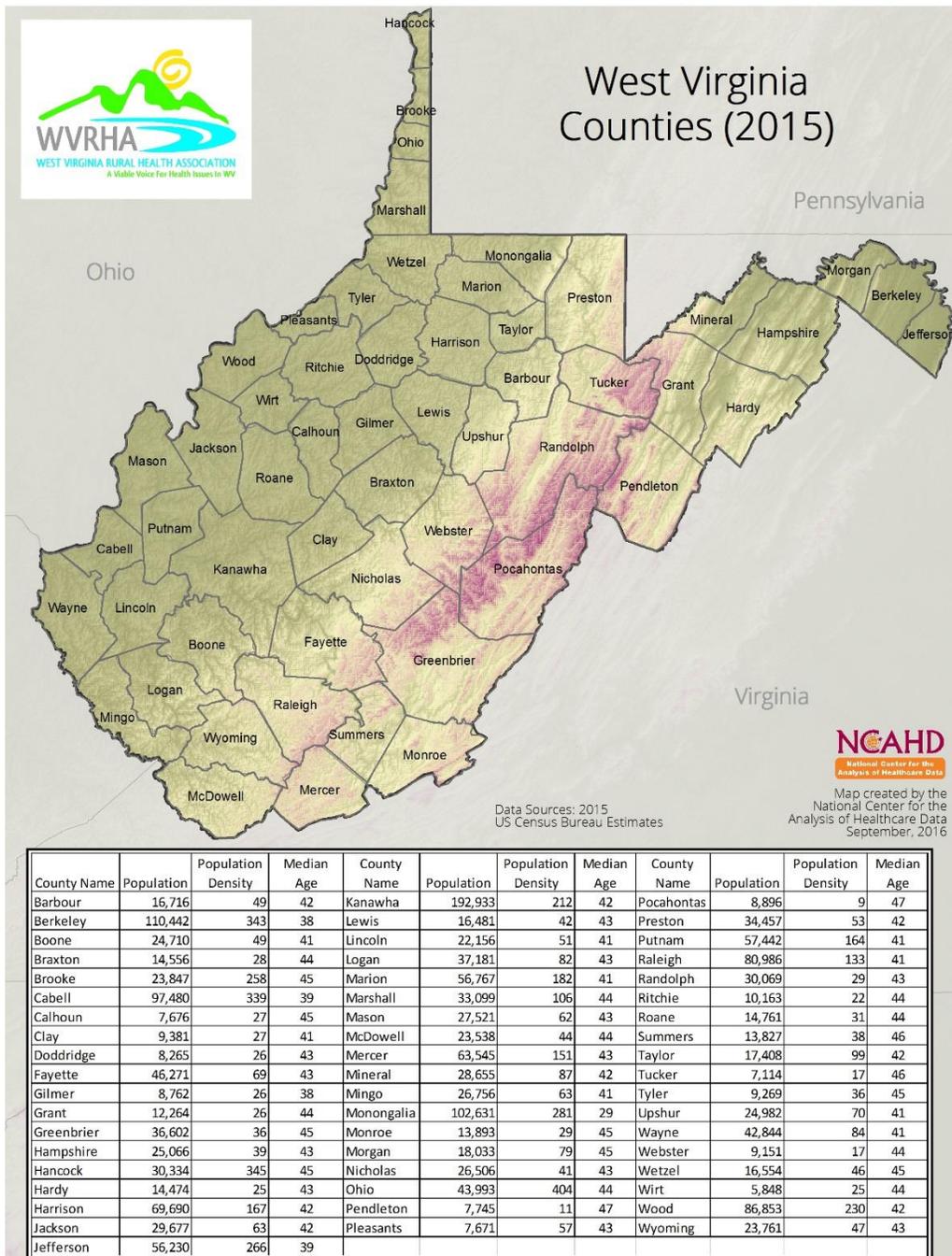


MAP 1- FREE AND CHARITABLE CLINICS

BASELINE

Many factors affect health outcomes, quality of healthcare delivery systems and workforce supply. Being able to project healthcare demand is complicated with our ever-changing healthcare delivery systems as the Patient Protection Affordable Care Act is being implemented across the country. Previous healthcare workforce projections (in the 1990s) were based upon an expectation that the delivery models would be closed, tightly managed care networks and would greatly decrease the demand for subspecialty care². Much has been published about the burgeoning aging population, but other influencers, such as income, emerging new technologies, changing disease profiles, changing public health priorities and the growing focus upon prevention programs greatly impact all stakeholders attempting to address their “niche” of healthcare issues.³

The following series of maps provide baseline data on West Virginia’s population relative to certain demographic, health outcomes and current insurance status for use in comparative analysis. In **Map 2**, the table provides the median age, county population and density.



MAP 2 WEST VIRGINIA COUNTY POPULATION ESTIMATES

Demographic influencers can directly impact access to care and the ability of areas to attract and retain healthcare services and providers, especially in rural areas. Low population density makes the affordable provision of care more difficult, with these populations relying heavily upon services in adjacent states (Maryland, Kentucky, Ohio, Pennsylvania, Virginia). Lower population density coupled with higher percentages of elderly population as seen in **Figure 3** indicate greater demand of healthcare services in these areas. Total population aged 65 years or older is expected to rise by more than 41 percent between 2010 and 2030, an increase of

nearly 123,300 people. About 93 percent of this increase comes from the aging Baby Boomer population. This has not changed because there has not been a population projection since his study was conducted.

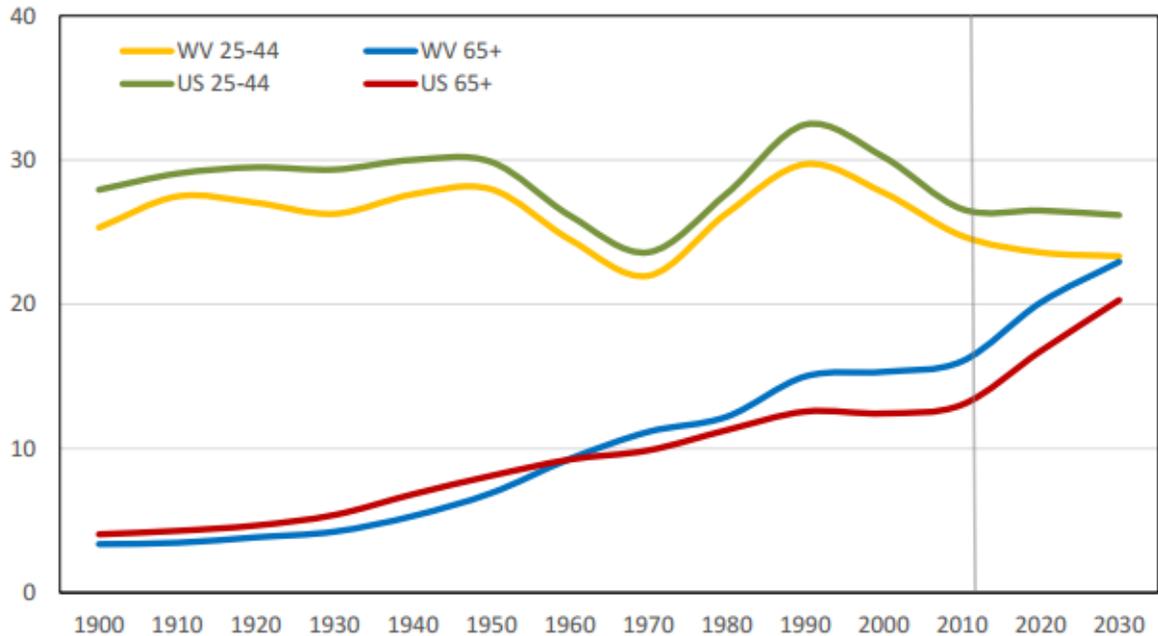
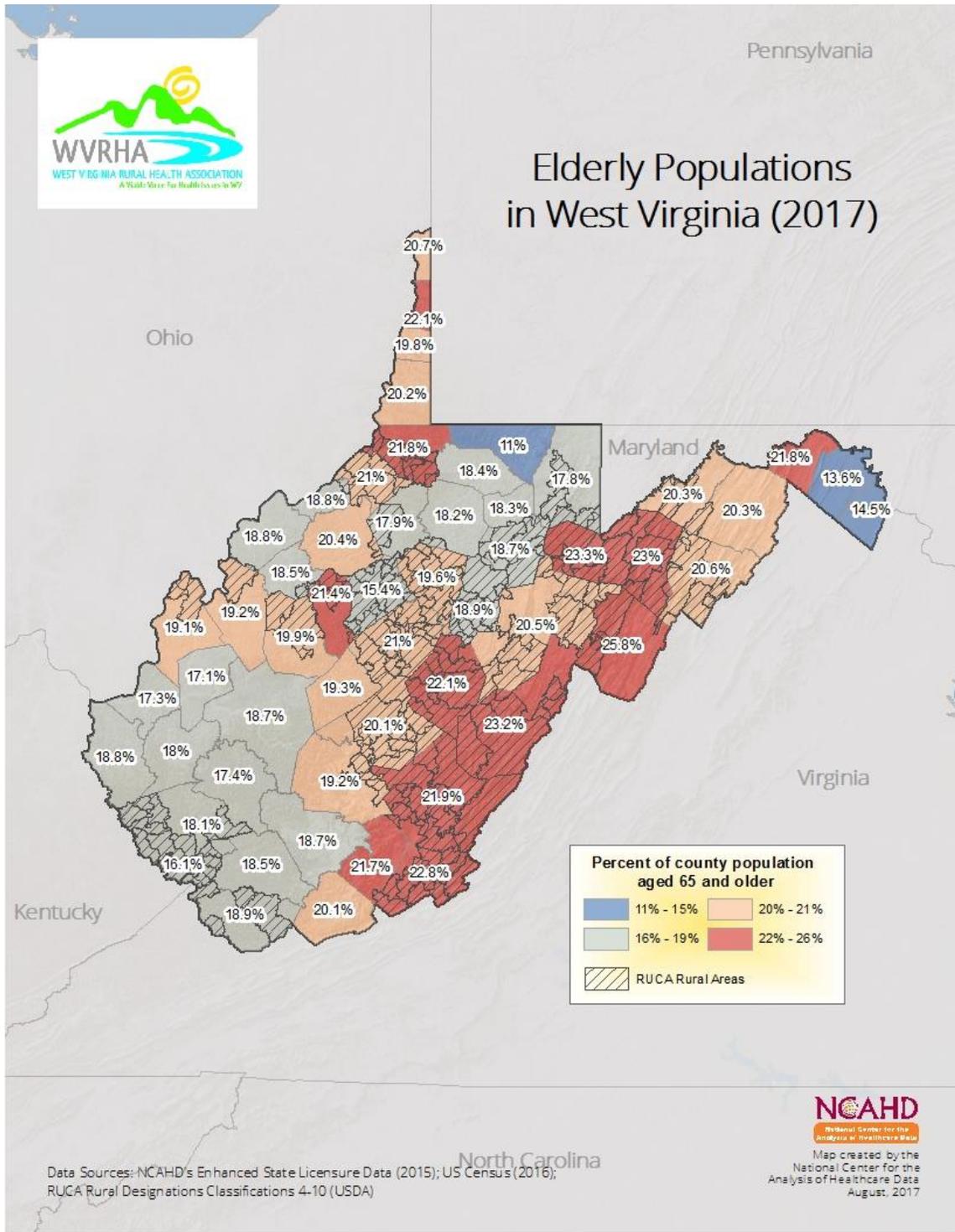


FIGURE 3 - SHARE OF POPULATION AGES 25-44 AND OVER AGE 65, 1900-2030

West Virginia is expected to remain among the oldest states in the nation in 2030. The share of the state's population that is 65 years and older will rise to 22.9 percent by 2030, up from 16.0 percent in 2010. This compares to the expectation that 20.3 percent of the national population will be age 65 and older by 2030. The state's share of population below 45 years old will decline to 52.6 percent, well below the national average of 57.1 percent (see Figure 13 above). This trend marks a substantial shift in the state's age distribution since the mid-20th century. In 1950, the year in which the state population reached its peak, West Virginia was among the youngest in the nation, posting a median age of 26.3 years, significantly below the national figure of 30.2 years⁴. **Map 3** demonstrates the distribution by county of the over 65 population as a percentage of the total county population.



MAP 3 - PERCENT OF ELDERLY POPULATIONS BY COUNTY

GRANDPARENTS RAISING GRANDCHILDREN

Across the United States, the rate of custodial grandparents has steadily risen over the last 30 years⁵. Census data indicates that the current number of custodial grandparents is approximately 2.6 million grandparents raising 4.5 million grandchildren⁶. Children under the care of custodial grandparents are believed to have higher rates of psychological issues however, little research has been done to examine the extent to which psychological issues impact the lives of the grandchildren. Most often, grandparents gain custody of grandchildren through extreme circumstances such as parent illness or death, substance abuse, child abuse/neglect, incarceration, divorce, and teenage pregnancy. This early childhood trauma, which takes place during very formative developmental years, causes long-term issues such as anxiety, abnormally high rates of irritability and anger, ADHD, and high rates of physical violence in teenage years⁷.

In addition to childhood development issues, studies also show increased psychological distress in custodial grandparents. These issues include inadequate support of grandchildren, anger, isolation due to social stigmas, disrupted leisure and retirement, guilt, and financial strain. These changes are most often seen in custodial grandmothers and contribute to insufficient parenting⁸. Additionally, many custodial grandparents suffer from health or mental issues diagnosed prior to custodial duties or may be forced out of retirement to meet the financial responsibilities of raising children⁹. This transition can be rough on all parties involved and contribute to the maladjustment in custodial grandchildren³.

In West Virginia, currently there are more than 25,000 children being raised by grandparents and this number has been steadily¹⁰. In some areas this number is significantly higher than the rest of the West Virginia. Schools in McDowell County West Virginia estimate that approximately 45% of children live apart from their birth parents. As seen in **Map 4**, McDowell County has the highest rate of grandchildren living with grandparents in the state (17%).

Virginia, WV Bureau of Senior Services and the Brookdale Foundation, provides non-financial assistance and outreach to all relatives serving as custodians for children across West Virginia. They provide educational support, new parent training, online support groups, and advocacy to an underrepresented portion of the population⁵.

ACCESS TO FOOD – IMPACT UPON HEALTH

Eating more fruits and vegetables and fewer prepackaged meals contribute to a person's quality and length of life. Increasing the availability of healthy food options also increases the likelihood of healthier eating. The research is unclear though on whether food access changes the relationship between poverty and health especially rural areas of the United States. While there is well-developed literature in urban food access and poverty, rural poverty issues have received notably less attention in both the academic research and policy arenas.¹¹ Unfortunately, the lack of rural relevant research in this area is persistent in most areas of health-related research. Typically, data collection activities are conducted through sample surveys which are often skewed to urban areas/participants.

The rise in diet-related chronic disease can be attributed to a number of factors, among them poor dietary choices, limited knowledge about nutrition, food environments characterized by deficient access to and availability of healthy foods, public policies, and social norms. Rates of both diet-related chronic disease and food insecurity have increased substantially in recent decades, and low-income and rural populations are disproportionately affected. Areas in both urban and rural referred to as “food deserts”. The Healthy Food Financing Initiative (HFFI) Working Group considers a food desert as a low-income census tract where a substantial number or share of residents has low access to a supermarket or large grocery store. Furthermore, to qualify as a food desert tract, at least 33 percent of the tract's population or a minimum of 500 people in the tract must have low access to a supermarket or large grocery store.

The US Department of Agriculture just released in July 2017, the food desert change data that demonstrates those areas that became food deserts in 2015, were removed in 2015 or that are still food desert since 2010 when the classification was started. Below is an image of the food desert areas in and around West Virginia (see **Figure 4**). (**Note:** This data will be available through the WVHDP in late September). In this figure, you will note areas that have not changed from being food deserts in five years. Much has been written about food choices around easier access (e.g. fast food and convenience store) and the quality of food choices in these establishments relating to population health. Although there are direct correlations, in rural areas, access to food is often directly coupled with transportation, or the lack there of.

One of the few rural food access research publications, drew the correlation, that in rural areas, not urban, obesity rates were significantly lower in areas with higher density of farmers markets.¹² Similarly, both rural and urban counties with higher than average convenience stores were associated with poorer health outcomes, including adjusted mortality, diabetes, and obesity rates.¹³ Research conducted in 2014 to explore the relationship between poverty, health and access to healthy foods determined that higher levels of healthy food access are associated with better health. Therefore, promoting access to healthier foods in rural areas, such as farmers' markets and better-quality food sources at convenience stores may help mitigate the poverty and health relationship.¹⁴

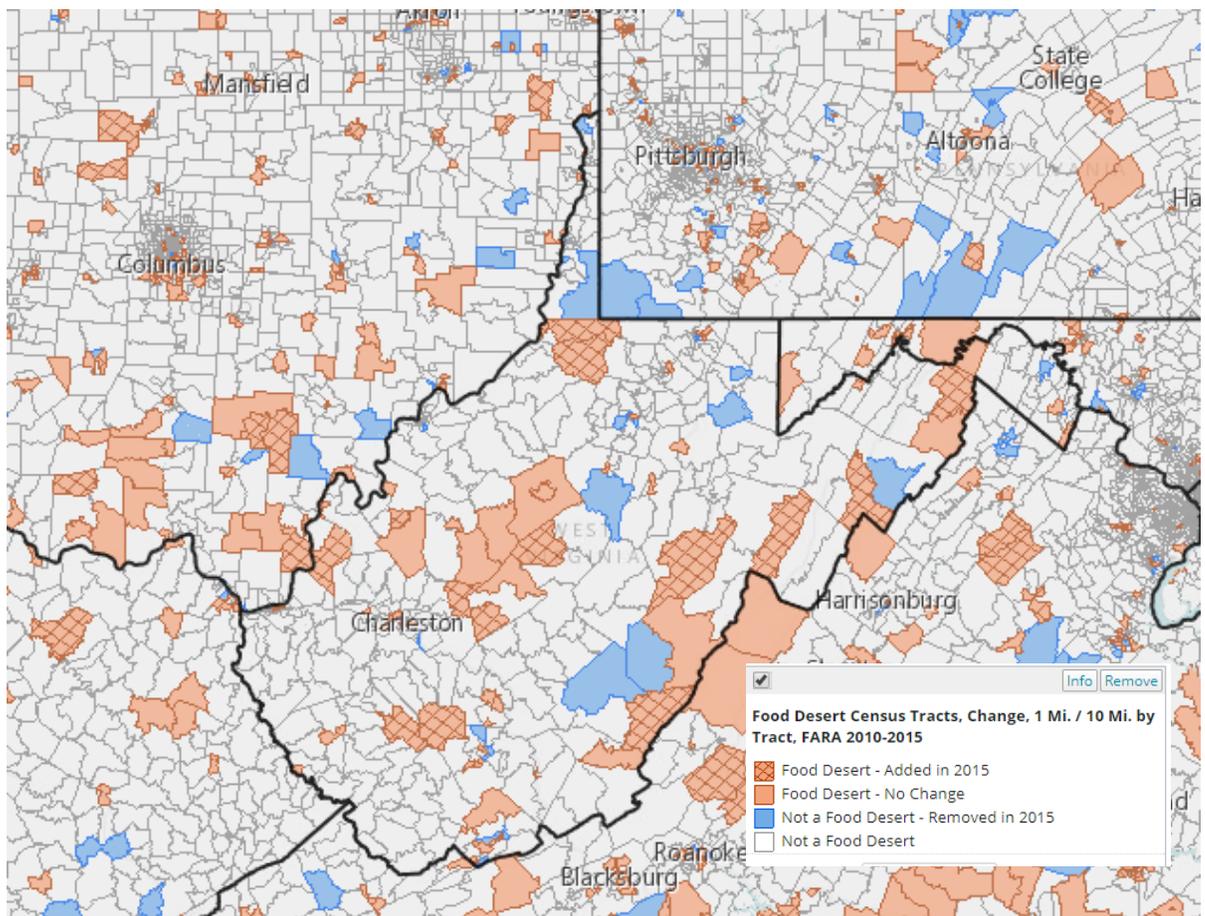
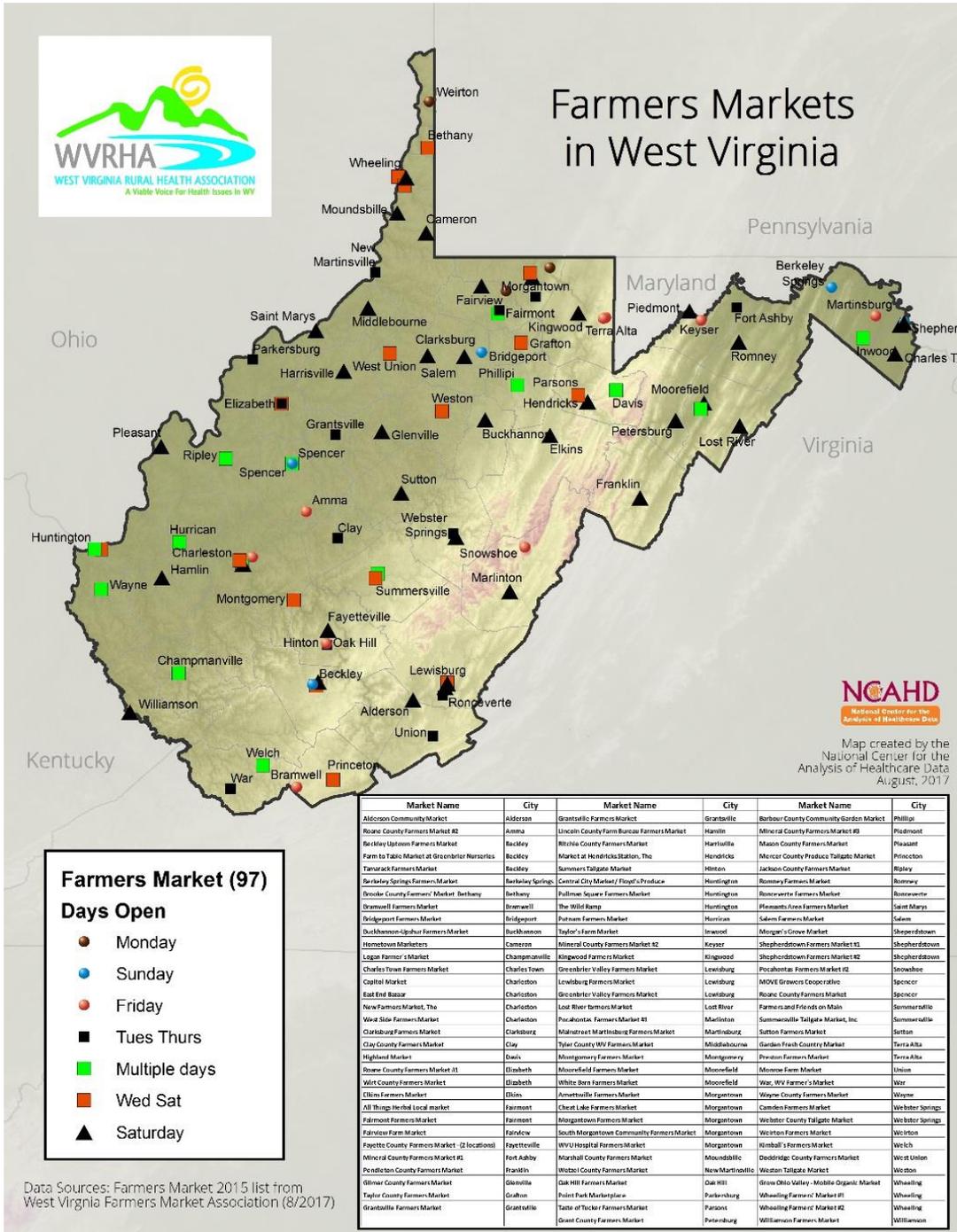


FIGURE 4 - USDA CHANGES IN FOOD DESERT (2010 - 2015)

In support of helping to provide data and information to support improved access to food, NCAHD, we created a data list of the most current collection of Farmers' Markets locations in West Virginia from the WV Farmers Market Associations (See **Map 5 - WV Farmers Markets**).



Farmers Markets in West Virginia



Farmers Market (97)

Days Open

- Monday
- Sunday
- Friday
- Tues Thurs
- Multiple days
- Wed Sat
- ▲ Saturday

| Market Name | City | Market Name | City | Market Name | City |
|----------------------------------------------|------------------|-------------------------------------------|------------------|------------------------------------------|-----------------|
| Alderson Community Market | Alderson | Grantville Farmers Market | Grantville | Barbour County Community Garden Market | Phillip |
| Roane County Farmers Market #2 | Amma | Lincoln County Farm Bureau Farmers Market | Hanlin | Mineral County Farmers Market #3 | Piedmont |
| Berkeley Uptown Farmers Market | Beckley | Mitchell County Farmers Market | Hartsville | Mason County Farmers Market | Pleasant |
| Farm to Table Market at Greenbrier Nurseries | Beckley | Market at Hendricks Station, The | Hendricks | Mercer County Produce Tallgate Market | Princeton |
| Tanawack Farmers Market | Beckley | Summers Tallgate Market | Hinton | Jackson County Farmers Market | Ripley |
| Berkeley Springs Farmers Market | Berkeley Springs | Central City Market/ Floop's Produce | Huntington | Romney Farmers Market | Romney |
| Brock County Farmers Market | Bethany | Pullman Square Farmers Market | Huntington | Roswell Farmers Market | Roswell |
| Dramwell Farmers Market | Dramwell | The Wild Ramp | Huntington | Plattsburgh Area Farmers Market | Saint Marys |
| Delaplane Farmers Market | Bridgeport | Parsons Farmers Market | Harrison | Salem Farmers Market | Salem |
| Buckhannon-Goshaw Farmers Market | Buckhannon | Taylor's Farm Market | Inwood | Morgan's Grove Market | Shepherdstown |
| Homebown Market | Cameron | Mineral County Farmers Market #2 | Keyser | Shepherdstown Farmers Market #1 | Shepherdstown |
| Logan Farmer's Market | Chapmanville | Kingwood Farmers Market | Kingwood | Shepherdstown Farmers Market #2 | Shepherdstown |
| Charles Town Farmers Market | Charles Town | Greenbrier Valley Farmers Market | Lewisburg | Pocahontas Farmers Market #2 | Snowshoe |
| Capital Market | Charleston | Lewisburg Farmers Market | Lewisburg | MOVE Growers Cooperative | Spencer |
| East End Bazaar | Charleston | Greenbrier Valley Farmers Market | Lewisburg | Roane County Farmers Market | Spencer |
| New Farmers Market, The | Charleston | Lost River Farmers Market | Lost River | Farmers and Friends on Main | Summersville |
| Wet Side Farmers Market | Charleston | Pocahontas Farmers Market #1 | Marlinburg | Summersville Tallgate Market, Inc. | Summersville |
| Clarksburg Farmers Market | Clarksburg | Marshall County Farmers Market | Moundsville | Sutton Farmers Market | Sutton |
| Clay County Farmers Market | Clay | Tyler County WV Farmers Market | Middlebourne | Garden Fresh Country Market | Terra Alta |
| Highland Market | Davis | Montgomery Farmers Market | Montgomery | Princeton Farmers Market | Terra Alta |
| Roane County Farmers Market #1 | Elizabeth | Moorefield Farmers Market | Moorefield | Mason Farm Market | Union |
| Wirt County Farmers Market | Elizabeth | White Barn Farmers Market | Moorefield | War, WV Farmer's Market | War |
| Elkins Farmers Market | Elkins | Amesville Farmers Market | Morgantown | Wayne County Farmers Market | Wayne |
| All Things Herbal Local market | Fairmont | Cheat Lake Farmers Market | Morgantown | Camden Farmers Market | Webster Springs |
| Fairmont Farmers Market | Fairmont | Morgantown Farmers Market | Morgantown | Webster County Tallgate Market | Webster Springs |
| Fairview Farm Market | Fairview | South Morgantown Community Farmers Market | Morgantown | Weston Farmers Market | Weston |
| Putnam County Farmers Market (2 Locations) | Fayetteville | WV Hospital Farmers Market | Morgantown | Winhall's Farmers Market | Winch |
| Mineral County Farmers Market #1 | Fort Ashby | Marshall County Farmers Market | Moundsville | Deedsridge County Farmers Market | West Union |
| Pendleton County Farmers Market | Franklin | Webster County Farmers Market | New Martinsville | Western Tallgate Market | Weston |
| Glinn County Farmers Market | Glennville | Oak Hill Farmers Market | Oak Hill | Grow Ohio Valley - Mobile Organic Market | Wheeling |
| Taylor County Farmers Market | Grafton | Poison Park Marketplace | Parkersburg | Wheeling Farmer's Market #1 | Wheeling |
| Grantville Farmers Market | Grantville | Table of Tucker Farmers Market | Parsons | Wheeling Farmer's Market #2 | Wheeling |
| | | Grant County Farmers Market | Petersburg | Williamson Farmers Market | Williamson |

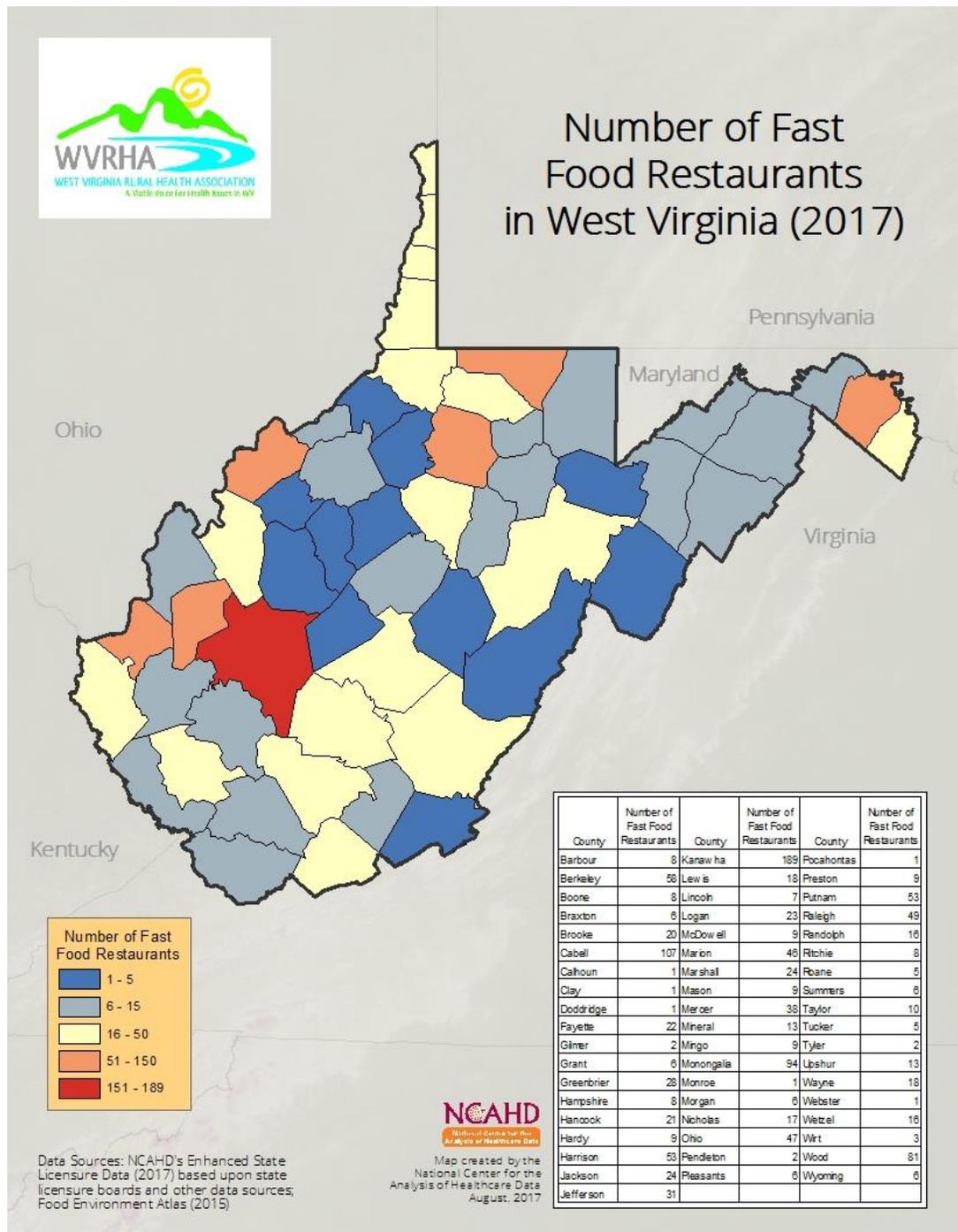
Data Sources: Farmers Market 2015 list from West Virginia Farmers Market Association (8/2017)

MAP 5 - WEST VIRGINIA FARMERS MARKETS

As previously mentioned, the collection of data on access to food in rural areas is limited and through the USDA's Food Atlas, is typically over a decade old. We did add the few current data that will be added to the WVHDP that will be useful in identifying and targeting planning and policy surrounding access to health food are: Number of Fast Food Restaurants by county, percentage change in Fast Food Restaurants, and the Number of Fast Food Restaurants per 1,000 people (see **Maps 6-8**).



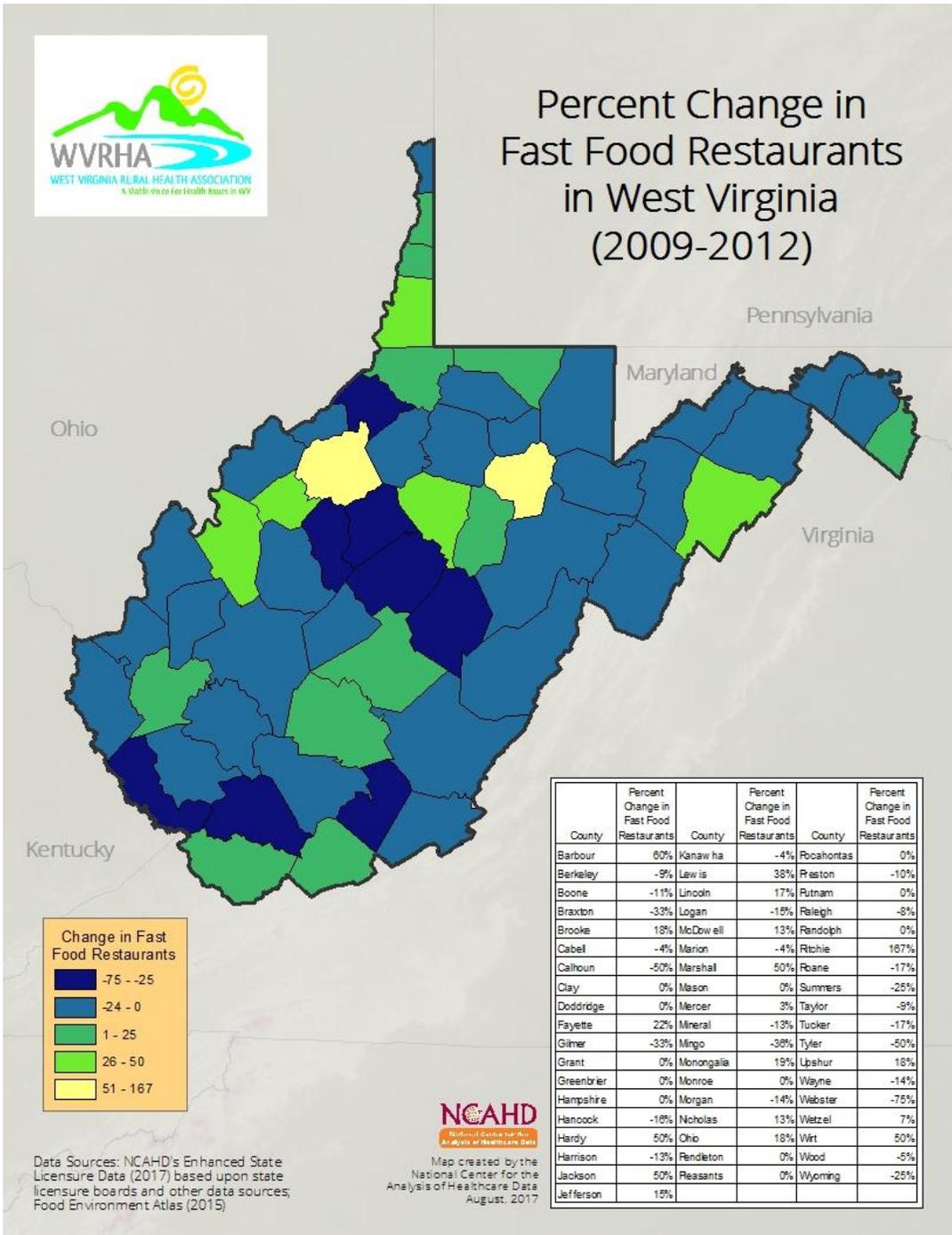
Number of Fast Food Restaurants in West Virginia (2017)



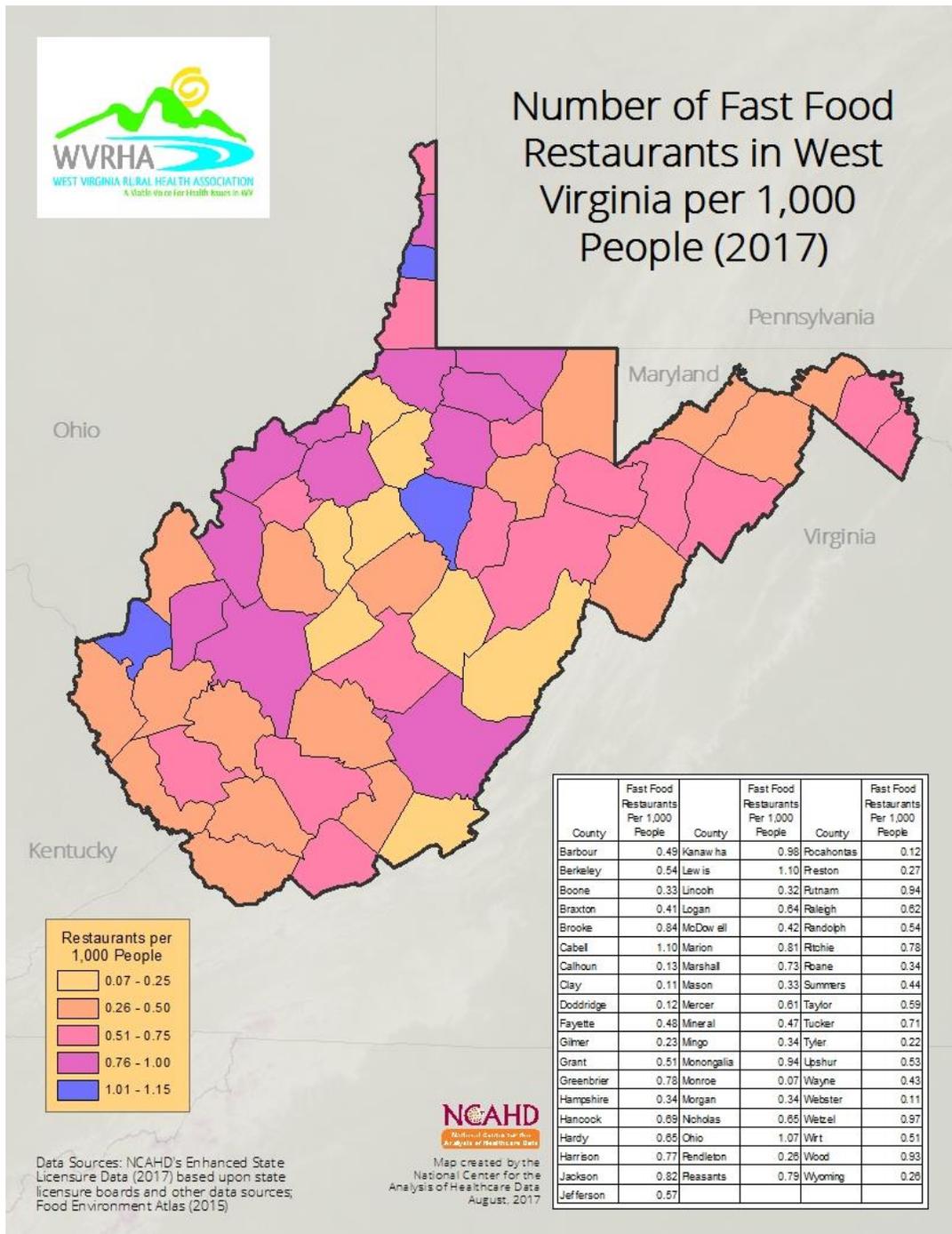
MAP 6 -FAST FOOD RESTAURANTS BY COUNTY



Percent Change in Fast Food Restaurants in West Virginia (2009-2012)



MAP 7 % CHANGE IN FAST FOOD RESTAURANTS



MAP 8 FAST FOOD RESTAURANTS PER 1,000 PEOPLE

RESULTS OF HEALTHCARE WORKFORCE PLANNING

The importance of growing and sustaining a primary care workforce and its related infrastructure (e.g. education, facilities, policy, etc.) has been the topic of research and discussion for decades. In the 1990s, public policy and funding efforts were aligned to increase the primary care workforce inasmuch that family medicine training efforts across the country grew 34 percent.

Although this increase occurred, the growth of the subspecialist workforce outstripped that of primary care physicians. Since 1997, U.S. medical school graduate matches in family medicine and general internal medicine programs have fallen by nearly 50 percent. In West Virginia, 65 percent of all Osteopathic Physicians practice a primary care specialty as compared to 33 percent of Allopathic Physicians. Physician research and state workforce development boards across the county are researching how best to address the recruitment and retention challenges of healthcare workforce.

In May, 2017, the Government Accountability Office published their research results of the impact the four federal programs are having upon addressing the growing physician workforce needs in rural/underserved areas. These primary care Graduate Medical Education (GME) incentives, including the Primary Care Health Professions Shortage area program were initially created to provide monetary incentives, such as the Medicare 10% bonus payment or loan reductions/payoff, and other clinic, residency program or hospital-based incentives. What GAO found was that although more than \$15 Billion per year is going into these programs, about 3 percent went into residency program serving rural/underserved and federal funding for some of the programs geared to support rural GME has ended.¹⁵ **Figure 5** demonstrate the maldistribution of funded GME residents by training site.

Distribution of Graduate Medical Education Residents in their Primary Training Sites, Academic Year 2015

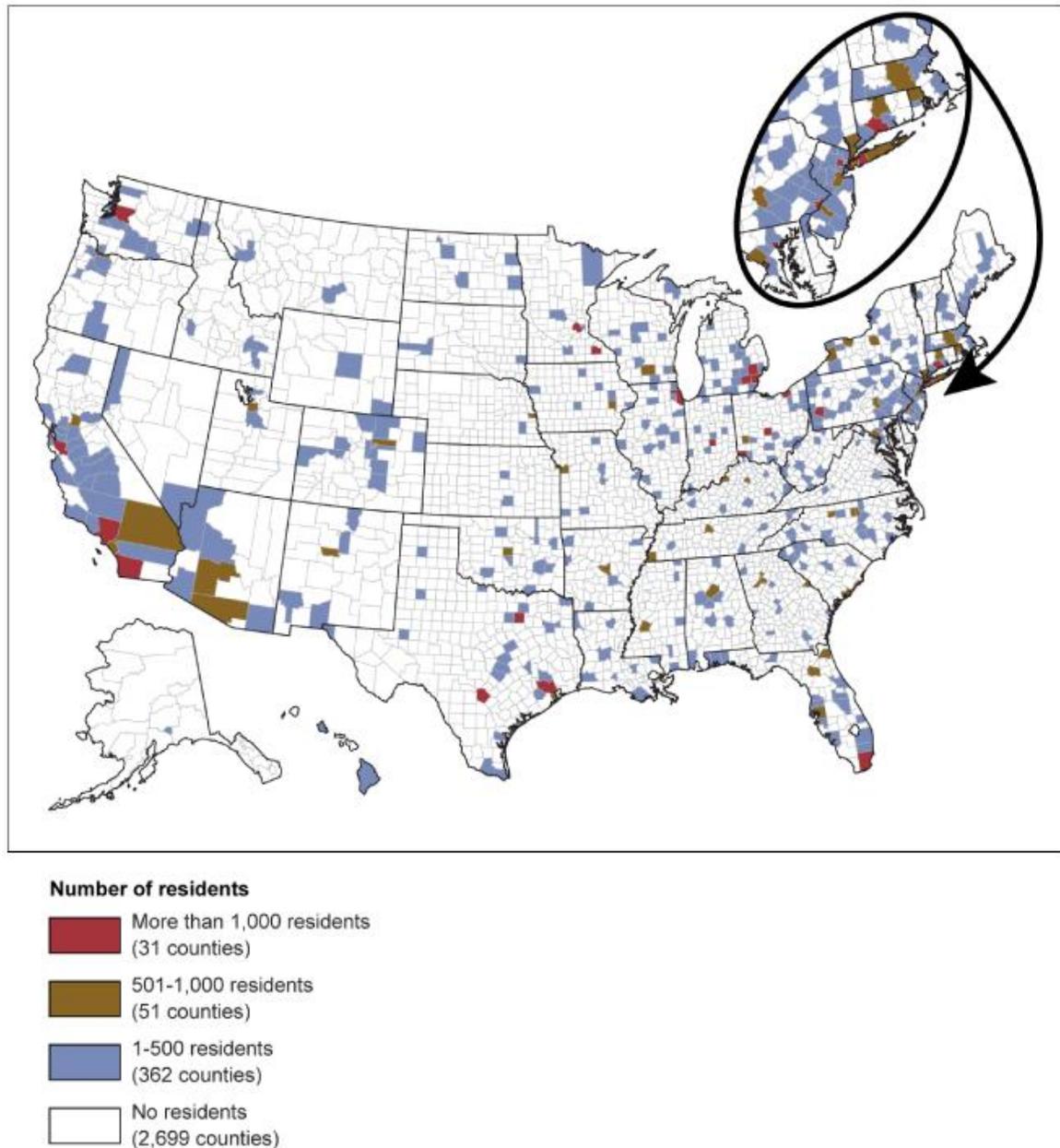


FIGURE 5 - FUNDED GME RESIDENTS BY TRAINING SITE

Unfortunately, in 2016 HRSA's Bureau of Health Professions (BrHP) changed their data source and methodology used for determining Primary Care Health Professional Shortage Areas (PC HPSA)s. Instead of using the AMA Physician Masterfile data source, they are now using the National Provider Index (NPI) file, a data source that was never intended for use in healthcare workforce analysis and providers are not required to update this information and it will miss those providers not providing services to Medicare/Medicaid patients.¹⁶ As you can see from NCAHD's comparative analysis below, our ESL data is significantly different than the NPI (See **Table 1-2017 West Virginia NPI to ESL comparison**).

| 2017 West Virginia Healthcare Workforce National Provide Index (NPI) to ESL* Comparative Analysis* | | | |
|-------------------------------------------------------------------------------------------------------|---------------------------------|-----------|--------------|
| Provider Type | ESL Total Active Licensed | NPI Total | % Difference |
| Allopathic Physicians | 5,177 | 3,955 | -24% |
| Osteopathic Physicians | 955 | 817 | -14% |
| Nurse Practitioner | 1,199 | 821 | -32% |
| Physician Assistants | 698 | 605 | -13% |
| Dentists | 895 | 576 | -36% |
| Physical Therapists | 1,025 | 860 | -16% |
| Totals | 9,949 | 7,634 | -23% |

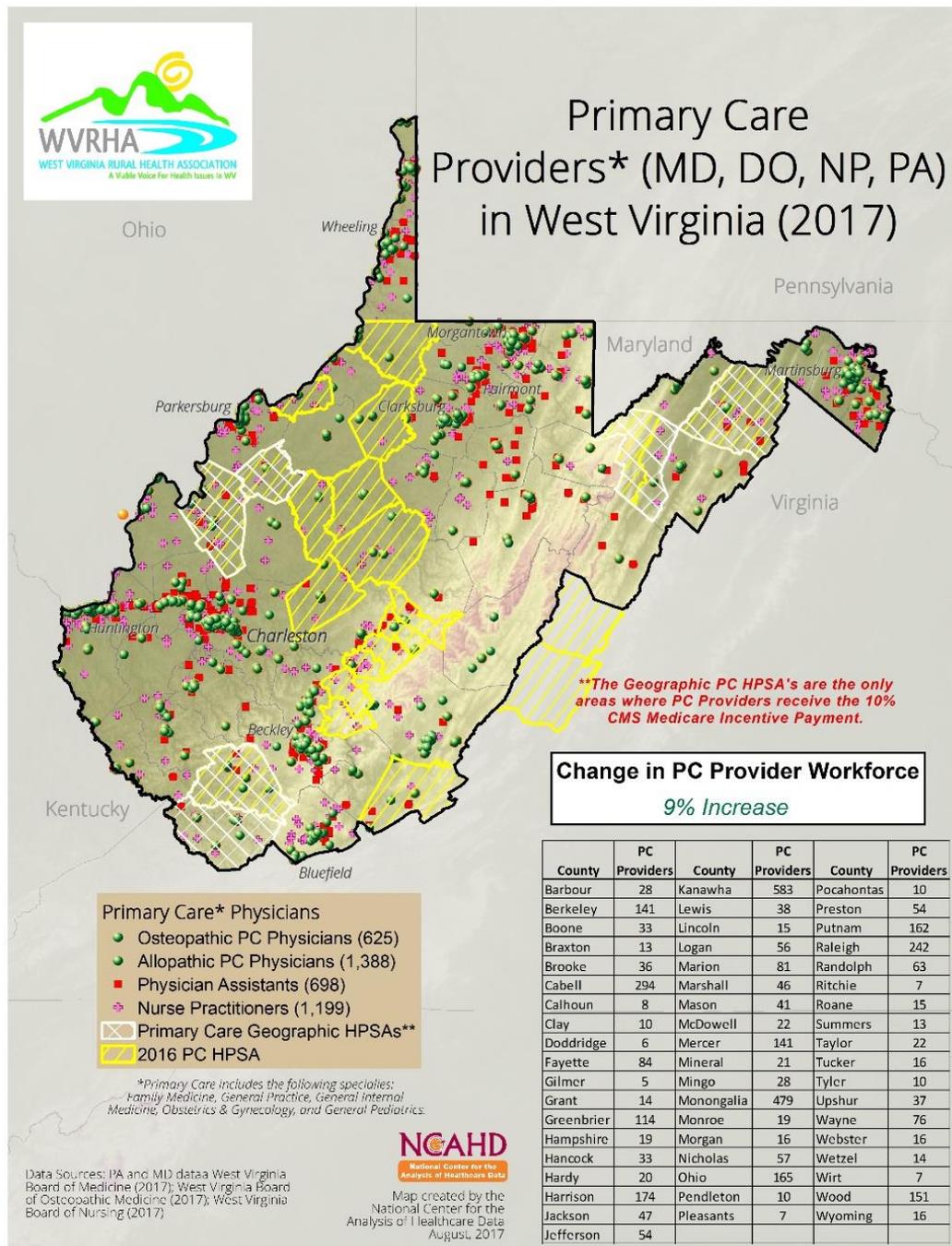
TABLE 1 - 2017 WEST VIRGINIA NPI TO ESL COMPARISON

The change for West Virginia providers was significant with an average of 54% of the former eligible primary care practitioners (PC MD, DO, Nurse Practitioners and Physician Assistants) will no longer receive the 10% CMS Incentive payment for certain Medicare Services (see **Table 2**).

| Provider Type | # receiving CMS Payment in 2016 | # receiving CMS Payment in 2017 | % Impacted by reduction of eligible areas |
|---------------|------------------------------------------|------------------------------------------|-------------------------------------------------|
| MD | 42 | 25 | 55% |
| DO | 42 | 20 | 48% |
| PA | 29 | 15 | 51% |
| NP | 101 | 55 | 54% |
| Totals | 214 | 115 | Average 54% |

TABLE 2 - COMPARISON OF PROVIDERS RECEIVING CMS BONUS PAYMENT

To visualize providers/areas that will be most impacted by the change in PC HPSA designation, we generated a map comparing the 2016 PC HPSA to the current PC HPSA (See **Map 9**).



MAP 9 - COMPARISON OF PRIMARY CARE PROVIDERS TO PC HPSA 2016 TO 2017

HEALTHCARE WORKFORCE SUPPLY (INSTATE)

West Virginia institutions of higher education offer an array of health profession training programs, many of which emphasize training in primary care and the importance of providing care in rural and underserved area of the state. These education and training programs are the foundation of statewide efforts to increase the supply and more effective distribution of primary care providers. To complement the training programs, West Virginia also significantly invests in pipeline programs, community-based training for students in primary care training programs, and incentive programs for primary care providers.

A host of pipeline programs are offered in middle school, high school, and college and allow students to explore healthcare careers. Each of the state's three academic health centers located at Marshall University, the West Virginia School of Osteopathic Medicine, and the West Virginia University Health Sciences Center partner with communities across the state to host enrichment programs like health career clubs, summer camps, and shadowing programs. Many of these activities are conducted in partnership with the state's five Area Health Education Center regional sites.

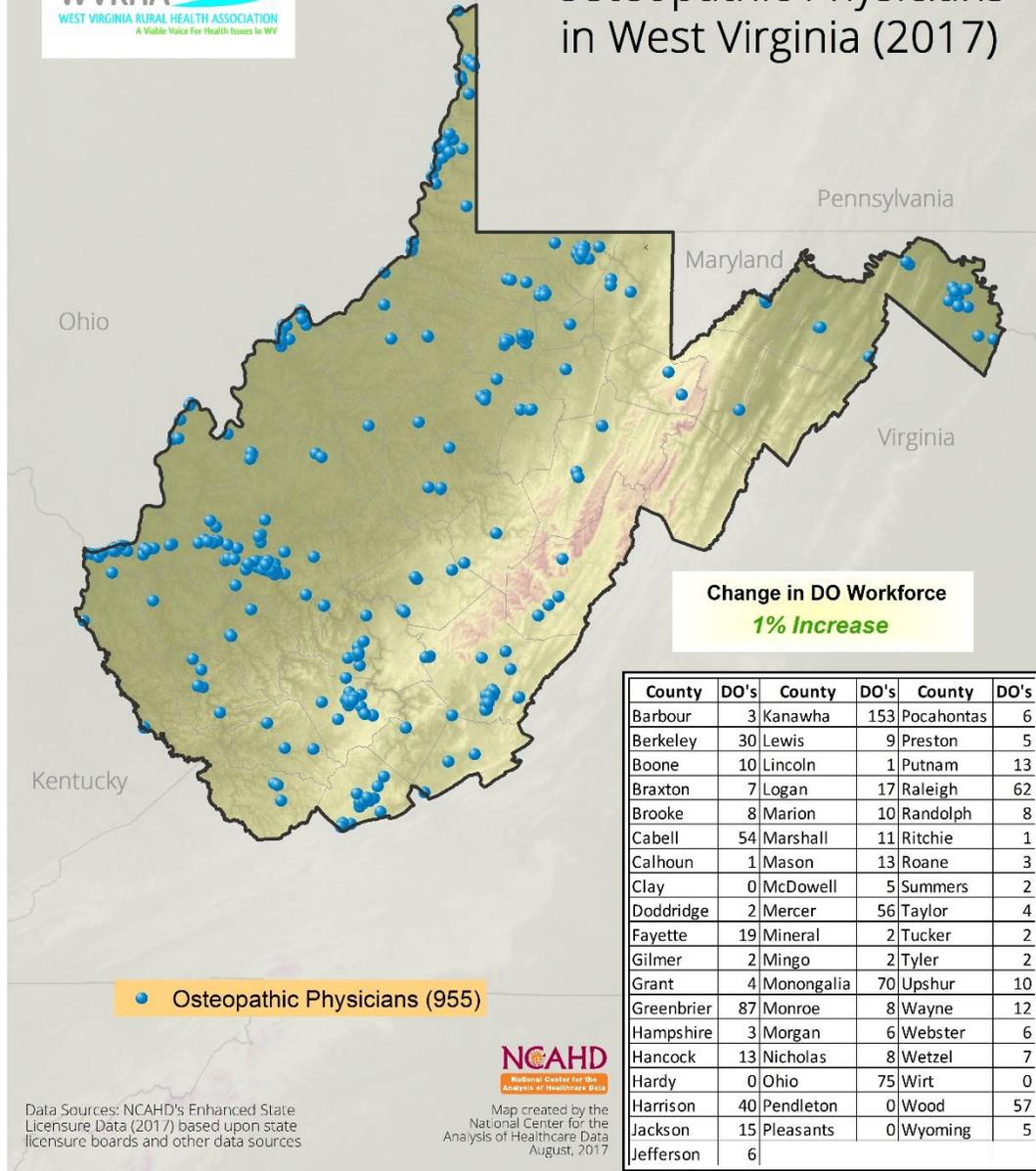
Scores of primary care providers in West Virginia volunteer as clinical preceptors to ensure students and residents incur meaningful experiences while on clinical rotations. The state-funded Rural Health Initiative provides significant funding to support student rotations and housing, community-based research, incentive stipends, and intensive field experiences for students and residents most interested in primary care and rural health.

In addition to federal programs like the National Health Service Corps, West Virginia offers several state-funded incentive programs designed to attract a variety of primary care providers to underserved areas of the state. These programs include the Bureau for Public Health's Recruitment and Retention Community Project and the West Virginia Higher Education Policy Commission's Health Sciences Scholarship Program and offer between \$10,000 and \$50,000 in assistance to primary care providers in exchange for at least a two-year service obligation.

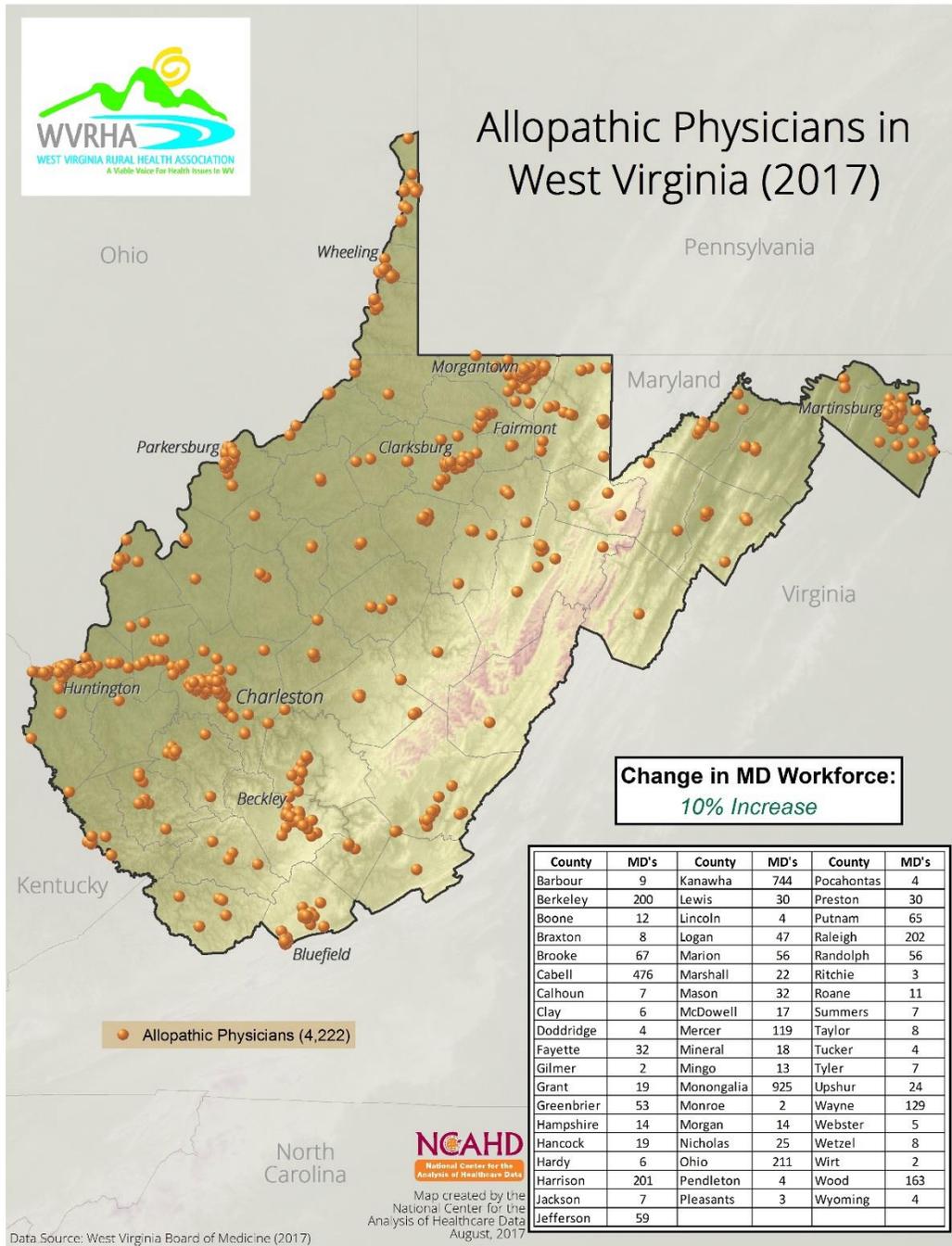
For the following maps, the provider's practice site is shown relative to county boundaries and major cities. Where there are clusters of providers, the assumption is that multiple providers practice at the same facility/site. For each provider, there are four maps: Individual provider distribution, county aggregate (with the number practicing within the county), normalized county aggregated (to 10,000 population) and regional aggregation (with the total by region indicated).



Osteopathic Physicians in West Virginia (2017)



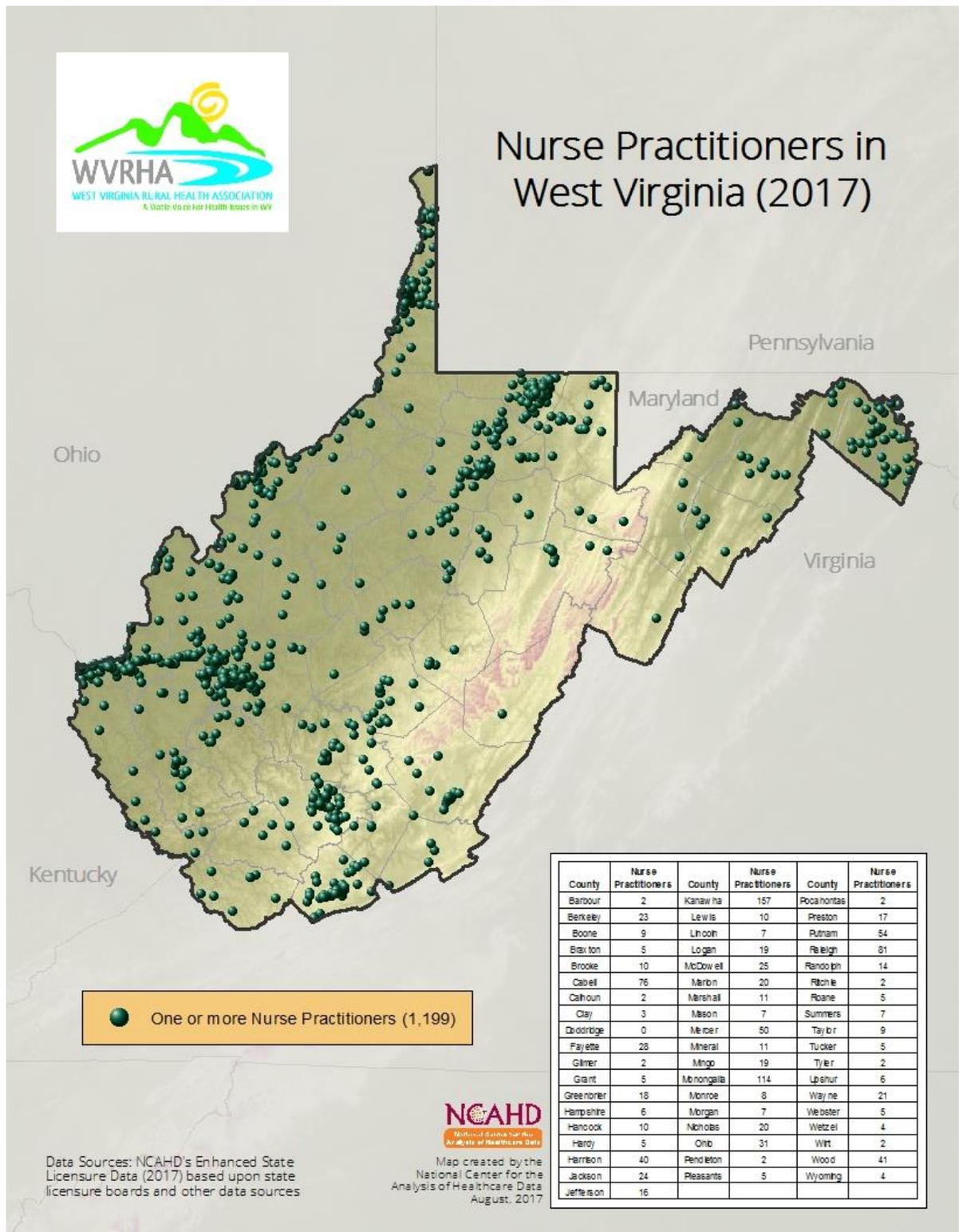
MAP 10- STATEWIDE DISTRIBUTION OF OSTEOPATHIC PHYSICIANS



MAP 11- STATEWIDE DISTRIBUTION OF ALLOPATHIC PHYSICIANS



Nurse Practitioners in West Virginia (2017)



| County | Nurse Practitioners | County | Nurse Practitioners | County | Nurse Practitioners |
|------------|---------------------|------------|---------------------|------------|---------------------|
| Barbour | 2 | Kanawha | 157 | Pocahontas | 2 |
| Berkeley | 23 | Lewis | 10 | Preston | 17 |
| Boone | 9 | Lincoln | 7 | Putnam | 54 |
| Braxton | 5 | Logan | 19 | Randolph | 81 |
| Brooke | 10 | McDowell | 25 | Randolph | 14 |
| Cabell | 75 | Marion | 20 | Roane | 2 |
| Calhoun | 2 | Marshall | 11 | Roane | 5 |
| Clay | 3 | Mason | 7 | Summers | 7 |
| Doddridge | 0 | Mercer | 50 | Taylor | 9 |
| Fayette | 28 | Mineral | 11 | Tucker | 5 |
| Gilmer | 2 | Mingo | 19 | Tyler | 2 |
| Grant | 5 | Monongalia | 114 | Upshur | 6 |
| Greenbrier | 18 | Monroe | 8 | Wayne | 21 |
| Hampshire | 6 | Morgan | 7 | Webster | 5 |
| Hancock | 10 | Nichols | 20 | Wetzel | 4 |
| Harby | 5 | Ohio | 31 | Wirt | 2 |
| Harrison | 40 | Pendleton | 2 | Wood | 41 |
| Jackson | 24 | Putnam | 5 | Wyoming | 4 |
| Jefferson | 16 | | | | |

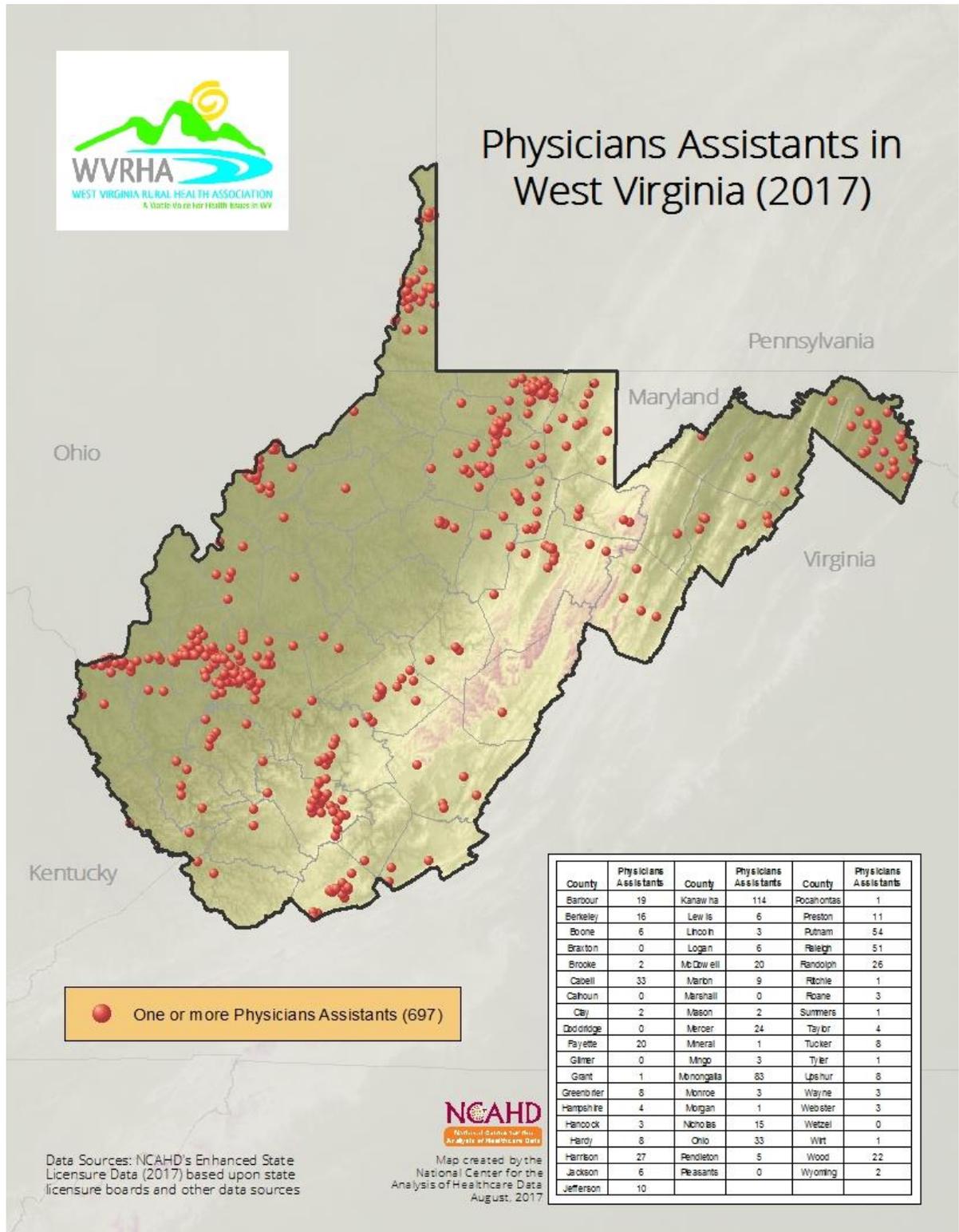
Data Sources: NCAHD's Enhanced State Licensure Data (2017) based upon state licensure boards and other data sources

NCAHD
 National Center for the
 Analysis of Healthcare Data
 August, 2017

MAP 12 - STATEWIDE DISTRIBUTION OF NURSE PRACTITIONERS



Physicians Assistants in West Virginia (2017)



● One or more Physicians Assistants (697)

| County | Physicians Assistants | County | Physicians Assistants | County | Physicians Assistants |
|------------|-----------------------|------------|-----------------------|------------|-----------------------|
| Barbour | 19 | Kanawha | 114 | Pocahontas | 1 |
| Berkeley | 16 | Lewis | 6 | Preston | 11 |
| Boone | 6 | Lincoln | 3 | Putnam | 54 |
| Braxton | 0 | Logan | 6 | Reign | 51 |
| Brooke | 2 | McDowell | 20 | Randolph | 26 |
| Cabell | 33 | Marton | 9 | Roche | 1 |
| Calhoun | 0 | Marshall | 0 | Roane | 3 |
| Clay | 2 | Mason | 2 | Summers | 1 |
| Dodridge | 0 | Mercer | 24 | Taylor | 4 |
| Fayette | 20 | Mineral | 1 | Tucker | 8 |
| Gilmer | 0 | Mingo | 3 | Tyler | 1 |
| Grant | 1 | Monongalia | 83 | Upshur | 8 |
| Greenbrier | 8 | Monroe | 3 | Wayne | 3 |
| Hampshire | 4 | Morgan | 1 | Webster | 3 |
| Hancock | 3 | Nichols | 15 | Wetzel | 0 |
| Hardy | 8 | Ohio | 33 | Wirt | 1 |
| Harrison | 27 | Pendleton | 5 | Wood | 22 |
| Jackson | 6 | Putnam | 0 | Wyoming | 2 |
| Jefferson | 10 | | | | |

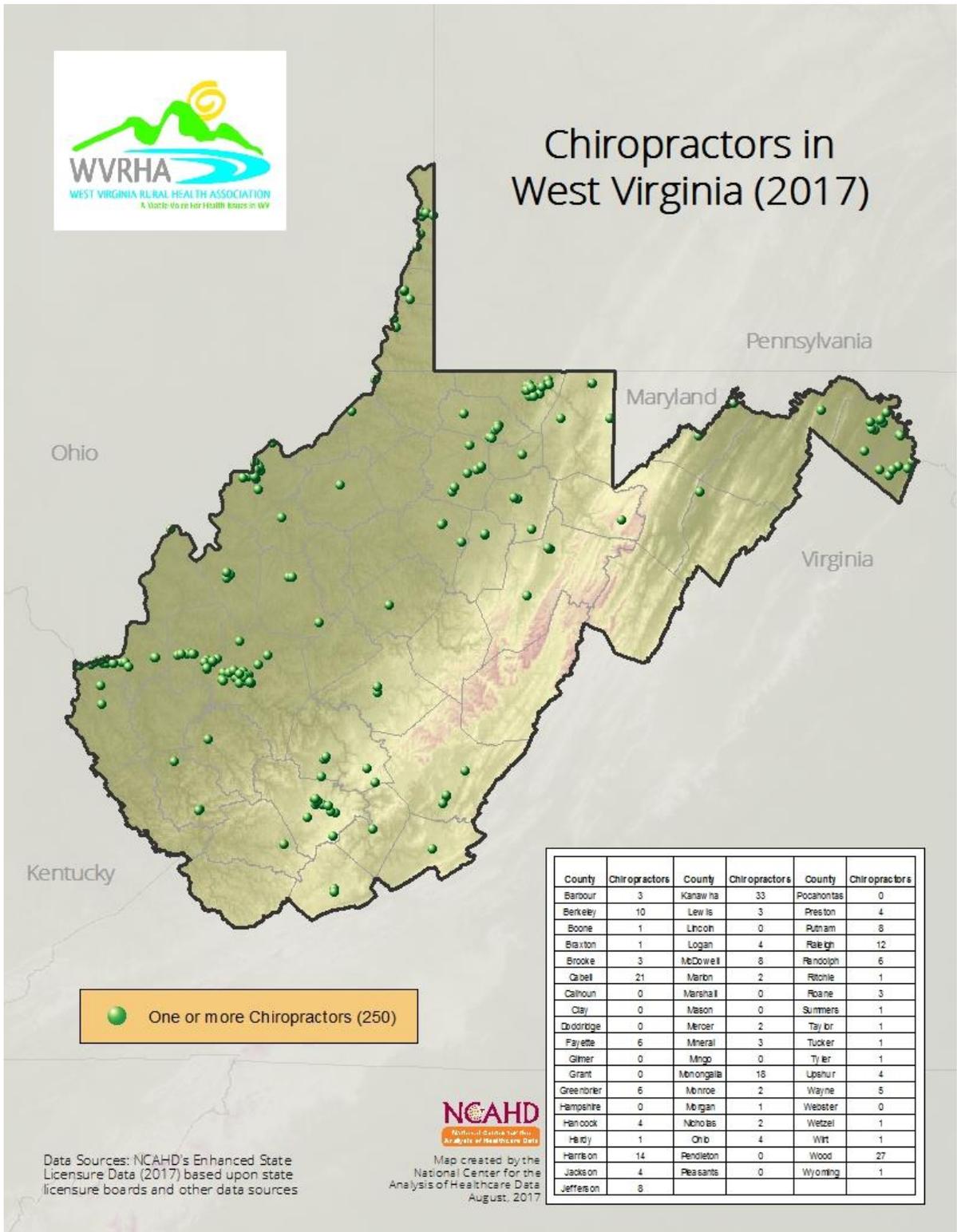
Data Sources: NCAHD's Enhanced State Licensure Data (2017) based upon state licensure boards and other data sources

NCAHD
National Center for the Analysis of Healthcare Data
Map created by the National Center for the Analysis of Healthcare Data
August, 2017

MAP 13 - STATEWIDE DISTRIBUTION OF PHYSICIAN ASSISTANTS



Chiropractors in West Virginia (2017)



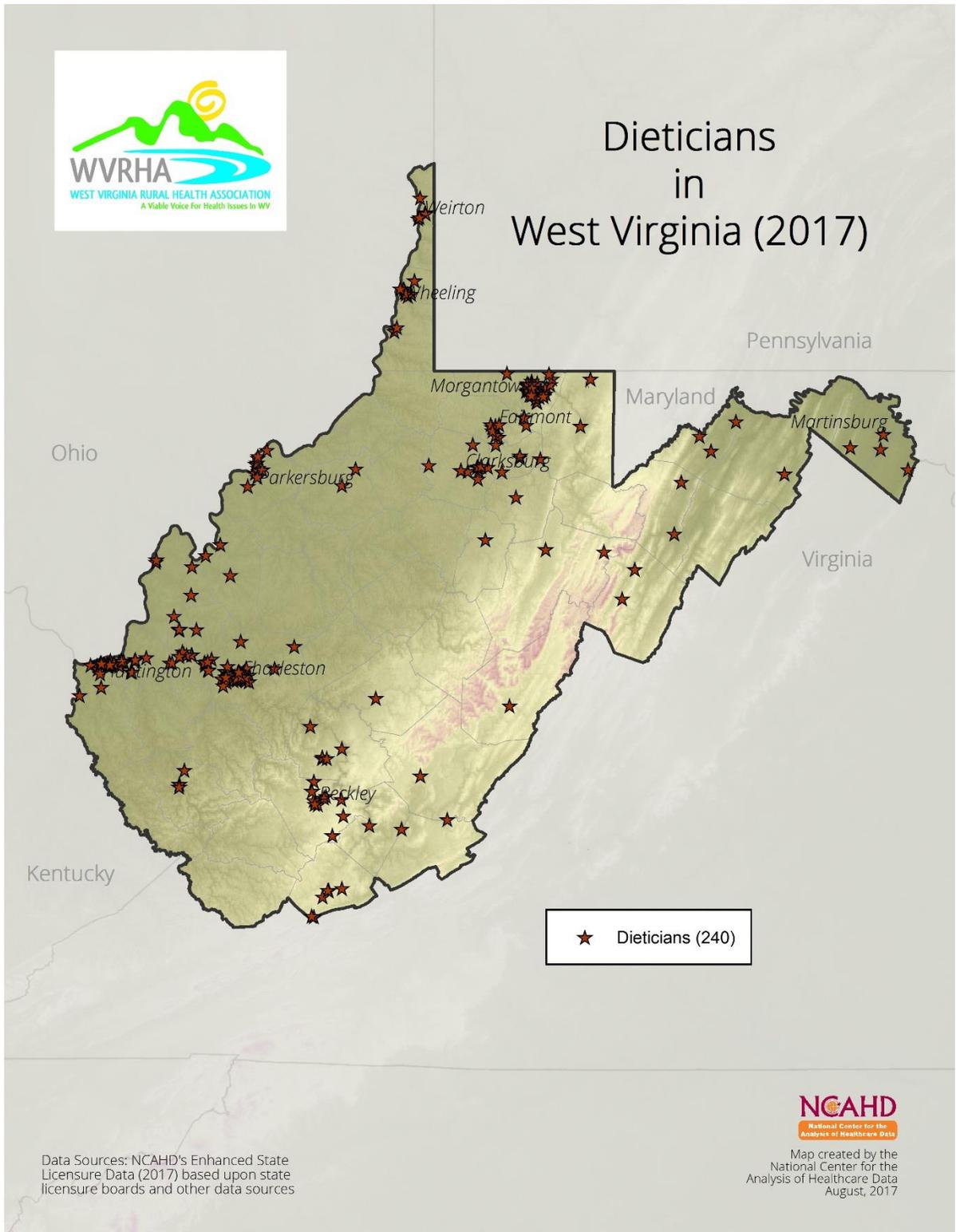
● One or more Chiropractors (250)

| County | Chiropractors | County | Chiropractors | County | Chiropractors |
|------------|---------------|------------|---------------|------------|---------------|
| Barbour | 3 | Kanawha | 33 | Pocahontas | 0 |
| Berkeley | 10 | Lewis | 3 | Preston | 4 |
| Boone | 1 | Lincoln | 0 | Putnam | 8 |
| Braxton | 1 | Logan | 4 | Raleigh | 12 |
| Brooke | 3 | McDowell | 8 | Randolph | 6 |
| Cabell | 21 | Marion | 2 | Roche | 1 |
| Calhoun | 0 | Marshall | 0 | Roane | 3 |
| Clay | 0 | Mason | 0 | Summers | 1 |
| Dodridge | 0 | Mercer | 2 | Taylor | 1 |
| Fayette | 6 | Mineral | 3 | Tucker | 1 |
| Gilmer | 0 | Mingo | 0 | Tyler | 1 |
| Grant | 0 | Monongalia | 18 | Upshur | 4 |
| Greenbrier | 6 | Monroe | 2 | Wayne | 5 |
| Hampshire | 0 | Morgan | 1 | Webster | 0 |
| Hancock | 4 | Nichols | 2 | Wetzel | 1 |
| Hardy | 1 | Ohio | 4 | Wirt | 1 |
| Harrison | 14 | Pendleton | 0 | Wood | 27 |
| Jackson | 4 | Pleasants | 0 | Wyoming | 1 |
| Jefferson | 8 | | | | |

Data Sources: NCAHD's Enhanced State Licensure Data (2017) based upon state licensure boards and other data sources

NCAHD
National Center for the Analysis of Healthcare Data
Map created by the National Center for the Analysis of Healthcare Data August, 2017

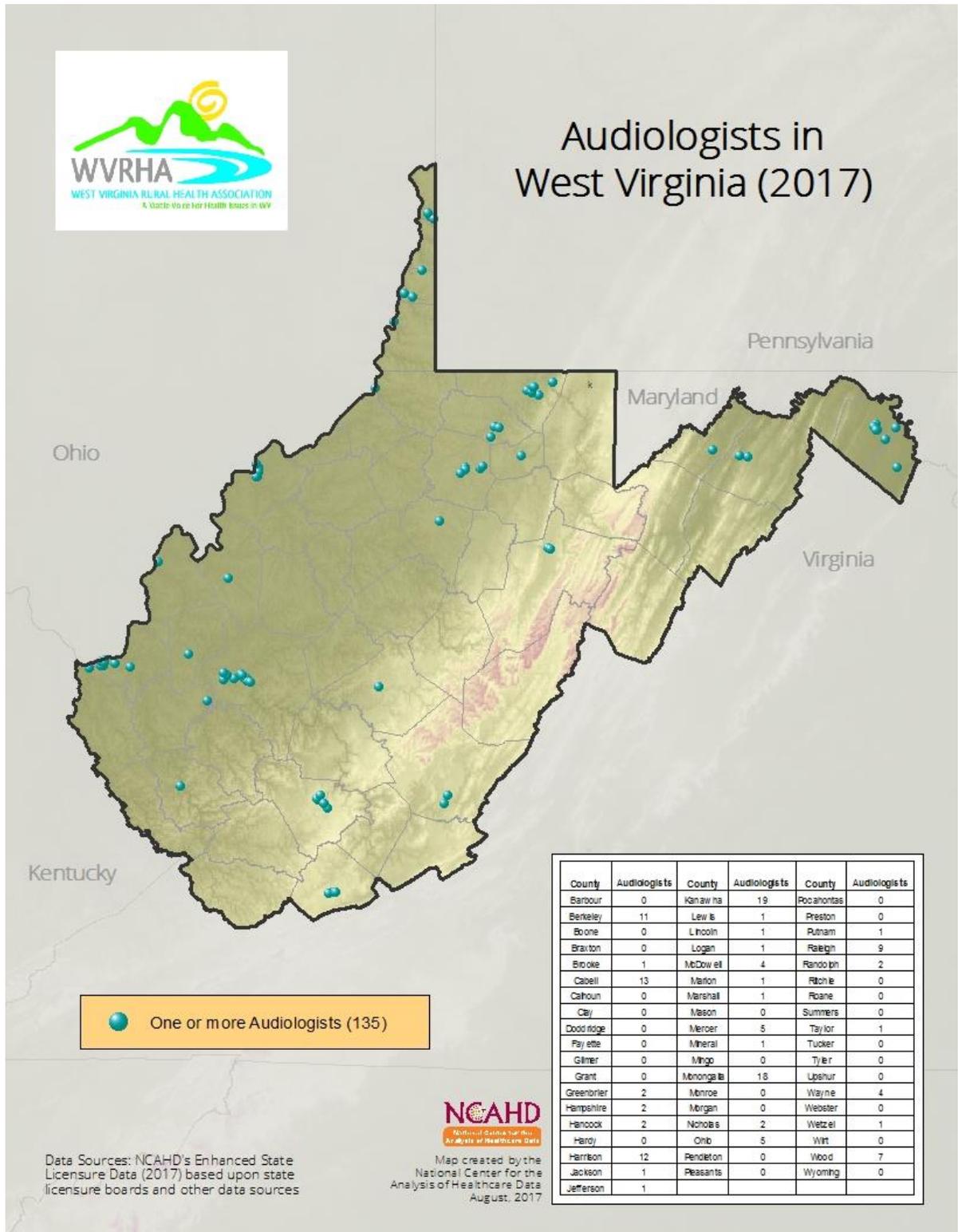
MAP 14 - DISTRIBUTION OF CHIROPRACTORS



MAP 15 - DISTRIBUTION OF DIETICIANS



Audiologists in West Virginia (2017)



● One or more Audiologists (135)

| County | Audiologists | County | Audiologists | County | Audiologists |
|------------|--------------|-----------|--------------|------------|--------------|
| Barbour | 0 | Kanawha | 19 | Pocahontas | 0 |
| Berkeley | 11 | Lewis | 1 | Preston | 0 |
| Boone | 0 | Lincoln | 1 | Rainham | 1 |
| Braxton | 0 | Logan | 1 | Raleigh | 9 |
| Brooke | 1 | McDowell | 4 | Randolph | 2 |
| Cabell | 13 | Marion | 1 | Ritchie | 0 |
| Calhoun | 0 | Marshall | 1 | Roane | 0 |
| Clay | 0 | Mason | 0 | Summers | 0 |
| Doddridge | 0 | Mercer | 5 | Taylor | 1 |
| Fayette | 0 | Mineral | 1 | Tucker | 0 |
| Glinn | 0 | Mingo | 0 | Tyler | 0 |
| Grant | 0 | Morgan | 18 | Upshur | 0 |
| Greenbrier | 2 | Monroe | 0 | Wayne | 4 |
| Hampshire | 2 | Morgan | 0 | Webster | 0 |
| Hancock | 2 | Nichols | 2 | Wetzel | 1 |
| Hardy | 0 | Ohio | 5 | Wirt | 0 |
| Harrison | 12 | Pendleton | 0 | Wood | 7 |
| Jackson | 1 | Pleasants | 0 | Wyoming | 0 |
| Jefferson | 1 | | | | |

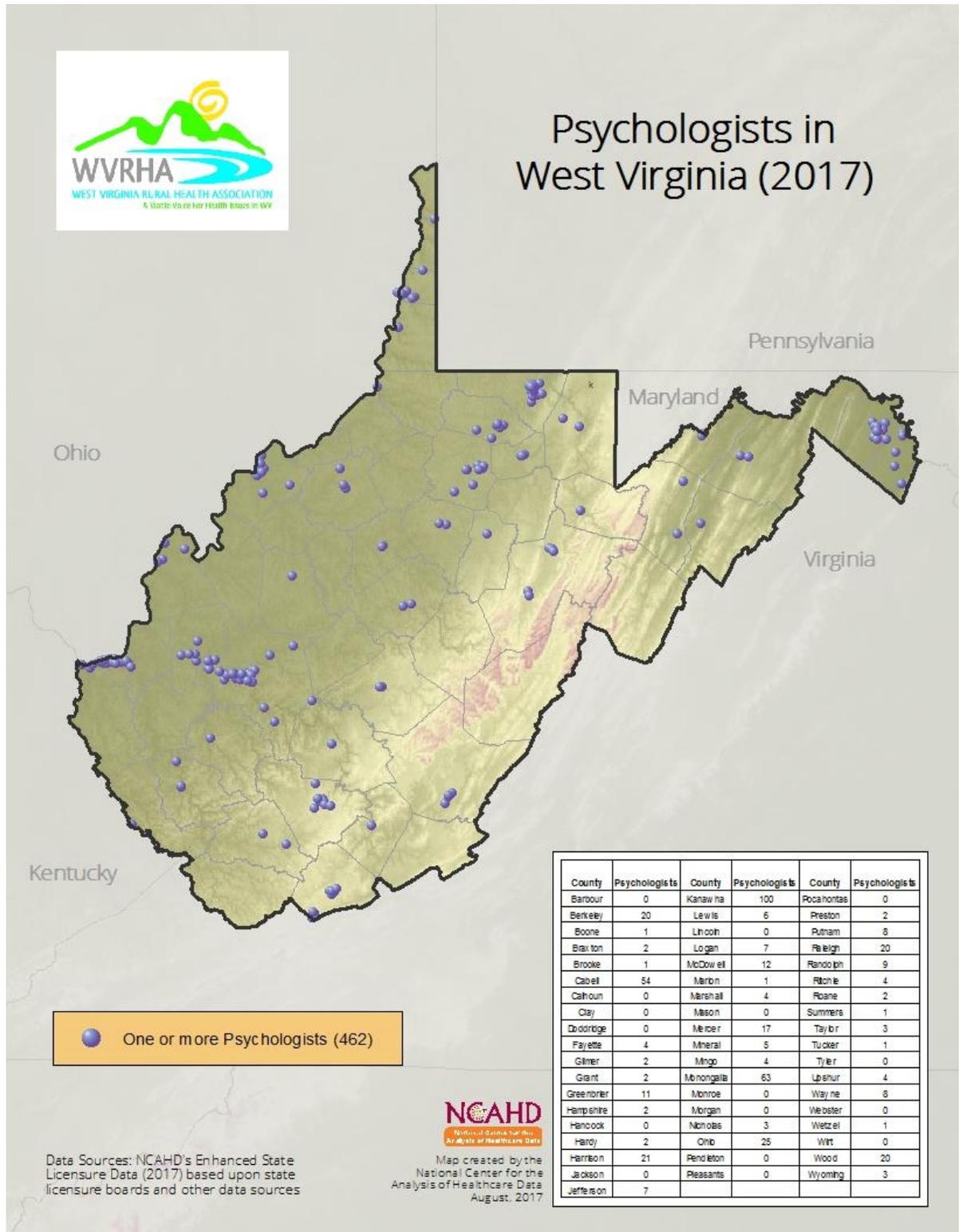
Data Sources: NCAHD's Enhanced State Licensure Data (2017) based upon state licensure boards and other data sources

NCAHD
National Center for the Analysis of Healthcare Data
Map created by the National Center for the Analysis of Healthcare Data
August, 2017

MAP 16 - DISTRIBUTION OF AUDIOLOGISTS



Psychologists in West Virginia (2017)



● One or more Psychologists (462)

| County | Psychologists | County | Psychologists | County | Psychologists |
|------------|---------------|------------|---------------|------------|---------------|
| Barbour | 0 | Kanawha | 100 | Pocahontas | 0 |
| Berkeley | 20 | Lewis | 6 | Preston | 2 |
| Boone | 1 | Lincoln | 0 | Rutland | 8 |
| Braxton | 2 | Logan | 7 | Raleigh | 20 |
| Brooke | 1 | McDowell | 12 | Randolph | 9 |
| Cabell | 54 | Marion | 1 | Richie | 4 |
| Calhoun | 0 | Marshall | 4 | Roane | 2 |
| Clay | 0 | Mason | 0 | Summers | 1 |
| Doddridge | 0 | Meigs | 17 | Taylor | 3 |
| Fayette | 4 | Mineral | 5 | Tucker | 1 |
| Gilmer | 2 | Mingo | 4 | Tierr | 0 |
| Giant | 2 | Monongalia | 63 | Upshur | 4 |
| Greenbrier | 11 | Monroe | 0 | Wayne | 8 |
| Hampshire | 2 | Morgan | 0 | Webster | 0 |
| Hancock | 0 | Nicholas | 3 | Wetzel | 1 |
| Hardy | 2 | Ohio | 25 | Wirt | 0 |
| Harrison | 21 | Putnam | 0 | Wood | 20 |
| Jackson | 0 | Putnam | 0 | Wyoming | 3 |
| Jefferson | 7 | | | | |

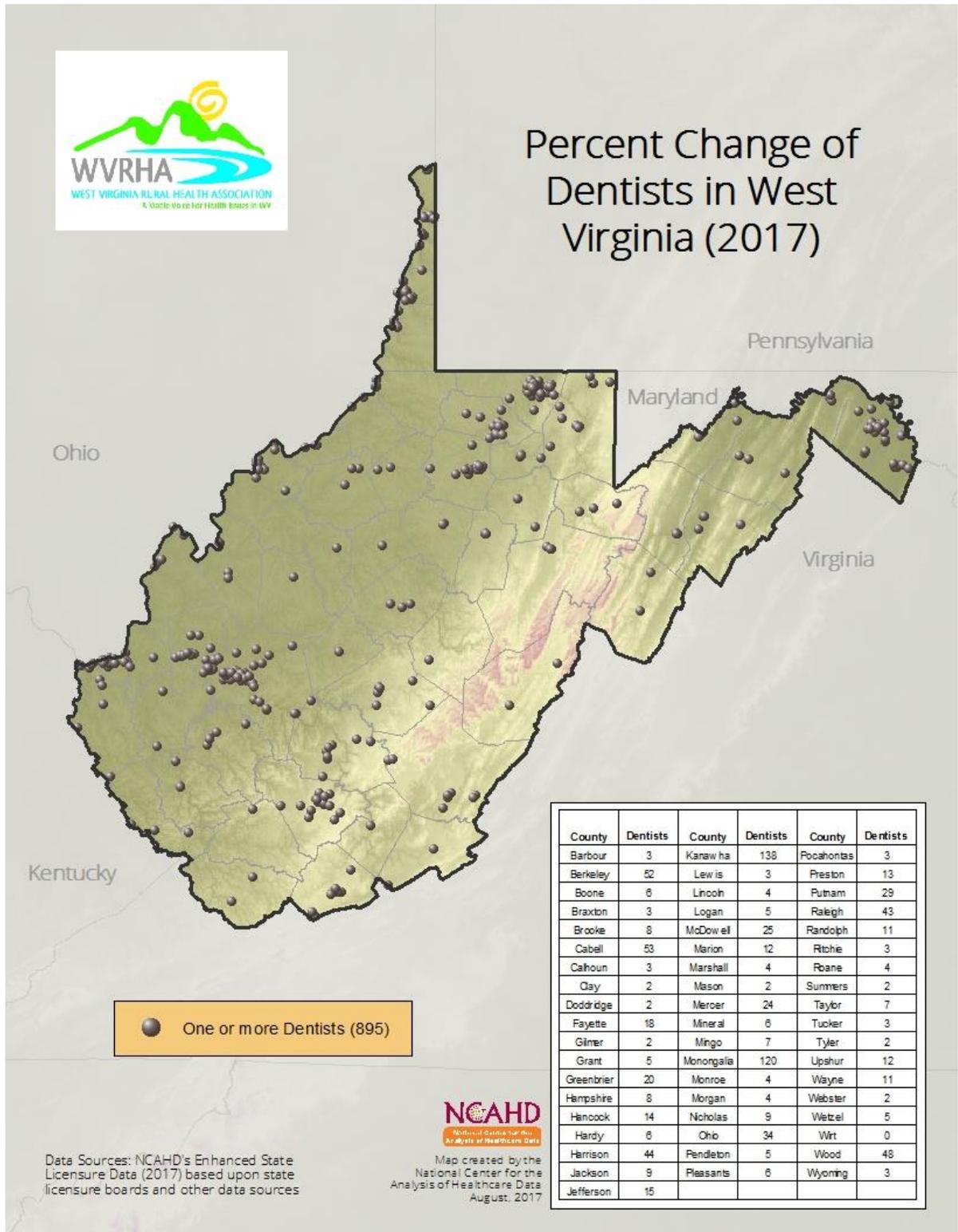
Data Sources: NCAHD's Enhanced State Licensure Data (2017) based upon state licensure boards and other data sources

NCAHD
National Center for the Analysis of Healthcare Data
Map created by the National Center for the Analysis of Healthcare Data
August, 2017

MAP 17 - DISTRIBUTION OF PSYCHOLOGISTS



Percent Change of Dentists in West Virginia (2017)



| County | Dentists | County | Dentists | County | Dentists |
|------------|----------|------------|----------|------------|----------|
| Barbour | 3 | Kanawha | 138 | Focahontas | 3 |
| Berkeley | 52 | Lewis | 3 | Preston | 13 |
| Boone | 6 | Lincoln | 4 | Putnam | 29 |
| Braxton | 3 | Logan | 5 | Raleigh | 43 |
| Brooke | 8 | McDowell | 25 | Randolph | 11 |
| Cabell | 53 | Marion | 12 | Ritchie | 3 |
| Calhoun | 3 | Marshall | 4 | Roane | 4 |
| Clay | 2 | Mason | 2 | Summers | 2 |
| Doddridge | 2 | Mercer | 24 | Taylor | 7 |
| Fayette | 18 | Mineral | 6 | Tucker | 3 |
| Glimer | 2 | Mingo | 7 | Tyler | 2 |
| Grant | 5 | Monongalia | 120 | Upshur | 12 |
| Greenbrier | 20 | Monroe | 4 | Wayne | 11 |
| Hampshire | 8 | Morgan | 4 | Webster | 2 |
| Hancock | 14 | Nicholas | 9 | Wetzel | 5 |
| Hardy | 6 | Ohio | 34 | Wirt | 0 |
| Harrison | 44 | Pendleton | 5 | Wood | 48 |
| Jackson | 9 | Pleasants | 6 | Wyoming | 3 |
| Jefferson | 15 | | | | |

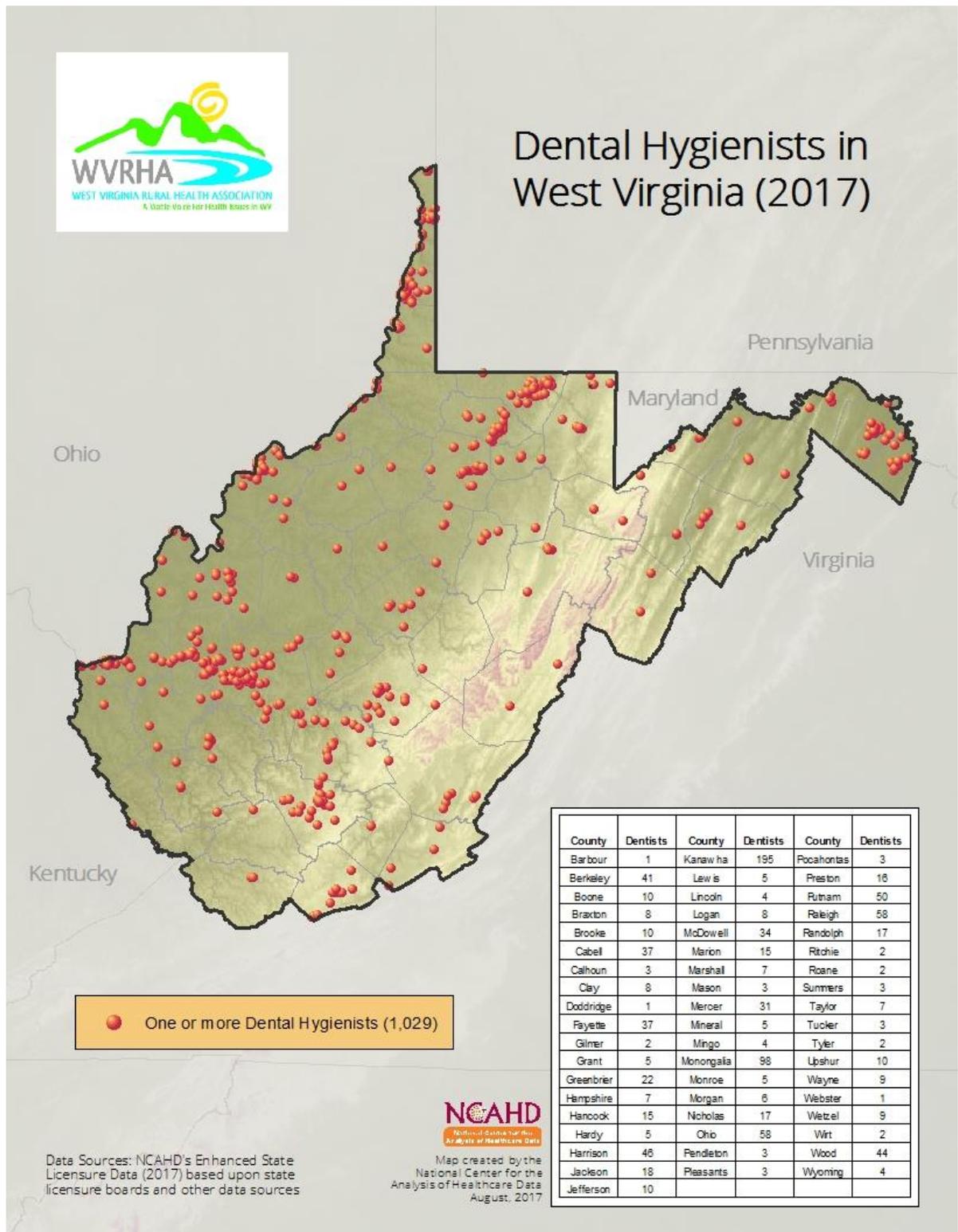
Data Sources: NCAHD's Enhanced State Licensure Data (2017) based upon state licensure boards and other data sources

NCAHD
National Center for the Analysis of Healthcare Data
August, 2017

MAP 18 - DISTRIBUTION OF DENTISTS



Dental Hygienists in West Virginia (2017)



● One or more Dental Hygienists (1,029)

| County | Dentists | County | Dentists | County | Dentists |
|------------|----------|------------|----------|------------|----------|
| Barbour | 1 | Kanawha | 195 | Focahontas | 3 |
| Berkeley | 41 | Lewis | 5 | Preston | 16 |
| Boone | 10 | Lincoln | 4 | Putnam | 50 |
| Braxton | 8 | Logan | 8 | Raleigh | 58 |
| Brooke | 10 | McDowell | 34 | Randolph | 17 |
| Cabell | 37 | Marion | 15 | Ritchie | 2 |
| Calhoun | 3 | Marshall | 7 | Roane | 2 |
| Clay | 8 | Mason | 3 | Summers | 3 |
| Doddridge | 1 | Mercer | 31 | Taylor | 7 |
| Fayette | 37 | Mineral | 5 | Tucker | 3 |
| Glimer | 2 | Mingo | 4 | Tyler | 2 |
| Grant | 5 | Monongalia | 98 | Lipshur | 10 |
| Greenbrier | 22 | Monroe | 5 | Wayne | 9 |
| Hampshire | 7 | Morgan | 6 | Webster | 1 |
| Hancock | 15 | Nicholas | 17 | Wetzel | 9 |
| Hardy | 5 | Ohio | 58 | Wirt | 2 |
| Harrison | 46 | Pendleton | 3 | Wood | 44 |
| Jackson | 18 | Pleasants | 3 | Wyoming | 4 |
| Jefferson | 10 | | | | |

Data Sources: NCAHD's Enhanced State Licensure Data (2017) based upon state licensure boards and other data sources

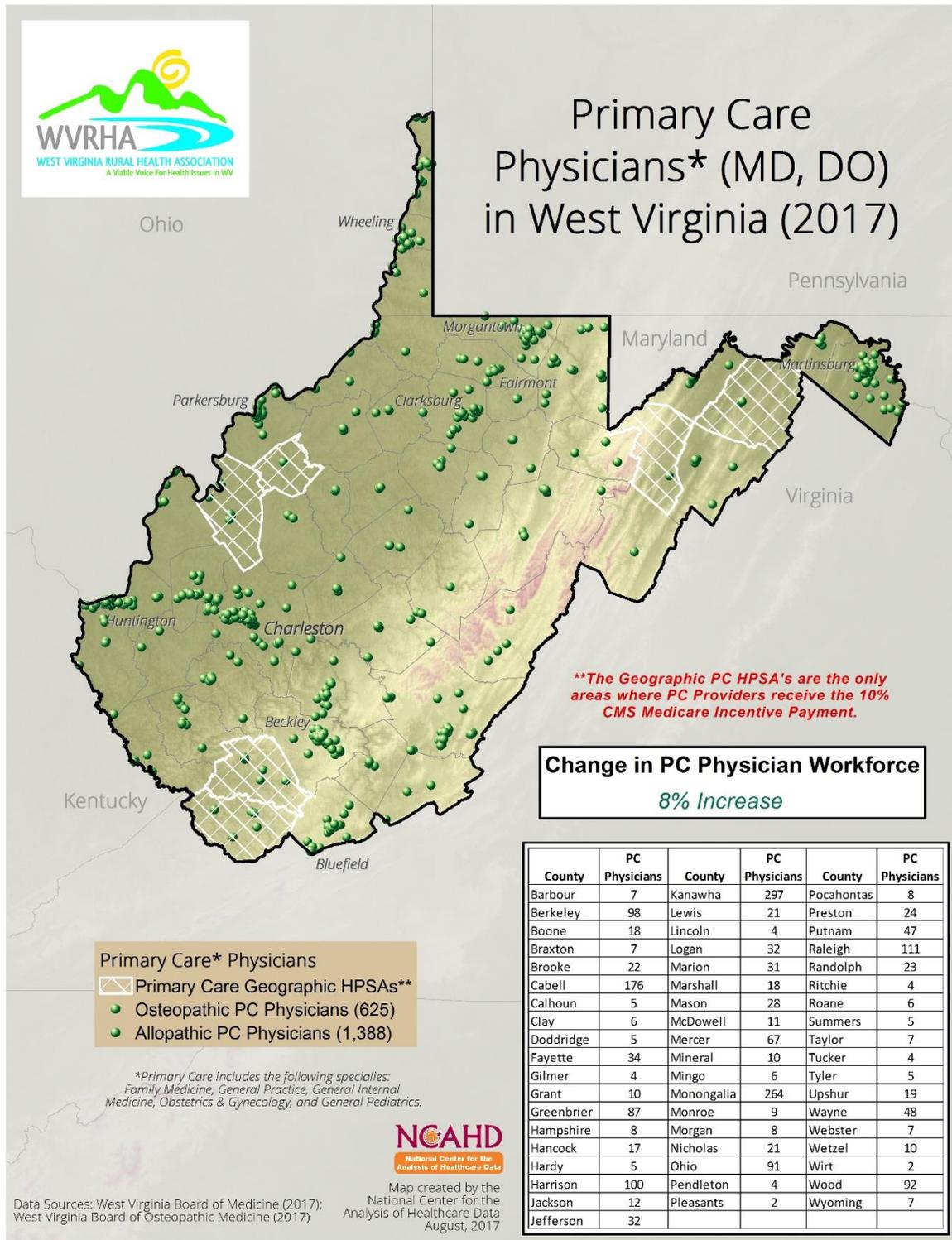
NCAHD
National Center for the Analysis of Healthcare Data
Map created by the National Center for the Analysis of Healthcare Data
August, 2017

MAP 19 - DISTRIBUTION OF DENTAL HYGIENISTS

Primary Care Workforce

The U.S. primary care workforce consists of physicians specializing in family medicine, general practice, general internal medicine, general pediatrics and obstetrics-gynecology and nurse practitioners (also known as advance practice registered nurses) (NP) and physician assistants (PA).

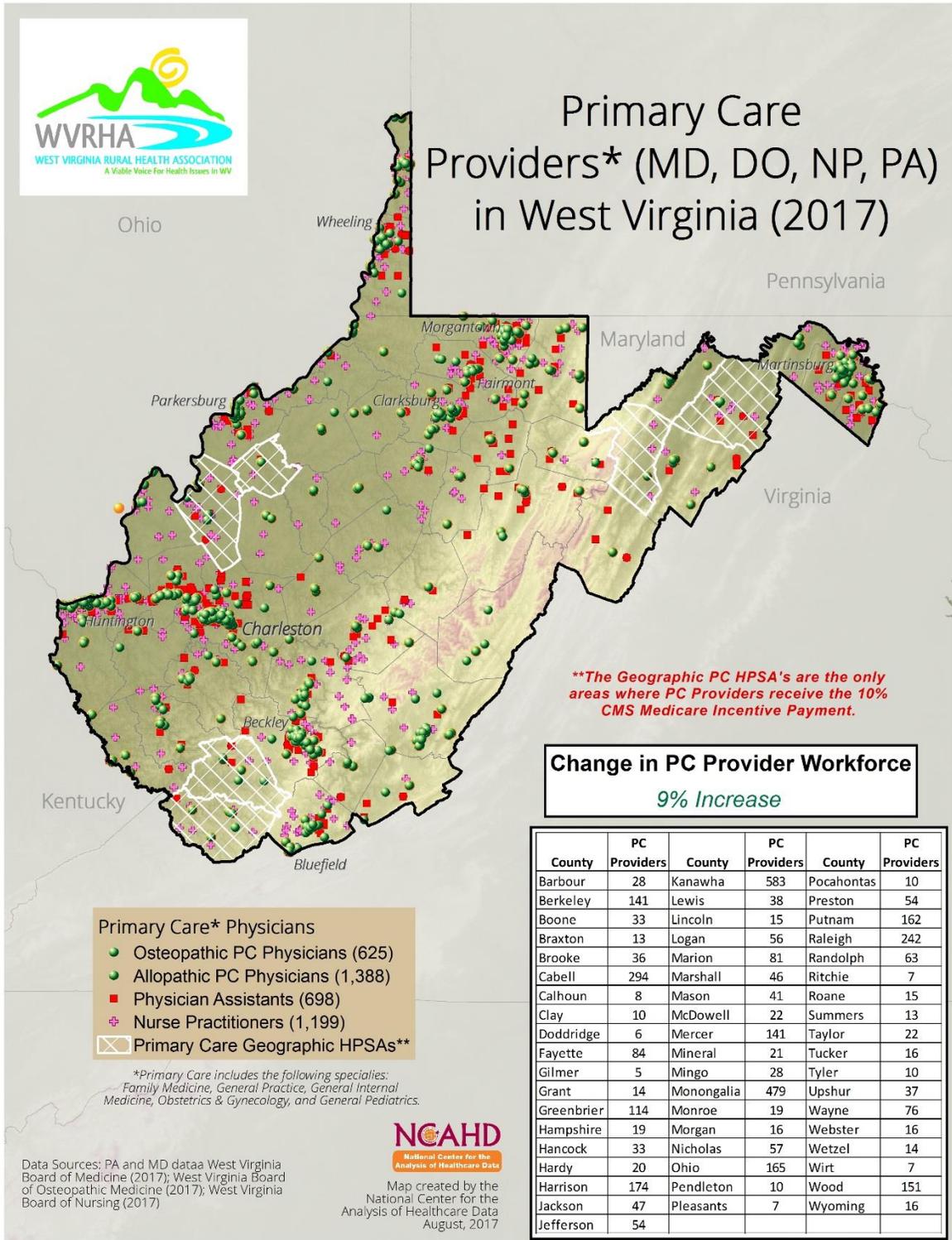
Currently, West Virginia's primary care workforce (primary care physicians, nurse practitioners and physician assistants) has realized an overall increase of in numbers of 317 (9.2 percent) from 2016 (see on the West Virginia Rural Health Association sites – **West Virginia Primary Care Workforce County Trend Analysis**).



MAP 20 - STATEWIDE DISTRIBUTION OF PRIMARY CARE PHYSICIANS



Primary Care Providers* (MD, DO, NP, PA) in West Virginia (2017)



****The Geographic PC HPSA's are the only areas where PC Providers receive the 10% CMS Medicare Incentive Payment.**

Change in PC Provider Workforce
 9% Increase

- Primary Care* Physicians
 - Osteopathic PC Physicians (625)
 - Allopathic PC Physicians (1,388)
 - Physician Assistants (698)
 - Nurse Practitioners (1,199)
- ▭ Primary Care Geographic HPSAs**

*Primary Care includes the following specialties:
 Family Medicine, General Practice, General Internal Medicine, Obstetrics & Gynecology, and General Pediatrics.

Data Sources: PA and MD dataa West Virginia Board of Medicine (2017); West Virginia Board of Osteopathic Medicine (2017); West Virginia Board of Nursing (2017)



Map created by the National Center for the Analysis of Healthcare Data August, 2017

| County | PC Providers | County | PC Providers | County | PC Providers |
|------------|--------------|------------|--------------|------------|--------------|
| Barbour | 28 | Kanawha | 583 | Pocahontas | 10 |
| Berkeley | 141 | Lewis | 38 | Preston | 54 |
| Boone | 33 | Lincoln | 15 | Putnam | 162 |
| Braxton | 13 | Logan | 56 | Raleigh | 242 |
| Brooke | 36 | Marion | 81 | Randolph | 63 |
| Cabell | 294 | Marshall | 46 | Ritchie | 7 |
| Calhoun | 8 | Mason | 41 | Roane | 15 |
| Clay | 10 | McDowell | 22 | Summers | 13 |
| Doddridge | 6 | Mercer | 141 | Taylor | 22 |
| Fayette | 84 | Mineral | 21 | Tucker | 16 |
| Gilmer | 5 | Mingo | 28 | Tyler | 10 |
| Grant | 14 | Monongalia | 479 | Upshur | 37 |
| Greenbrier | 114 | Monroe | 19 | Wayne | 76 |
| Hampshire | 19 | Morgan | 16 | Webster | 16 |
| Hancock | 33 | Nicholas | 57 | Wetzel | 14 |
| Hardy | 20 | Ohio | 165 | Wirt | 7 |
| Harrison | 174 | Pendleton | 10 | Wood | 151 |
| Jackson | 47 | Pleasants | 7 | Wyoming | 16 |
| Jefferson | 54 | | | | |

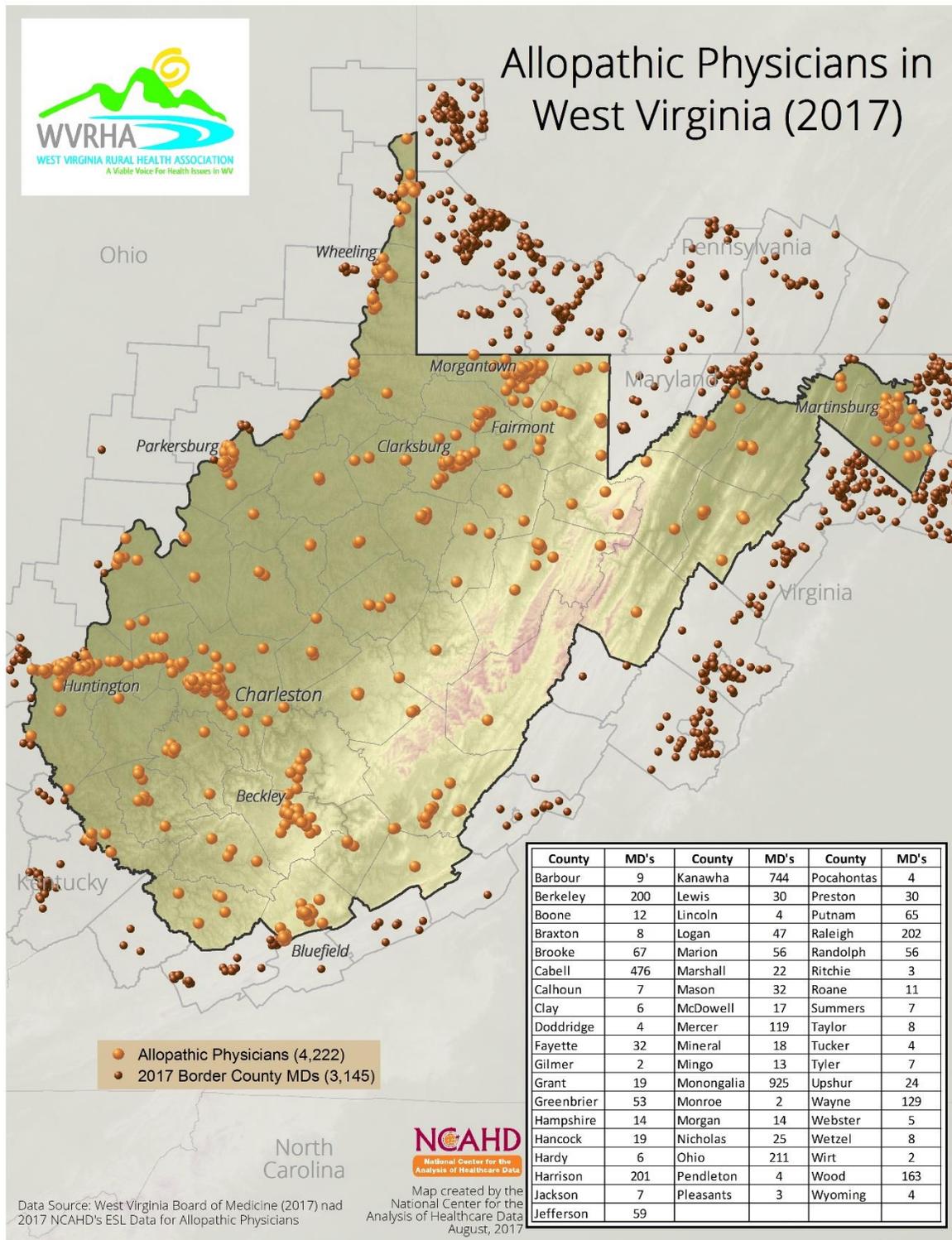
MAP 21 - STATEWIDE DISTRIBUTION OF PRIMARY CARE PROVIDERS

See on the West Virginia Rural Health Association website - **West Virginia All Healthcare Workforce County Trend Analysis** for additional provider trend analysis as well as viewing the trends within the portal (<http://wvrha.org/>).

HEALTHCARE WORKFORCE SUPPLY (CONTIGUOUS STATES' COUNTIES)

In general, geography has less influence upon how patients seek healthcare in comparison to the quality of the provider, reference by family member, etc. Therefore, all stakeholders involved in the planning, management, provision and monitoring of healthcare at any level of geography (city, county, state, service region, etc.), will require knowledge about healthcare workforce in West Virginia's contiguous states (Maryland, Pennsylvania, Ohio, Kentucky, Virginia) to truly be successful. Often hospitals and healthcare workforce planner will use the term "Rational service areas" (RSA) for healthcare services are defined typically by a hospital as a service area and based upon either county boundaries or zip code boundaries. In areas with geographical/natural barriers (e.g. mountains, rivers, etc.), defining RSA will result in larger areas of coverage in order for the healthcare system to have a volume of patients needed to be profitable. In rural areas, RSA often close state boundaries and for patients, this means they are referred or seek services in a contiguous state. Data on primary care providers in contiguous state is provided through the portal to assist in determining proximity of providers outside of West Virginia.

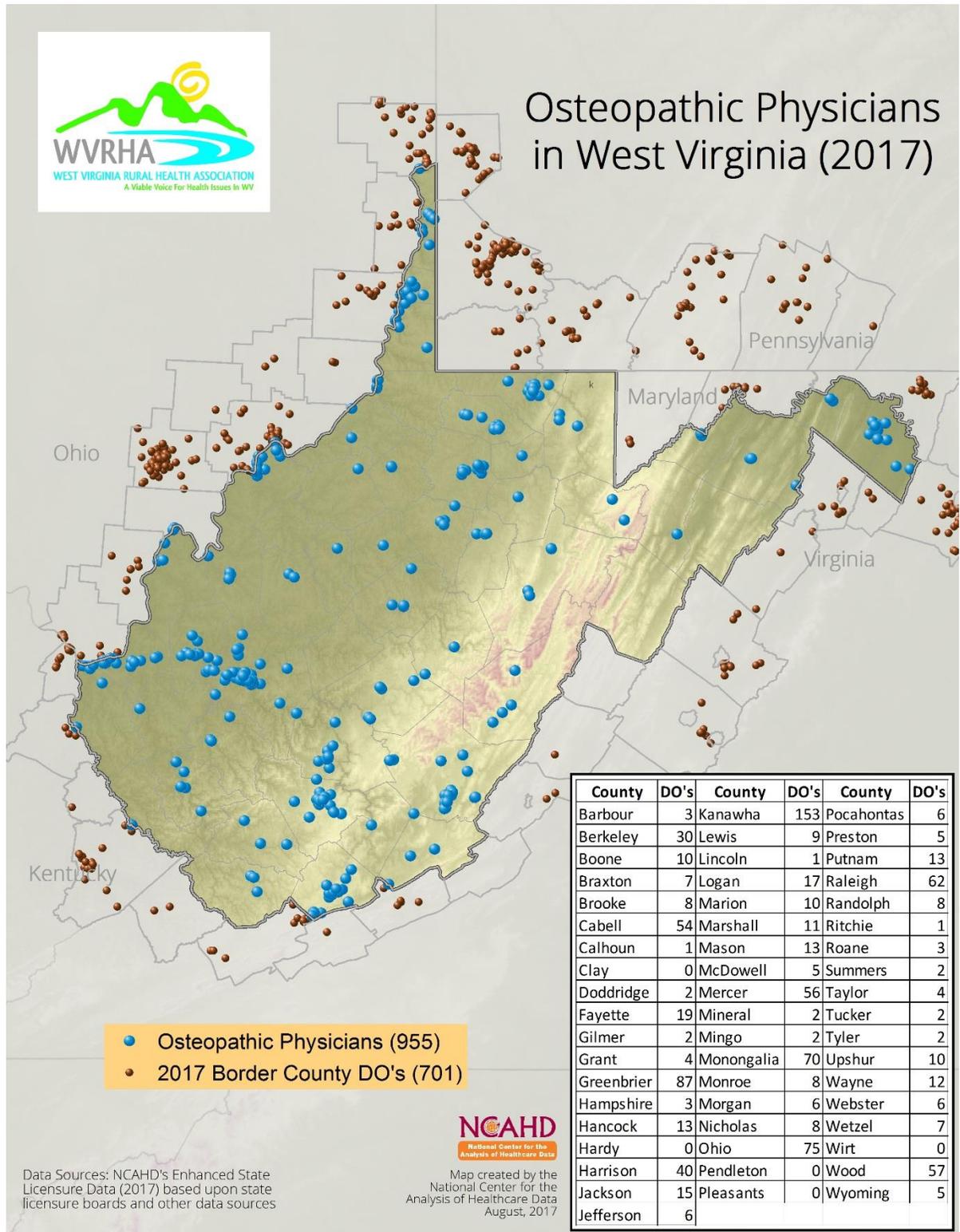
Within the portal, users will be able to interactively view, download, make maps and analyze healthcare workforce in the contiguous counties as seen in the image from the portal (see **Figures 22-26** below).



MAP 22 - ALLOPATHIC PHYSICIANS IN CONTIGUOUS COUNTIES



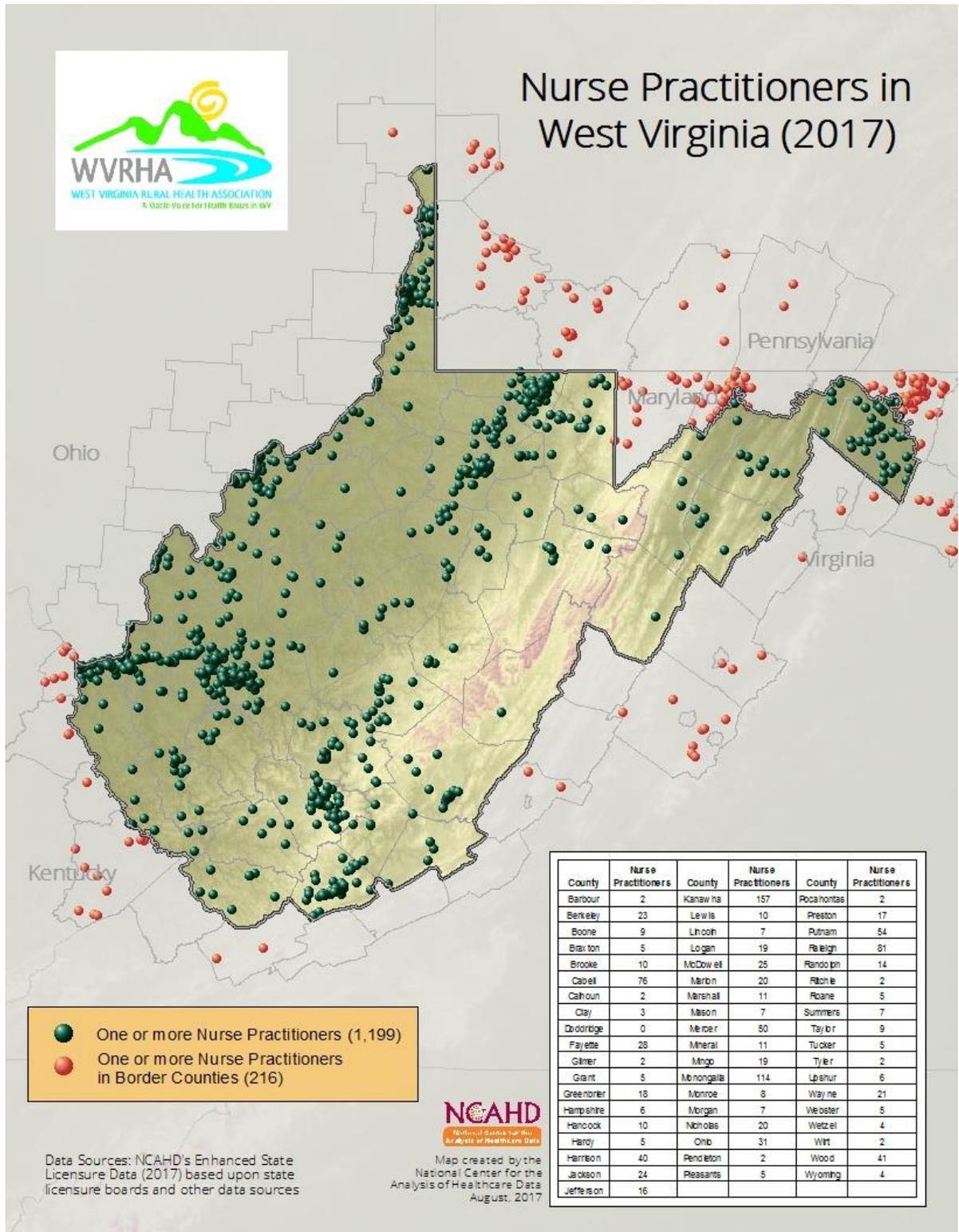
Osteopathic Physicians in West Virginia (2017)



MAP 23-OSTEOPATHIC PHYSICIANS IN CONTIGUOUS COUNTIES



Nurse Practitioners in West Virginia (2017)



● One or more Nurse Practitioners (1,199)
● One or more Nurse Practitioners in Border Counties (216)

| County | Nurse Practitioners | County | Nurse Practitioners | County | Nurse Practitioners |
|------------|---------------------|-----------|---------------------|------------|---------------------|
| Barbour | 2 | Kanawha | 157 | Pocahontas | 2 |
| Berkeley | 23 | Lewis | 10 | Preston | 17 |
| Boone | 9 | Lincoln | 7 | Putnam | 54 |
| Braxton | 5 | Logan | 19 | Randolph | 81 |
| Brooke | 10 | McDowell | 25 | Randolph | 14 |
| Cabell | 75 | Marion | 20 | Roane | 2 |
| Calhoun | 2 | Marshall | 11 | Roane | 5 |
| Clay | 3 | Mason | 7 | Summers | 7 |
| Doddridge | 0 | Mercer | 50 | Taylor | 9 |
| Fayette | 28 | Mineral | 11 | Tucker | 5 |
| Gilmer | 2 | Mingo | 19 | Tyler | 2 |
| Grant | 5 | Mingo | 114 | Upshur | 6 |
| Greenbrier | 18 | Monroe | 8 | Wayne | 21 |
| Hampshire | 6 | Morgan | 7 | Webster | 5 |
| Hancock | 10 | Nichols | 20 | Wetzel | 4 |
| Harby | 5 | Ohio | 31 | Wirt | 2 |
| Harrison | 40 | Pendleton | 2 | Wood | 41 |
| Jackson | 24 | Putnam | 5 | Wyoming | 4 |
| Jefferson | 16 | | | | |

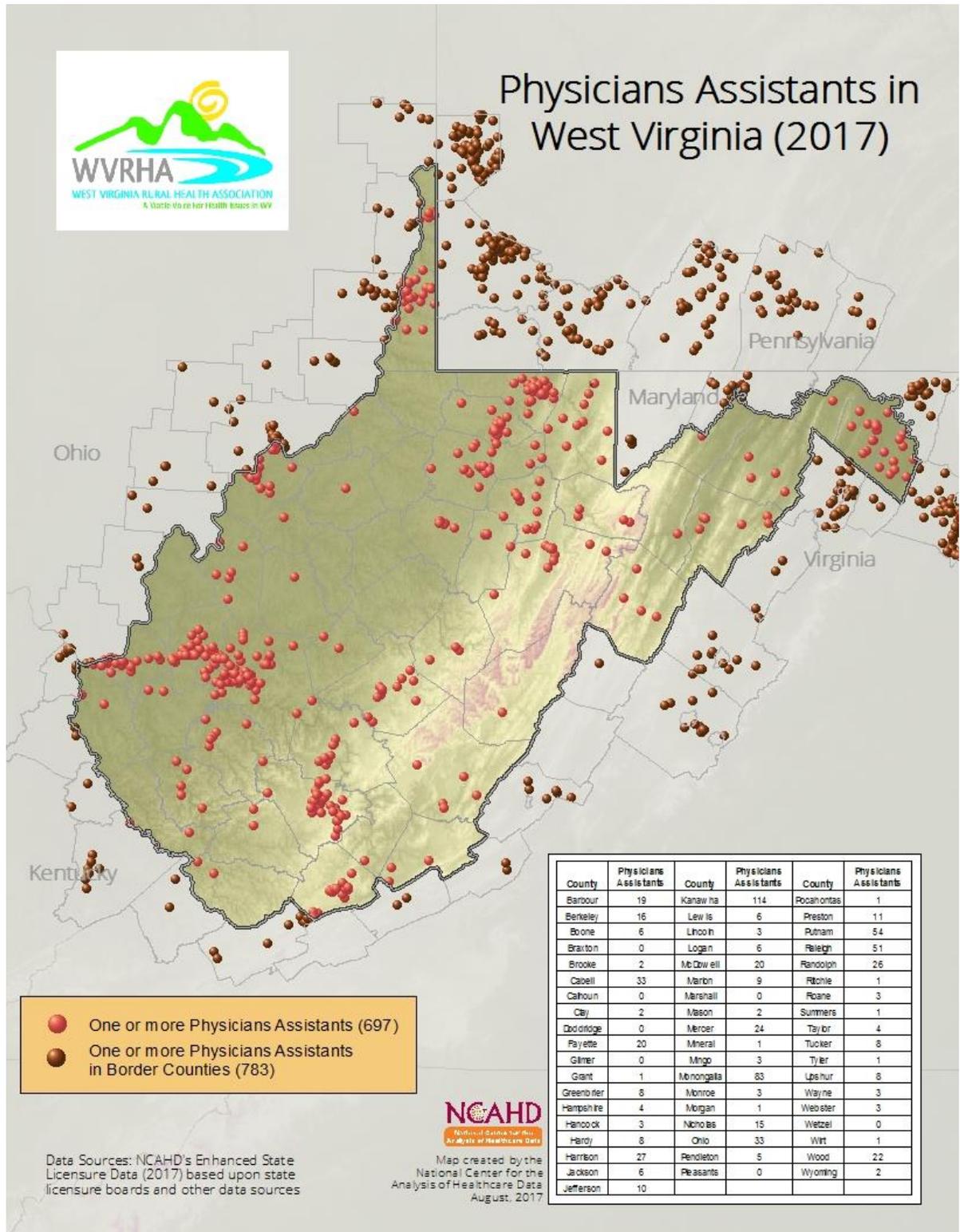
Data Sources: NCAHD's Enhanced State Licensure Data (2017) based upon state licensure boards and other data sources

NCAHD
 National Center for the Analysis of Healthcare Data
 August, 2017

MAP 24 - NURSE PRACTITIONER IN CONTIGUOUS COUNTIES



Physicians Assistants in West Virginia (2017)



● One or more Physicians Assistants (697)
● One or more Physicians Assistants in Border Counties (783)

| County | Physicians Assistants | County | Physicians Assistants | County | Physicians Assistants |
|------------|-----------------------|------------|-----------------------|------------|-----------------------|
| Barbour | 19 | Kanawha | 114 | Pocahontas | 1 |
| Berkeley | 16 | Lewis | 6 | Preston | 11 |
| Boone | 6 | Lincoln | 3 | Rainham | 54 |
| Braxton | 0 | Logan | 6 | Reign | 51 |
| Brooke | 2 | McDowell | 20 | Randolph | 26 |
| Cabell | 33 | Marton | 9 | Ritchie | 1 |
| Calhoun | 0 | Marshall | 0 | Roane | 3 |
| Clay | 2 | Mason | 2 | Summers | 1 |
| Dodridge | 0 | Mercer | 24 | Taylor | 4 |
| Fayette | 20 | Mineral | 1 | Tucker | 8 |
| Gilmer | 0 | Mingo | 3 | Tyler | 1 |
| Grant | 1 | Monongalia | 83 | Upshur | 8 |
| Greenbrier | 8 | Monroe | 3 | Wayne | 3 |
| Hampshire | 4 | Morgan | 1 | Webster | 3 |
| Hancock | 3 | Nichols | 15 | Wetzel | 0 |
| Hardy | 8 | Ohio | 33 | Wirt | 1 |
| Harrison | 27 | Pendleton | 5 | Wood | 22 |
| Jackson | 6 | Putnam | 0 | Wyoming | 2 |
| Jefferson | 10 | | | | |

Data Sources: NCAHD's Enhanced State Licensure Data (2017) based upon state licensure boards and other data sources

NCAHD
 National Center for the Analysis of Healthcare Data
 Map created by the National Center for the Analysis of Healthcare Data
 August, 2017

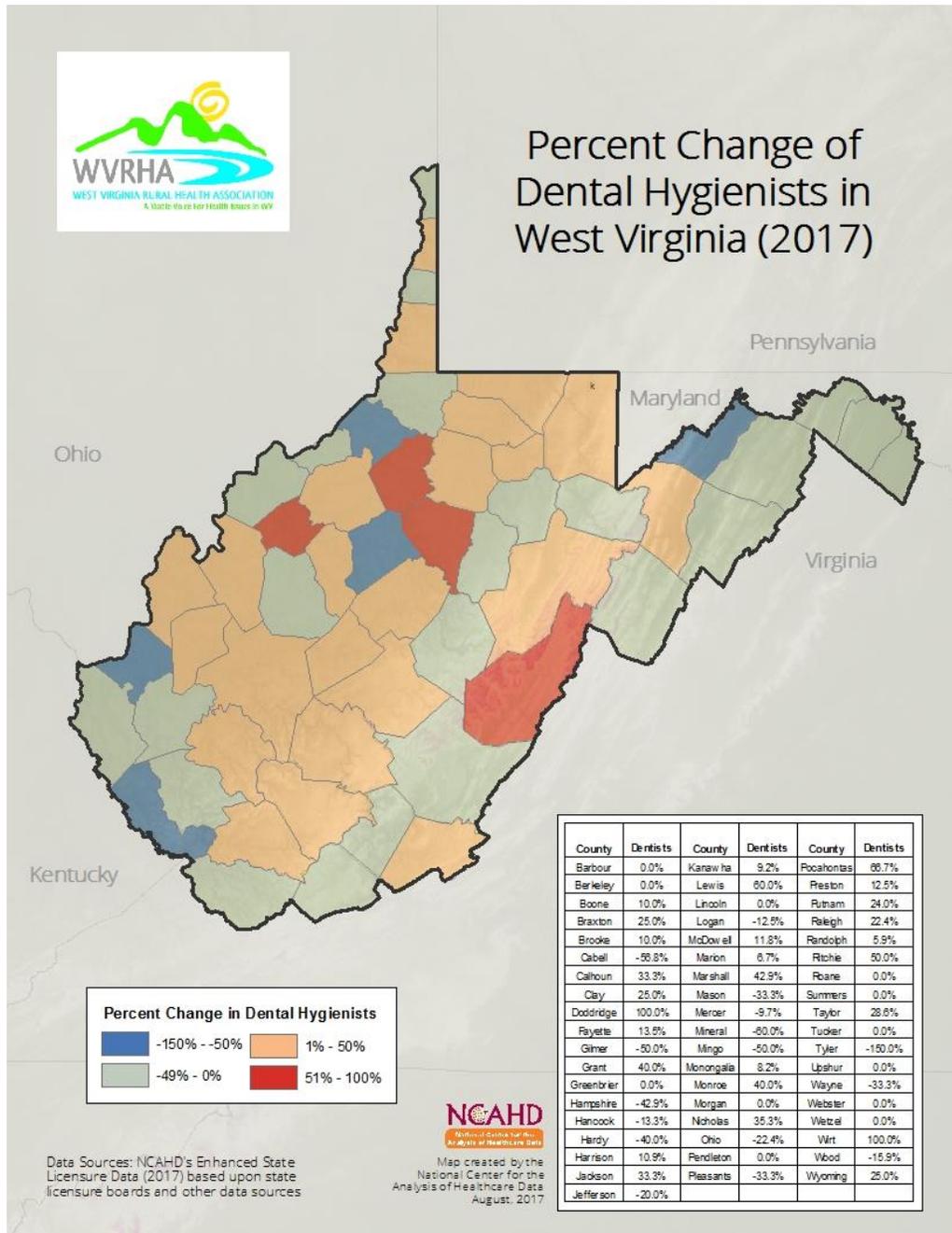
MAP 25 - PHYSICIAN ASSISTANTS IN CONTIGUOUS COUNTIES

HEALTHCARE WORKFORCE TREND ANALYSIS

An important component for healthcare workforce planning, recruitment/retention, policy making, education planning, etc., is to perform comparative analysis over time. We performed two types of trend analysis for the report. The maps below reflect the change from 2016 to 2017.

| 2016-2017 Workforce Trends | | | |
|-----------------------------------|-------------|-------------|----------------|
| Provider Type | 2016 | 2017 | %Change |
| Dieticians | 236 | 240 | 2% |
| Dental Hygenists | 927 | 1,029 | 10% |
| Dentists | 847 | 895 | 5% |
| Psychologists | 516 | 462 | 10% |
| Speeh Language Pathologists | 949 | 800 | 16% |

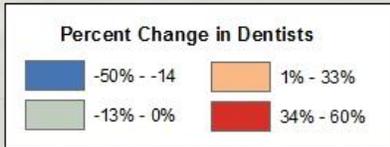
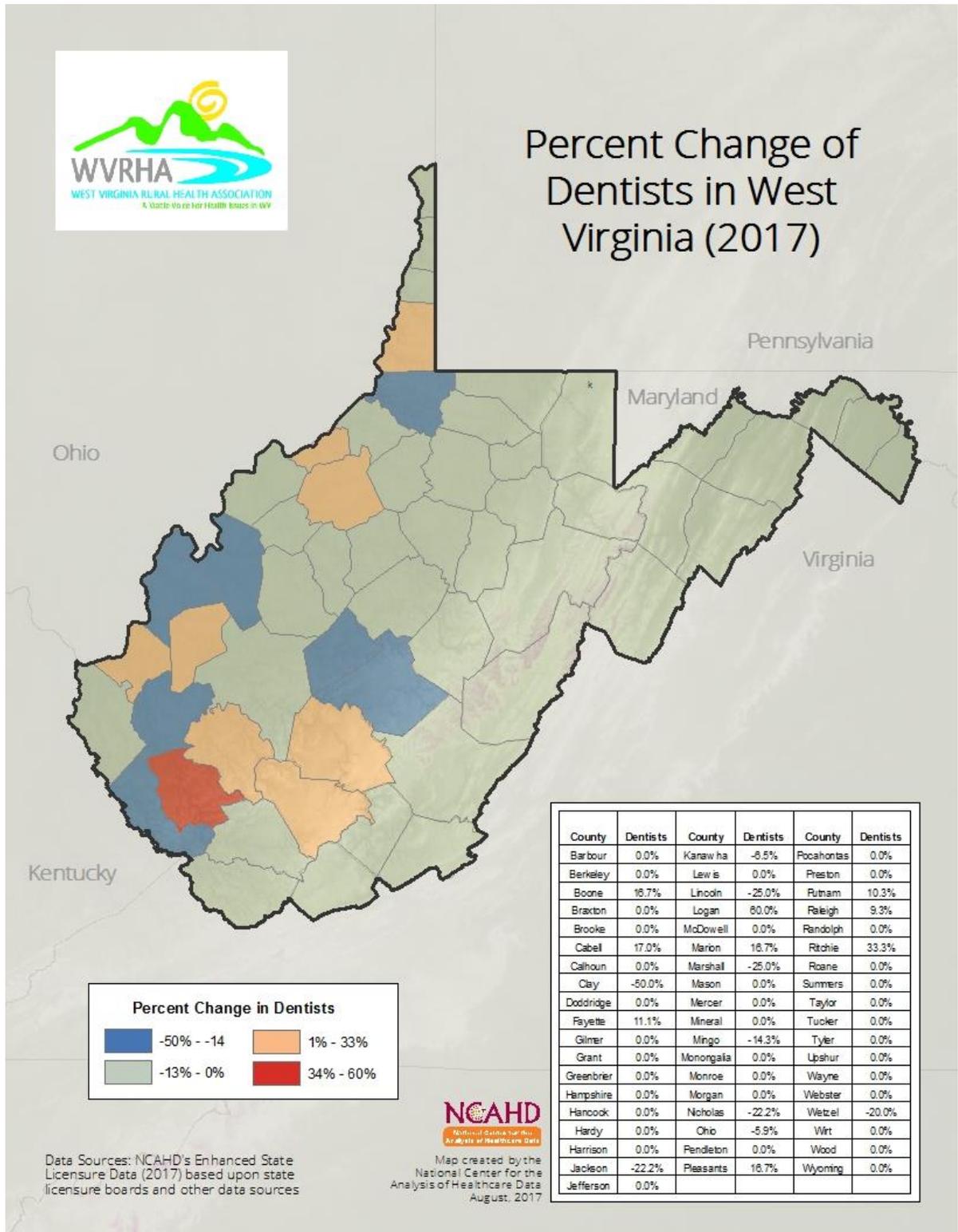
TABLE 3 - WV PROVIDER ANNUAL TREND ANALYSIS



MAP 26 - CHANGE IN DENTAL HYGIENISTS



Percent Change of Dentists in West Virginia (2017)



| County | Dentists | County | Dentists | County | Dentists |
|------------|----------|------------|----------|----------|----------|
| Barbour | 0.0% | Kanawha | -6.5% | Fayette | 0.0% |
| Berkeley | 0.0% | Lewis | 0.0% | Preston | 0.0% |
| Boone | 16.7% | Lincoln | -25.0% | Rainham | 10.3% |
| Braxton | 0.0% | Logan | 60.0% | Raleigh | 9.3% |
| Brooke | 0.0% | McDowell | 0.0% | Randolph | 0.0% |
| Cabell | 17.0% | Marion | 16.7% | Putnam | 33.3% |
| Calhoun | 0.0% | Marshall | -25.0% | Roane | 0.0% |
| Clay | -50.0% | Mason | 0.0% | Summers | 0.0% |
| Doddridge | 0.0% | Mercer | 0.0% | Taylor | 0.0% |
| Fayette | 11.1% | Mineral | 0.0% | Tucker | 0.0% |
| Gilmer | 0.0% | Mingo | -14.3% | Tyler | 0.0% |
| Grant | 0.0% | Monongalia | 0.0% | Upshur | 0.0% |
| Greenbrier | 0.0% | Monroe | 0.0% | Wayne | 0.0% |
| Hampshire | 0.0% | Morgan | 0.0% | Webster | 0.0% |
| Hancock | 0.0% | Nicholas | -22.2% | Wetzel | -20.0% |
| Hardy | 0.0% | Ohio | -5.9% | Wirt | 0.0% |
| Harrison | 0.0% | Pendleton | 0.0% | Wood | 0.0% |
| Jackson | -22.2% | Pleasants | 16.7% | Wyoming | 0.0% |
| Jefferson | 0.0% | | | | |

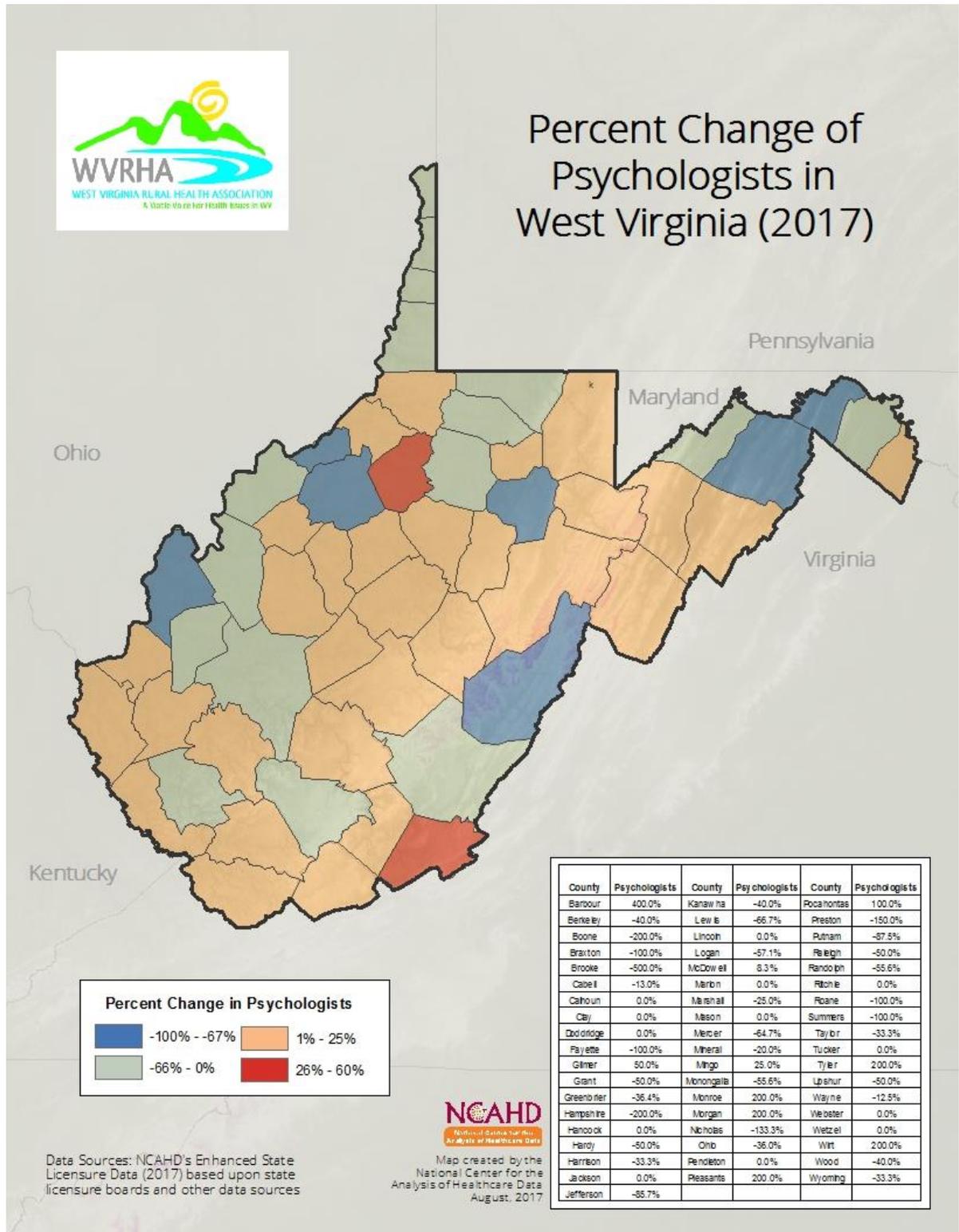
Data Sources: NCAHD's Enhanced State Licensure Data (2017) based upon state licensure boards and other data sources

NCAHD
National Center for the Analysis of Healthcare Data
Map created by the National Center for the Analysis of Healthcare Data
August, 2017

MAP 27 - CHANGE IN DENTISTS



Percent Change of Psychologists in West Virginia (2017)



| County | Psychologists | County | Psychologists | County | Psychologists |
|------------|---------------|------------|---------------|-----------|---------------|
| Barbour | 400.0% | Kanawha | -40.0% | Rochester | 100.0% |
| Berkeley | -40.0% | Lewis | -66.7% | Preston | -150.0% |
| Boone | -200.0% | Lincoln | 0.0% | Putnam | -87.5% |
| Braxton | -100.0% | Logan | -57.1% | Reigh | -50.0% |
| Brooke | -500.0% | McDowell | 8.3% | Randolph | -55.6% |
| Cabell | -13.0% | Marion | 0.0% | Ritchie | 0.0% |
| Calhoun | 0.0% | Marshall | -25.0% | Roane | -100.0% |
| Clay | 0.0% | Mason | 0.0% | Summers | -100.0% |
| Dodridge | 0.0% | Mercer | -64.7% | Taylor | -33.3% |
| Fayette | -100.0% | Mingo | 25.0% | Tucker | 0.0% |
| Gilmer | 50.0% | Monongalia | -55.6% | Tyler | 200.0% |
| Grant | -50.0% | Monroe | 200.0% | Upshur | -50.0% |
| Greenbrier | -36.4% | Morgan | 200.0% | Wayne | -12.5% |
| Hampshire | -200.0% | Nicholas | -133.3% | Webster | 0.0% |
| Hancock | 0.0% | Ohio | -36.0% | Wetzel | 0.0% |
| Hardy | -50.0% | Pendleton | 0.0% | Wirt | 200.0% |
| Harrison | -33.3% | Pleasants | 200.0% | Wood | -40.0% |
| Jackson | 0.0% | | | Wyoming | -33.3% |
| Jefferson | -85.7% | | | | |

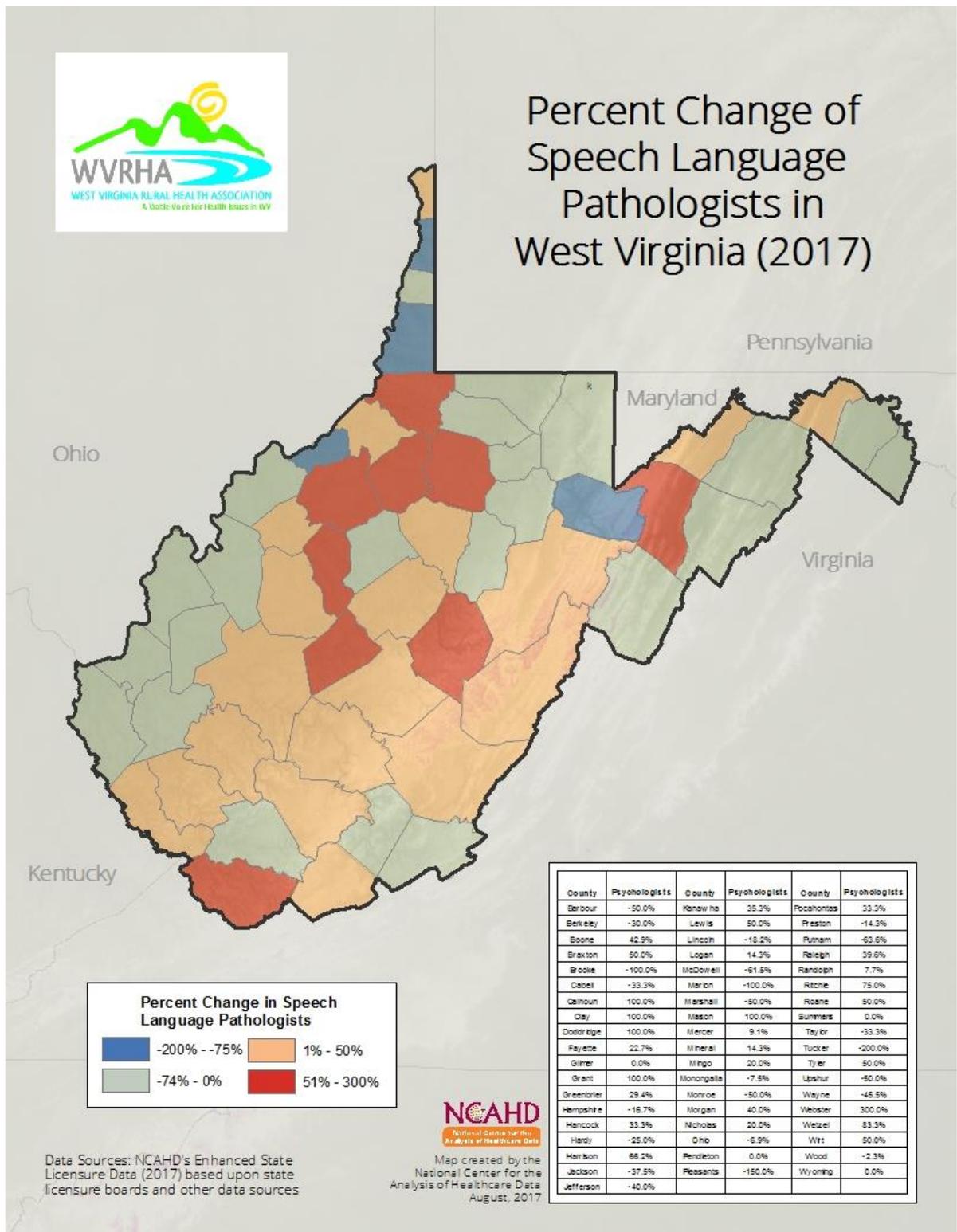
Data Sources: NCAHD's Enhanced State Licensure Data (2017) based upon state licensure boards and other data sources

NCAHD
National Center for the Analysis of Healthcare Data
August, 2017

MAP 28 - CHANGE IN PSYCHOLOGISTS



Percent Change of Speech Language Pathologists in West Virginia (2017)



Percent Change in Speech Language Pathologists

- 200% - -75%
- 74% - 0%
- 1% - 50%
- 51% - 300%

| County | Psychologists | County | Psychologists | County | Psychologists |
|------------|---------------|--------------|---------------|------------|---------------|
| Berkeley | -50.0% | Kenawha | 35.3% | Pocahontas | 33.3% |
| Berkeley | -30.0% | Lewis | 50.0% | Preston | -14.3% |
| Boone | 42.9% | Lincoln | -18.2% | Putnam | -53.8% |
| Braxton | 50.0% | Logan | 14.3% | Reign | 39.6% |
| Brooke | -100.0% | McDowell | -61.5% | Randolph | 7.7% |
| Cabell | -33.3% | Marion | -100.0% | Ritchie | 75.0% |
| Calhoun | 100.0% | Marshall | -50.0% | Roane | 50.0% |
| Clay | 100.0% | Mason | 100.0% | Summers | 0.0% |
| Coalbridge | 100.0% | Mercer | 9.1% | Taylor | -33.3% |
| Fayette | 22.7% | Mineral | 14.3% | Tucker | -200.0% |
| Gilmer | 0.0% | Mingo | 20.0% | Tyler | 50.0% |
| Grant | 100.0% | Monongalia | -7.5% | Upshur | -50.0% |
| Greenbrier | 29.4% | Monroe | -50.0% | Wayne | -45.5% |
| Hampshire | -18.7% | Morgan | 40.0% | Webster | 300.0% |
| Hancock | 33.3% | Nichols | 20.0% | Wetzel | 83.3% |
| Hardy | -25.0% | Ohio | -6.9% | WV | 50.0% |
| Harrison | 66.2% | Penitentiary | 0.0% | Wood | -2.3% |
| Jackson | -37.5% | Pleasants | -150.0% | Wyoming | 0.0% |
| Jefferson | -40.0% | | | | |

Data Sources: NCAHD's Enhanced State Licensure Data (2017) based upon state licensure boards and other data sources

NCAHD
National Center for the Analysis of Healthcare Data
Map created by the National Center for the Analysis of Healthcare Data August, 2017

MAP 29 - CHANGE IN SPEECH LANGUAGE PATHOLOGISTS

For the second type of trend analysis research viewing a longer period of time provides a different perspective of the impact the state healthcare training programs have upon recruiting and retaining their respective healthcare students. Many of the healthcare training institutions in West Virginia have within their mission to generate healthcare workforce that will practice in West Virginia as well as in underserved areas. In the first graph, we demonstrate the percentage of each provider type that practiced in a medically underserved area for each respective year.

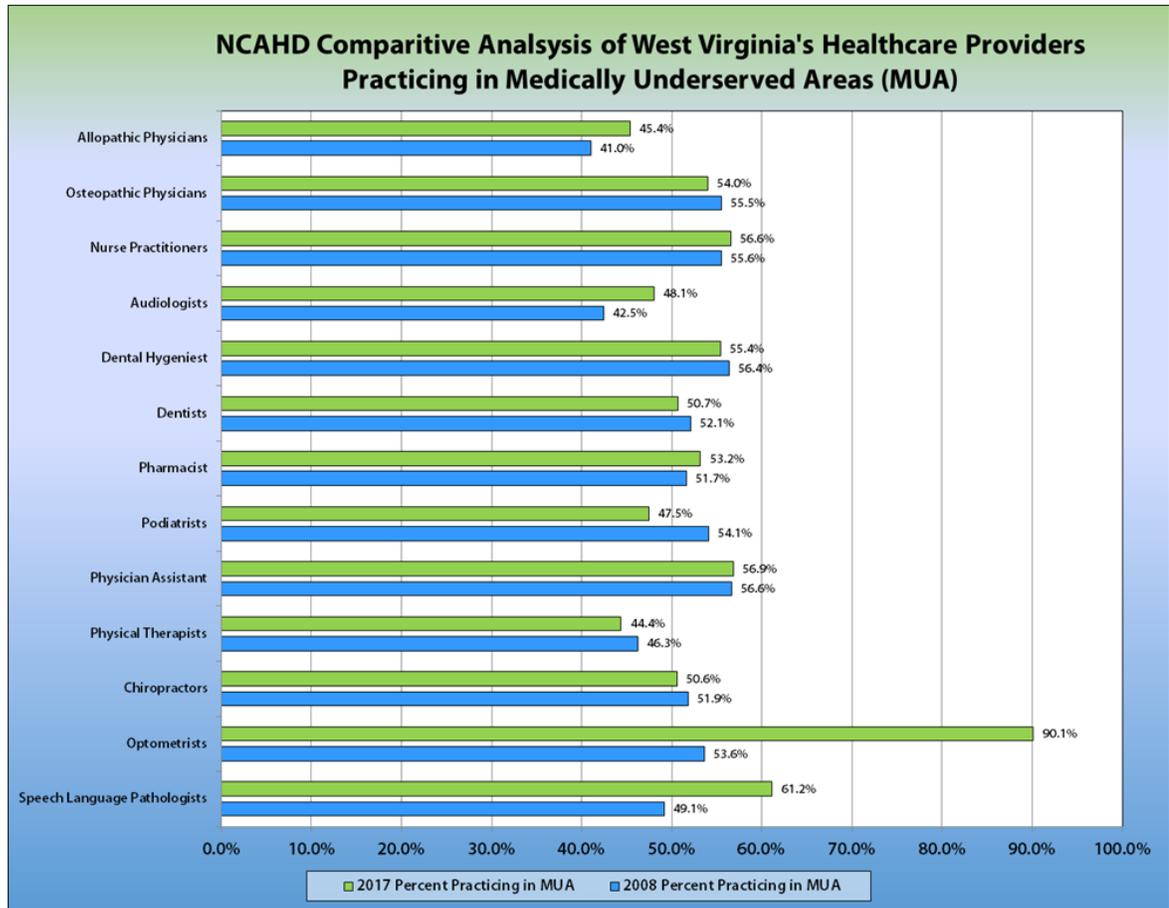


FIGURE 6 - WEST VIRGINIA HEALTHCARE WORKFORCE MUA/P TREND ANALYSIS

In the second graph, it demonstrates the portion of the total change that each provider was responsible for causing.

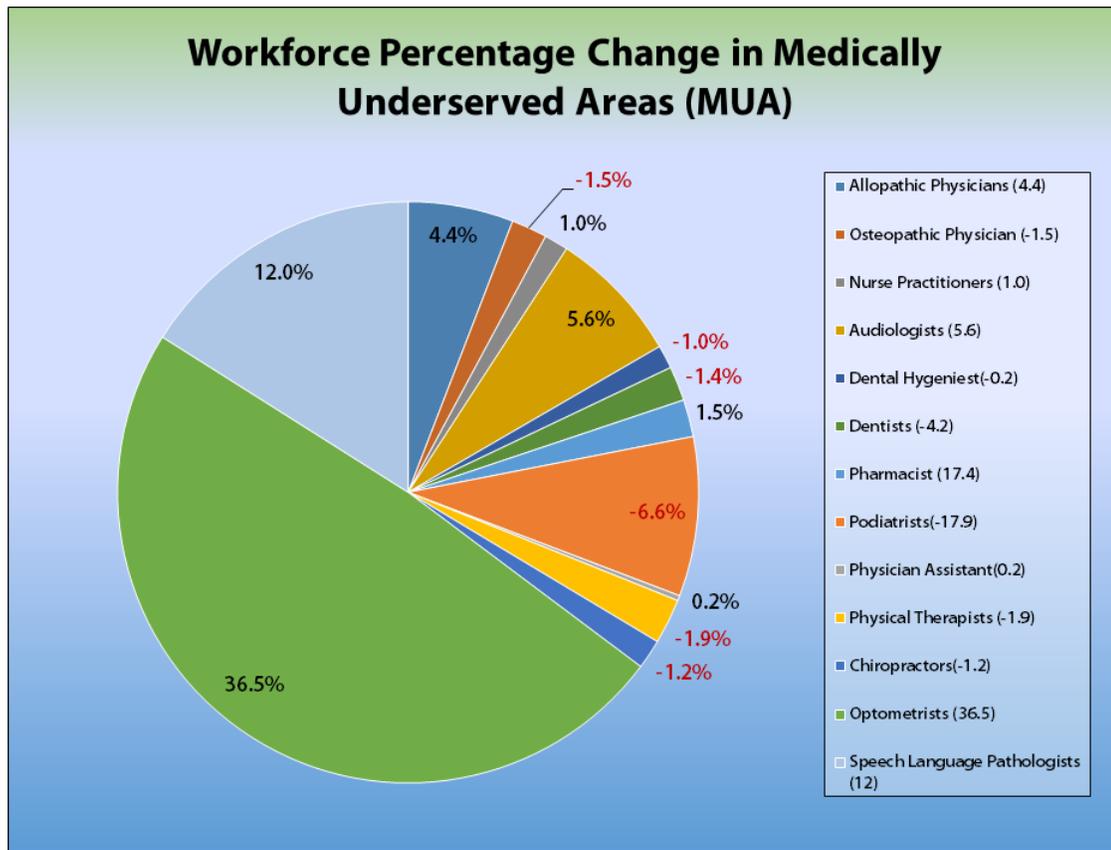


FIGURE 7 - WV HEALTHCARE CHANGE IN PRACTICE IN MUA/P

Stakeholders are encouraged to utilize the West Virginia Health Data portal (<http://wvrha.org/>) to view the data interactively and make their own maps.

HEALTHCARE WORKFORCE DEMAND

Primary Care Workforce

The importance of proximity of primary care workforce will be ever more important in 2017 as the number of individuals with health insurance seek access to primary care. With 14.1 percent of the U.S. population 65 year of age or older (West Virginia 18.3 percent) the need for healthcare is growing.¹⁷ Factoring in the demographic changes from the newly insured accessing care relative to safety net providers will be key in helping inform policy and decision makers in targeting their efforts. Healthcare is provided in regional patterns often controlled by geographic barrier, access to transportation and access to specialty providers.

Utilizing zip code boundaries, NCAHD analyzed the existence of primary care providers to populations and generated a table demonstrating the analysis of primary care physicians and primary care workforce to 10,000 population (See the West Virginia Rural Health Association website -**Primary Care Workforce Analysis spreadsheet**).

Aging Primary Care Workforce

Another key component in assessing the impact of demand upon the primary care workforce is the fact the patients they treat are aging, but the entire healthcare workforce is aging too. Recent research conducted by NCAHD indicated that 27.6 percent of the physician population is over 60 years old with West Virginia in the top quartile having 30.1 percent of their physicians over 60 years old.

In West Virginia, the average age for all of the Primary Care Workforce is 48 years, with primary care physicians average age at 48; Nurse Practitioners average at 46 years; and Physician Assistants average at 38 years.



Aging Allopathic Physician in West Virginia (2017)

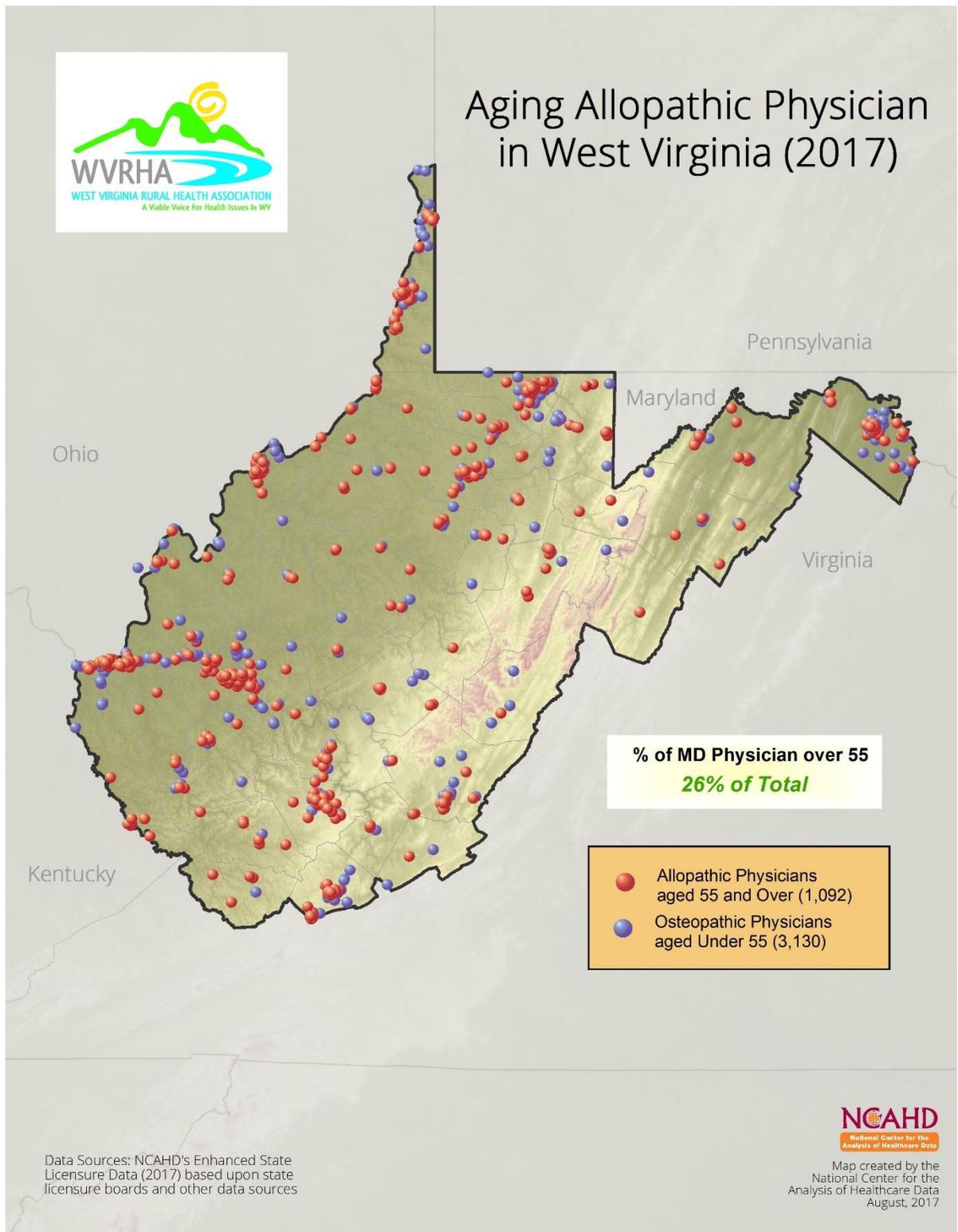


FIGURE 8 - AGING ALLOPATHIC PHYSICIAN DISTRIBUTION

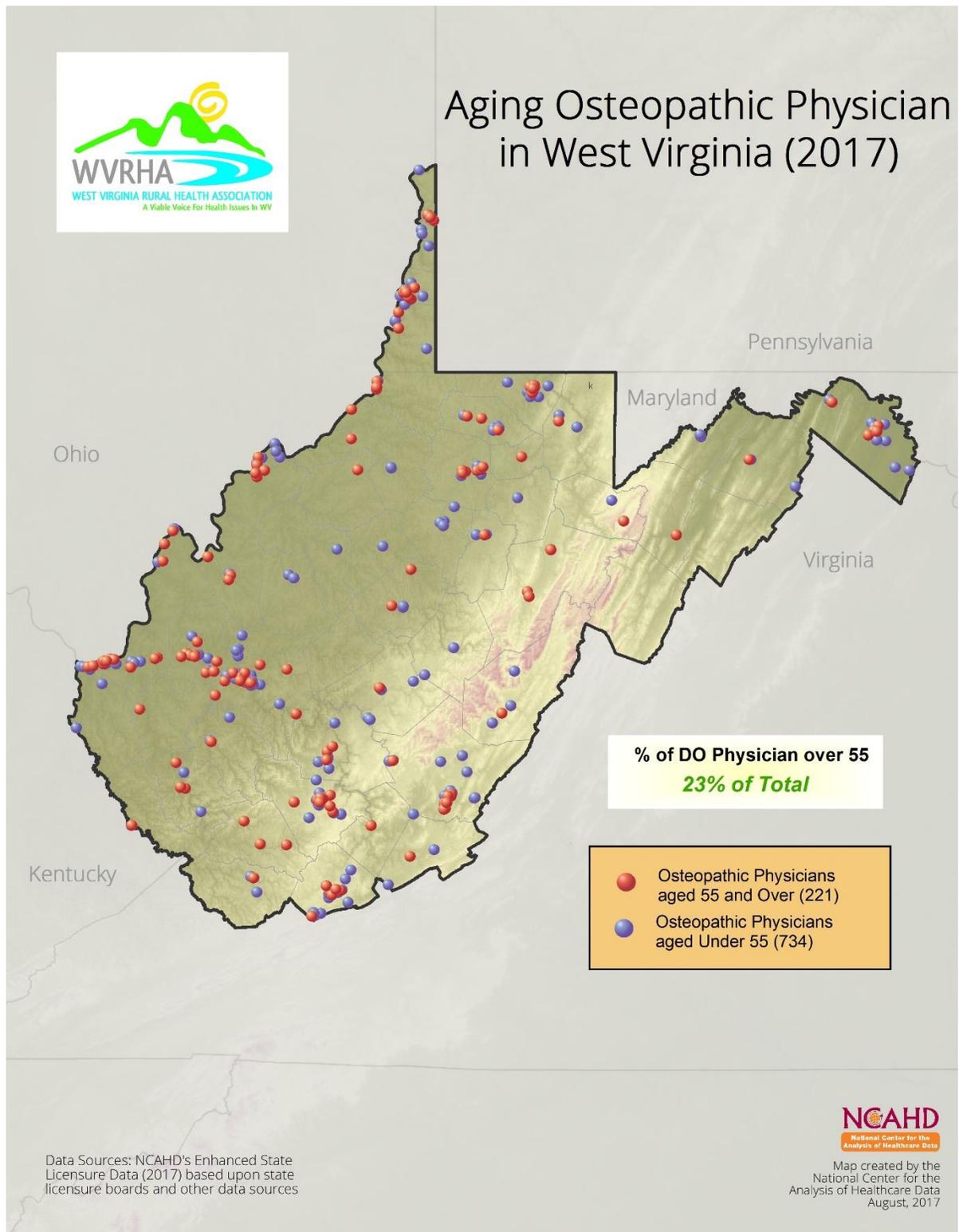


FIGURE 9 - AGING OSTEOPATHIC PHYSICIAN DISTRIBUTION

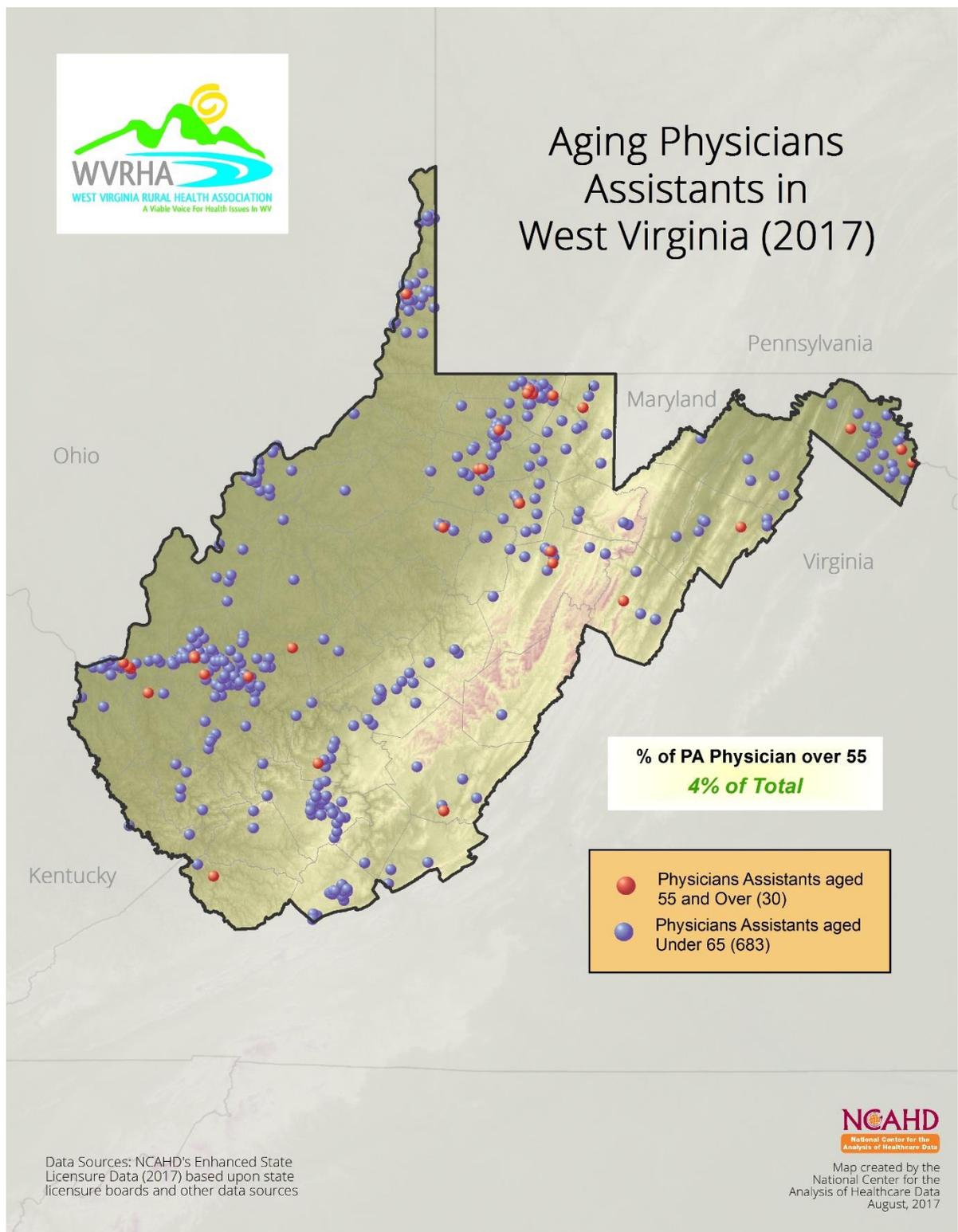


FIGURE 10 - AGING PHYSICIAN ASSISTANT DISTRIBUTION

As for the aging healthcare workforce, 23 percent of the aging Osteopathic physicians (over 55 years old) are practicing a primary care specialty and 26 percent of the Allopathic physicians aging are practicing a primary care specialty.

As previously mentioned, the overall nursing workforce is also aging with estimated half of all registered nurses reaching retirement age by 2020.¹⁸ With a need of over 6,000 dentists to meet the dental health needs in the U.S. and nearly 40 percent of currently actively practicing dentist over 55 years old, West Virginia and many states are turning to increasing the scope of practice for Dental Hygienists within the U.S.-to address their dental shortages in this manner.¹⁹

Identifying areas where there are both an aging population and aging healthcare workforce is critical in strategic planning for healthcare training, recruitment and retention programs. As many of the healthcare workforce training programs plan for expansions, there are multiple benefits in using the portal to identify existing training sites and/or those areas where patient populations are in greatest need. Additionally, the portal can be used to identify potential trainers and/or clinical training sites.

For the demand analysis, we reviewed the distribution of the combined aging primary care workforce and individual primary care providers so stakeholders had multiple perspectives of this important issue. The results are portrayed both on their individual's proximity and on their aggregate total compared to the total of their respective provider's in the county.

Specialty Care Workforce

Creating specialty physician needs ratios has primarily been limited to consulting companies creating their own based upon membership association data (e.g. Merritt Hawlins, etc.) or specialty physician organization or research organizations conducting member survey samples for use in ratio development. In 2017, NCAHD created specialty physician ratios utilized the 2017 Enhanced State Licensure data and 2015 Census estimated population and have generated similar specialty physician ratios for West Virginia as seen in the comparison chart, **Figure 11** below. The needs ratio was utilized to create the specialty physician workforce needs by county data that can be viewed within the portal.

2017 West Virginia Specialty Physician Needs Comparison

| Specialties | National Totals | West Virginia Totals (DO) | West Virginia Totals (MD) | National | West Virginia | % Difference |
|--------------------------------------|-----------------|---------------------------|---------------------------|---------------|---------------|--------------|
| | | | | Average Ratio | Average Ratio | |
| Primary Care | | | | | | |
| Family Medicine | 92,451 | 417 | 561 | 1:3,531 | 1,876 | 0.47 |
| Internal Medicine | 88,110 | 148 | 382 | 1:3,057 | 3,462 | 0.07 |
| Pediatrics | 42,041 | 25 | 212 | 1:7,766 | 7,742 | 0.00 |
| Medical Specialties | | | | | | |
| Allergy & Immunology | 2,778 | | 16 | 1:117,521 | 114,680 | 0.02 |
| Cardiology | 18,778 | 11 | 190 | 1:17386 | 9,129 | 0.47 |
| Dermatology | 9,512 | 9 | 47 | 1:34,322 | 32,766 | 0.05 |
| Endocrinology Diabetes, & Metabolism | 4,178 | 5 | 44 | 1:78,141 | 37,447 | 0.52 |
| Gastroenterology | 9,544 | 0 | 64 | 1:34,207 | 28,670 | 0.16 |
| Hematology & Oncology | 10,212 | 3 | 82 | 1:31,970 | 21,587 | 0.32 |
| Infectious Disease | 24,444 | 1 | 34 | 1:13,356 | 52,425 | -2.93 |
| Nephrology | 4,251 | 7 | 59 | 1:76,799 | 27,801 | 0.64 |
| Neurology | 11,401 | 2 | 91 | 1:28,636 | 19,730 | 0.31 |
| Psychiatry | 38,841 | 21 | 193 | 1:8,405 | 8,574 | -0.02 |
| Pulmonology | 5,610 | 7 | 74 | 1:58,195 | 22,653 | 0.61 |
| Rheumatology | 2,001 | 1 | 20 | 1:163,155 | 87,375 | 0.46 |
| Other Specialty | 38,107 | 9 | 339 | 1:8,567 | 5,273 | 0.38 |
| Surgical Specialties | | | | | | |
| General Surgery | 31,004 | 27 | 174 | 1:10,530 | 9,129 | 0.13 |
| Neurological Surgery | 4,610 | 1 | 36 | 1:70,819 | 49,591 | 0.30 |
| Obstetrics & Gynecology | 33,987 | 27 | 187 | 1:9,606 | 8,574 | 0.11 |
| Ophthalmology | 14,370 | 3 | 118 | 1:22,719 | 15,164 | 0.33 |
| Orthopaedic Surgery | 28,120 | 30 | 140 | 1:11,610 | 10,793 | 0.07 |
| Plastic Surgery | 5,610 | 0 | 29 | 1:58,195 | 63,272 | -0.09 |
| Urology | 7,511 | 6 | 57 | 1:43,466 | 29,125 | 0.33 |
| Other Surgical Specialties | 9,451 | 4 | 78 | 1:34,544 | 22,377 | 0.35 |
| Hospital-Based | | | | | | |
| Emergency Medicine | 37,590 | 135 | 371 | 1:8,685 | 3,626 | 0.58 |
| Anesthesiology | 35,441 | 39 | 186 | 1:9,212 | 8,155 | 0.11 |
| Radiology-Diagnostic | 41,009 | 12 | 221 | 1:7,961 | 7,875 | 0.01 |
| Pathology-Anatomic and Clinical | 13,009 | 5 | 112 | 1:25,096 | 15,683 | 0.38 |
| Pediatric Subspecialties | | | | | | |
| Pediatric Cardiology | 925 | 0 | 15 | 1:352,945 | 122,325 | 65% |
| Pediatric Neurology | 435 | 0 | 7 | 1:750,515 | 262,126 | 65% |
| Pediatric Psychiatry | 3,910 | 0 | 3 | 1:83,497 | 611,627 | -633% |
| Other Pediatric Subspecialties | 8,435 | 0 | 80 | 1:38,705 | 22,936 | 41% |

Using our 2017 Enhanced State Licensure data, we normalized to ACGME standards, the specialty information for all Allopathic and Osteopathic physicians and then applied the 2017 Estimated Demographics for all population, rural population and urban separately. Rural is defined by the OMB metro/non-metropolitan.

FIGURE 11 - WEST VIRGINIA PHYSICIAN SPECIALITIES RATIOS

Economic Impact of Primary Care Physician Mal-distribution

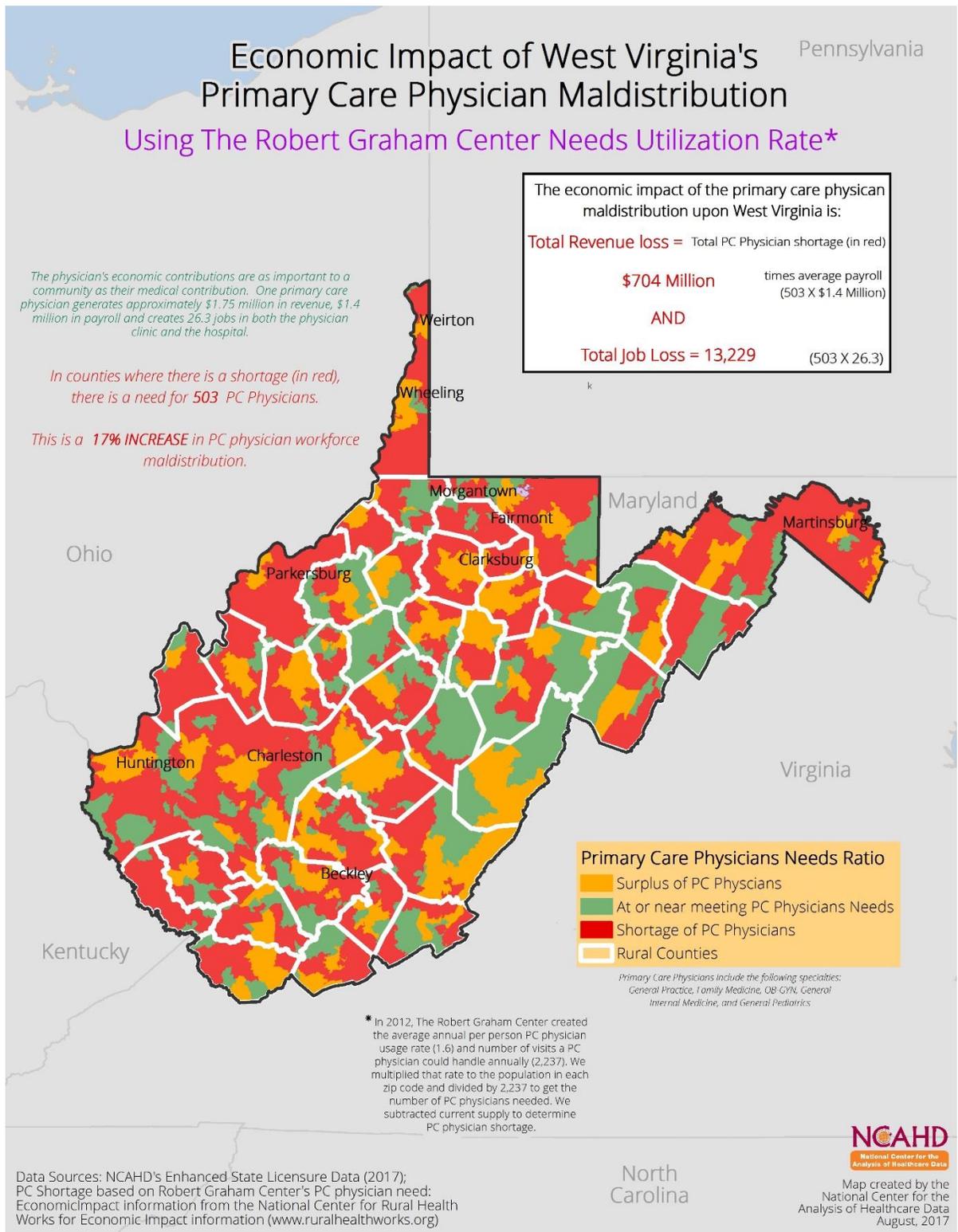
Most of the stakeholders are familiar with the federal shortage designations programs managed by the U.S. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Profession. These programs are coordinated with each state’s state primary care office. In 2008, the National Center for Rural Health Works (NCRHW) created an economic impact model to measure the economic impact of a rural primary care physician. Since the Primary Care Health Professional Shortage Area identifies areas where there are shortages, the application of the economic impact model to those shortage areas was performed to discern the costs of this healthcare workforce shortage. (Note: Over time, the NCRHW has updated their estimates to current wage earning.)

In December of 2012, the Robert Graham Center (RGC) published a new methodology for measuring primary care physician need by established a utilization rate based upon Medical Expenditure Panel Survey (MEPS) data²⁰. This new approach toward looking at demand for primary care services is based upon actual need rather than estimating the existence of shortage and is age adjusted. Because this methodology was designed to anticipate the additional patient load as the Affordable Care Act is implemented, it helps bring a more realistic view to current and future workforce demands than the current federal shortage program can produce through its methodology. Therefore, we have applied the RGC primary care utilization rate of 1.6 office visits per year by each West Virginia citizens. The PC Physician shortage figures below reflect this methodology for determining need and were utilized in creating the county based PC physician needs data available through the portal. **Map 30** following demonstrates the zip code aggregates of PC Physician distribution disparities. There was a 10% increase in this disparity since 2016.

| Primary Care Physician Distribution | | | | | | |
|-----------------------------------------------------|---------------------|--------------------------------|-------------------------|-----------------------|------------------------------|--------------------------|
| <i>Economic Impact Trend Analysis (2013 - 2017)</i> | | | | | | |
| Year | Total PC Physicians | Estimated Revenue Generation * | Estimate Job Generation | PC Physician Shortage | Revenue Loss Due to Shortage | Job Loss Due to Shortage |
| 2013 | 1,914 | \$1.7 Billion | 44,022 | 478 | \$430.2 Million | 10,994 |
| 2014 | 1,953 | \$1.8 Billion | 44,919 | 514 | \$462.6 Million | 11,822 |
| 2015 | 1,994 | \$2.6 Billion | 48,254 | 477 | \$620.1 Million | 11,591 |
| 2016 | 1,765 | \$2.3 Billion | 42,713 | 452 | \$587.6 Million | 10,938 |
| 2017 | 2,013 | \$2.8 Billion | 52,942 | 503 | \$704 Million | 13,229 |

**In 2013, the National Center for Rural health Works estimated one primary care physician generate \$900,000 and 23 jobs at both the clinic and through hospital admissions. This estimate changed in 2017 to \$1.4 in payroll and 26.3 jobs.*

TABLE 4 - ECONOMIC IMPACT OF PRIMARY CARE PHYSICIANS



MAP 30 - WEST VIRGINIA ECONOMIC IMPACT OF PC PHYSICIAN MALDISTRIBUTION

DATA SOURCES

The primary source for the provider data is their respective state licensure board which NCAHD collects and process annually (since 2007) to create the Enhanced State Licensure (ESL) dataset. In 2013, NCAHD determined the quality of certain attributes from the National Provider Index (NPI) met the center's QA/QC standards and integrated these attributes into the current ESL. (For more information on this process, see **Appendix A-NCAHD's National Data Collection Process**).

LIMITATIONS

The state licensure process for healthcare providers collects numerous elements of information (data) that are not released to the public, including the number of hours they practice, whether they accept Medicare, etc.; therefore, we assume that each licensee is equal to one Full-Time Equivalent (FTE).

Additionally, for those providers that practice in more than one location, we utilize their primary practice site only in the analysis since the additional practice site information is not publicly released.

All of the other data utilized in the maps or on the portal are properly cited on the map and/or within the portal.

WEST VIRGINIA RURAL HEALTH ASSOCIATION
2017 BOARD OF DIRECTORS

Jacquelynn A. Copenhaver, MA, LMT – President
West Virginia University Institute for Community and Rural Health

Debbie Curry, JD – President Elect
Marshall University Robert C. Byrd Center for Rural Health

Jeff Graham - Treasurer
Beckley Health Right

Alison Witte DLitt et Phil - Secretary
Glennville State College

David G. Bowyer, RPh
University of Charleston, School of Pharmacy

Brian K. Crist, MSW
Lincoln Primary Care

Lew Holloway MS, CHES
Northern WV Rural Health Education Center

Laura Jones, MSW, LGSW
Milan Puskar Health Right

Barbara W. Lay, MBA
Pocahontas Memorial Hospital

Alyson Leo, MD
Ruby Memorial Hospital

Aaron Spurlock, COO
Quality Insights

Brianna Willis, PhD, MA
WVU Institute for Community and Rural Health

Robert D. Whitler, MS
Partners in Health Network

Martha Wooten
WV Primary Care Association

Sandra Wynn, MS
Bluefield State College

Debrin Jenkins, MS, Executive Director

It is the mission of the West Virginia Rural Health Association to unite people, communities and organizations to strengthen rural health in West Virginia.

Patience and perseverance have a magical effect before which difficulties disappear and obstacles vanish.

John Quincy Adams

Be faithful in small things because it is in them that your strength lies.

Mother Teresa

Be the change that you wish to see in the world.

Mahatma Gandhi

REFERENCES

- ¹ Centers for Medicare and Medicaid Services, March 31, 2016 Effectuated Enrollment Snapshot, (Baltimore, MD: Centers for Medicare and Medicaid Services, June 2016), available online at <https://www.cms.gov/Newsroom/MediaReleaseDatabase/Fact-sheets/2016-Fact-sheets-items/2016-06-30.html> (last accessed Dec. 6, 2016).
- ² Schroeder, S. A., (1994). *Managing the U.S. health care workforce: Creating policy amidst uncertainty*. Inquiry. Vol.31: 266-275. Retrieved 9/20/2013 from: <http://www.jstor.org/stable/29772471>
- ³ Christiadi, Deskins, J., & Lego, B., (2014). Population Trends in West Virginia through 2030. West Virginia Research Corporations, West Virginia University College of Business and Economics. Retrieved from: <http://be.wvu.edu/bber/pdfs/BBER-2014-04.pdf>
- ⁴ Data Access and Dissemination Systems (DADS). (2010, October 05). American FactFinder - Community Facts. Retrieved August 26, 2017, from https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml
- ⁵Data Access and Dissemination Systems (DADS). (2010, October 05). American FactFinder - Community Facts. Retrieved August 26, 2017, from https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml
- ⁶American Association of Marriage and Family Therapy. (n.d.). Grandparents Raising Grandchildren. Retrieved August 26, 2017, from https://www.aamft.org/iMIS15/AAMFT/Content/consumer_updates/Grandparents_Raising_Grandchildren.asp
- ⁷Smith, G. C., & Palmieri, P. A. (2007). Risk of Psychological Difficulties Among Children Raised by Custodial Grandparents. *Psychiatric Services*,58(10), 1303-1310. doi:10.1176/appi.ps.58.10.1303
- ⁸Supporting grandparents raising grandkids in rural W.Va. (n.d.). Retrieved August 26, 2017, from <http://www.pbs.org/newshour/bb/rural-west-virginia-schools-help-grandparents-parenting-second-time/>
- ⁹Relatives As Parents Program. (n.d.). Retrieved August 26, 2017, from <https://www.missionwv.org/relatives-as-parents-program/>
- ¹⁰Starkey, J. (April 27, 2017). Special Report: Relatives raising grandchildren in West Virginia on the rise. WCHS Channel 8 New. Retrieved August 26, 2017, from <http://wchstv.com/news/local/relatives-raising-grandchildren-in-west-virginia-on-the-rise>
- ¹¹Weber, B., L. Jensen, K. Miller, J. Mosley, and M. Fisher. (2005). A critical review of rural poverty literature: is there truly a rural effect? Institute for Research on Poverty. Discussion Paper No. 1309-05. April. University of Wisconsin-Madison. Available online: <http://www.irp.wisc.edu/publications/dps/pdfs/dp130905.pdf> .

¹²Jillcot, S.B., T. Keyserling, T. Crawford, J.T. McGuirt, and A.S. Ammerman. (2011). Examining association among obesity and per capita farmers' markets, grocery stores/supermarkets, and supercenters in U.S. counties. *Journal of the American Dietetic Association* 111:567-572.

¹³Ahern, M., C. Brown, and S. Dukas. (2011). A national study of the association between food environments and county-level health outcomes *Journal of Rural Health* 27:367-379.

¹⁴Canto, A., L.E. Brown, and S.C. Deller. 2014. "<http://choicesmagazine.org/choices-magazine/theme-articles/food-and-poverty/rural-poverty-food-access-and-public-health-outcomes>

¹⁵Government Accounting Office, (May, 2017). Locations and Types of Graduate Training Were Largely Unchanged, and Federal Efforts May Not Be Sufficient to Meet Needs. GAO-17-411. Retrieved from:

¹⁶ Clark, J. and DiGaetano, R., (2014). Using the National Provider File as the Sampling Frame for a Physician Survey. *JSM 2014 – Survey Research Methods Section* pg. 1032.

¹⁷N.a., (2015). *The Aging Physician Workforce: A Demographic Dilemma*. Merritt Hawkins: Dallas, TX. Retrieved from:
https://www.merritthawkins.com/uploadedFiles/mhawwhitepaper_aging.pdf

¹⁸Huntingdon, L. and Heidkamp, M., (2013). *The Aging Workforce: Challenges for the Health Care Industry Workforce*. Issue Brief of the NTAR Leadership Center. Retrieved from:
<https://www.dol.gov/odep/pdf/ntar-agingworkforcehealthcare.pdf>

¹⁹N.a., (2013). *Oral Health Workforce: Policy Options to Meet Increased Demand*. National Conference of State Legislators presentation. Retrieved from:
<http://www.ncsl.org/documents/health/OralHealth121113webinarppt.pdf>

APPENDIX A – NCAHD NATIONAL DATA COLLECTION PROCESS

Many of the national healthcare provider organizations have created and maintain their own membership-based data inventories for their profession but the aggregation of these datasets for public access or assurance of their data quality has been well publicized. Considering the well published disparities in membership association data, and other private sector data sources, we determined that because the quality and consistency of provider data is controlled through state mandated licensure processes, it would become the basis for our national healthcare workforce data.

Therefore, in 2007, the National Center for the Analysis of Healthcare Data (NCAHD) took on the daunting task of researching and identifying sources for healthcare workforce data to establish a process that could assure a consistent data quality that would meet the needs of the research, healthcare education planning and more effective policy and decision-making. Consequently, NCAHD has collected, processed, normalized and made spatial the 2008, 2009, 2010, 2011, 2012 and 2013 licensure data from each licensure board in all 50 states for Allopathic and Osteopathic physicians and 14 non-physician healthcare providers (Physicians, Audiologists, Certified Registered Nurse Anesthetists (CRNAs), Certified Nurse Midwives (CNMs), Chiropractors, Clinical Nurse Specialists (CNS), Dentists, Dental Hygienists, Naturopaths, Nurse Practitioners (NPs), Optometrists, Oral and Maxillofacial Surgeons, Pharmacists, Physical Therapists (PTs), Physician Assistants (PAs), Podiatrists, Psychologists, and Speech-Language Pathologists (SLPs).

Since the type of data collected on each provider in each state is mandated differently (with all collecting a basic core set of elements: licensure #, address, status), we created a standardized process for data collection and management that helps to improve the quality of the licensure data.

For each data collection cycle, we utilized our unique national data collection and management system coupled with spatial analysis performed in three separate processes: Procurement, Data Normalization and Spatial Analysis and Aggregation

1. **Procurement:** Our process starts with identifying the source of each of the providers' state licensure information which is either their own provider licensure board or through a state repository. We contact each of these entities each year to determine any regulatory changes that may have transpired regarding either the collection or publication of the state licensure data and record any of those changes. Additionally, we determine the costs associated with the acquisition of the state licensure data and initiate the process to procure the data. After determining the costs and procurement process, we issue the check and wait for the state licensure board to send the data to our center for further processing.
2. **Data Normalization:** Upon receipt of each provider file, basic information is recorded as to date, number of raw records received and the format and if necessary, is converted into Excel spreadsheet format. Next, we conduct a thorough inventory of the data

attributes and quality of the data and record this information in an automated data matrix. In the next step, we remove duplicates, retired, deceased, overseas military and inactive licensees based upon the information provided by the state licensure boards on their status, licensure number and provider name. These licensees are put into a separate file for future reference. Our next step is to normalize the headers, names and addresses for each provider for each database in order to standardize the data and so that we manage the data for future research purposes.

3. **Handling of Multiple State Licenses:** Those licensees with multiple state licenses are assigned to the state in which their license is sent assuming that this is their main practice address. If the licensee has the license sent to a practice address within each of the states they are licensed in, it is assumed that they practice in each of those states to some degree throughout the year.
4. **Spatial Analysis and Aggregation:** At this point in the process, we will make the data spatial first through our automated geocoding process built within the GIS software. (We utilize the most current and spatially refined georeference file purchased separate from this grant for by the center.) We strive to geocode to the most refined level of geography provided through the licensure data. The resulting accuracy of the geocoding process is recorded as a part of each record. Providers that are not found through this process are identified through on-line internet searches.

After the data is made spatial, we segregate those providers that are in-state from all out-of-state providers and for the purposes of the HRSA grant, only aggregated the in-state providers to the county level. Our spatial aggregation process utilizes the most current county boundary file within the GIS. At the end of the spatial aggregation, we check the total number per state to the original in-state totals.

As a part of our data quality assurance process, we compare the county totals to the previous year's state licensure county totals. For those numbers that are off by more than 5%, we go back through the entire process again including checking with the data source to inquire as to the large difference from the previous year. If there was a data processing error, it is caught upon re-processing the file. If the large change was due to migration of providers or other potential suggestion by the board, we indicate it within the comments section of the file.

¹ Centers for Medicare and Medicaid Services, March 31, 2016 Effectuated Enrollment Snapshot, (Baltimore, MD: Centers for Medicare and Medicaid Services, June 2016), available online at <https://www.cms.gov/Newsroom/MediaReleaseDatabase/Fact-sheets/2016-Fact-sheets-items/2016-06-30.html> (last accessed Dec. 6, 2016).

⁴ Christiadi, Deskins, J., & Lego, B., (2014). Population Trends in West Virginia through 2030. West Virginia Research Corporations, West Virginia University College of Business and Economics. Retrieved from: <https://www.gao.gov/products/GAO-17-411> <http://be.wvu.edu/bber/pdfs/BBER-2014-04.pdf>

- ⁵Data Access and Dissemination Systems (DADS). (2010, October 05). American FactFinder - Community Facts. Retrieved August 26, 2017, from https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml
- ⁶American Association of Marriage and Family Therapy. (n.d.). Grandparents Raising Grandchildren. Retrieved August 26, 2017, from https://www.aamft.org/iMIS15/AAMFT/Content/consumer_updates/Grandparents_Raising_Grandchildren.asp
- ⁷Smith, G. C., & Palmieri, P. A. (2007). Risk of Psychological Difficulties Among Children Raised by Custodial Grandparents. *Psychiatric Services*, 58(10), 1303-1310. doi:10.1176/appi.ps.58.10.1303
- ⁸Supporting grandparents raising grandkids in rural W.Va. (n.d.). Retrieved August 26, 2017, from <http://www.pbs.org/newshour/bb/rural-west-virginia-schools-help-grandparents-parenting-second-time/>
- ⁹Relatives As Parents Program. (n.d.). Retrieved August 26, 2017, from <https://www.missionwv.org/relatives-as-parents-program/>
- ¹⁰
- ¹¹Weber, B., L. Jensen, K. Miller, J. Mosley, and M. Fisher. (2005). A critical review of rural poverty literature: is there truly a rural effect? Institute for Research on Poverty. Discussion Paper No. 1309-05. April. University of Wisconsin-Madison. Available online: <http://www.irp.wisc.edu/publications/dps/pdfs/dp130905.pdf> .
- ¹²Jillcot, S.B., T. Keyserling, T. Crawford, J.T. McGuirt, and A.S. Ammerman. (2011). Examining association among obesity and per capita farmers' markets, grocery stores/supermarkets, and supercenters in U.S. counties. *Journal of the American Dietetic Association* 111:567-572.
- ¹³Ahern, M., C. Brown, and S. Dukas. (2011). A national study of the association between food environments and county-level health outcomes *Journal of Rural Health* 27:367-379.
- ¹⁴Canto, A., L.E. Brown, and S.C. Deller. 2014. "<http://choicesmagazine.org/choices-magazine/theme-articles/food-and-poverty/rural-poverty-food-access-and-public-health-outcomes>
- ¹⁵Government Accounting Office, (May, 2017). Locations and Types of Graduate Training Were Largely Unchanged, and Federal Efforts May Not Be Sufficient to Meet Needs. GAO-17-411. Retrieved from:
- ¹⁶Clark, J. and DiGaetano, R., (2014). Using the National Provider File as the Sampling Frame for a Physician Survey. JSM 2014 – Survey Research Methods Section pg. 1032.
- ¹⁷N.a., (2015). The Aging Physician Workforce: A Demographic Dilemma. Merritt Hawkins: Dallas, TX. Retrieved from: https://www.merrithawkins.com/uploadedFiles/mhawwhitepaper_aging.pdf
- ¹⁸Huntingdon, L. and Heidkamp, M., (2013). The Aging Workforce: Challenges for the Health Care Industry Workforce. Issue Brief of the NTAR Leadership Center. Retrieved from: <https://www.dol.gov/odep/pdf/ntar-agingworkforcehealthcare.pdf>
- ¹⁹N.a., (2013). Oral Health Workforce: Policy Options to Meet Increased Demand. National Conference of State Legislators presentation. Retrieved from: <http://www.ncsl.org/documents/health/OralHealth121113webinarppt.pdf>