STATE OF NORTH CAROLINA
DEPARTMENT OF HEALTH AND HUMAN SERVICES

ROY COOPER
GOVERNOR

MANDY COHEN, MD, MPH
SECRETARY

December 17, 2018

SENT VIA ELECTRONIC MAIL

The Honorable Josh Dobson. Co-Chair
Joint Legislative Oversight Committee on
Health and Human Services
North Carolina General Assembly
Room 301N, Legislative Office Building
Raleigh, NC 27603-5925

The Honorable Louis Pate. Co-Chair
Joint Legislative Oversight Committee on
Health and Human Services
North Carolina General Assembly
Room 311, Legislative Office Building
Raleigh, NC 27603-5925

The Honorable Donny Lambeth, Co-Chair
Joint Legislative Oversight Committee on
Health and Human Services
North Carolina General Assembly
Room 303, Legislative Office Building
Raleigh, NC 27603-5925

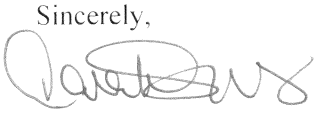
Dear Chairmen:

Session Law 2018-88, Section 1, requires the Department of Health and Human Services ("Department") to conduct a study and report on options for modification, enhancements, and other changes to graduate medical education (GME) payments to hospitals, as well as any other reimbursements, to incentivize health care providers in rural areas of the State to participate and support GME residency programs.

In addition, Section 2 requires the Department to conduct a study and provide an interim report on rural hospitals that desire to be designated as new teaching hospitals by the Centers for Medicare and Medicaid Services. These reports are due to the Joint Legislative Oversight Committee on Health and Human Services and the Joint Legislative Oversight Committee on Medicaid and NC Health Choice. Pursuant to the provisions of law, the Department is pleased to submit the attached report containing items identified in both studies.

Should you have any questions, please contact Maggie Sauer, Director of the Office of Rural Health, at 919-527-6440.

Sincerely,



for Mandy Cohen, MD., MPH
Secretary

cc:

Matt Gross	LT McCrimmon	Dave Richard	Rod Davis	Kody Kinsley
Joyce Jones	Marjorie Donaldson	Katherine Restrepo	Steve Owen	Lisa Wilks
Theresa Matula	Denise Thomas	Deborah Landry	Mark Benton	Zack Wortman
Leah Burns	Erin Matteson	Susan Perry-Manning	Jessica Meed	Mark Collins
Tara Myers	Maggie Sauer			

STATE OF NORTH CAROLINA
DEPARTMENT OF HEALTH AND HUMAN SERVICES

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GOVERNOR

MANDY COHEN, MD, MPH
SECRETARY

December 17, 2018

SENT VIA ELECTRONIC MAIL

The Honorable Nelson Dollar, Chair
Joint Legislative Oversight Committee on
Medicaid and NC Health Choice
North Carolina General Assembly
Room 307B, Legislative Office Building
Raleigh, NC 27603

The Honorable Ralph Hise, Chair
Joint Legislative Oversight Committee on
Medicaid and NC Health Choice
North Carolina General Assembly
Room 312, Legislative Office Building
Raleigh, NC 27603

The Honorable Donny Lambeth, Chair
Joint Legislative Oversight Committee on
Medicaid and NC Health Choice
North Carolina General Assembly
Room 303, Legislative Office Building
Raleigh, NC 27603

Dear Chairmen:

Session Law 2018-88, Section 1, requires the Department of Health and Human Services ("Department") to conduct a study and report on options for modification, enhancements, and other changes to graduate medical education (GME) payments to hospitals, as well as any other reimbursements, to incentivize health care providers in rural areas of the State to participate and support GME residency programs.

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Reports on GME and New Teaching Hospitals

Session Law 2018-88, Section 1.(b)
Session Law 2018-88, Section 2.(b)

Report to

Joint Legislative Oversight Committee on Health and Human Services

and

Joint Legislative Oversight Committee on Medicaid and NC Health Choice

by

N.C. Department of Health and Human Services

December 17, 2018

Executive Summary

In Part I, Section 1 (a) of Session Law 2018-88 (House Bill 998) the North Carolina General Assembly (NCGA) directed the North Carolina Department of Health and Human Services (DHHS) to conduct a study to identify options for modification, enhancements, and other changes to graduate medical education (GME) payments to hospitals, as well as any other reimbursements, to incentivize health care providers in rural areas of the State to (i) participate in medical education programs exposing residents to rural areas, programs and populations and (ii) support medical education and medical residency programs in a manner that addresses the health needs in the State. Furthermore HB 998 directs DHHS to collaborate with the North Carolina Area Health Education Centers (NCAHEC) program to examine:

(1) Changes in Medicaid graduate medical education reimbursement and funding sources after the 1115 waiver,
(2) Options to coordinate North Carolina Area Health Education Centers (NCAHEC) funding to create incentives for attracting residents and students to rural areas of the State,
(3) Any other issues the Department deems appropriate.

A final report is due October 1, 2018.

In Part I, Section 2 (a) of Session Law 2018-88 (House Bill 998) the North Carolina General Assembly (NCGA) directed the North Carolina Department of Health and Human Services (DHHS) to conduct a study to (i) identify rural hospitals that desire to be designated as new teaching hospitals by the Centers for Medicare and Medicaid Services; (ii) determine the technical assistance those hospitals require in order to be designated as new teaching hospitals by the Center for Medicare and Medicaid Services; and (iii) calculate the expected cost for those hospitals to be designated as new teaching hospitals by Centers for Medicare and Medicaid Services to examine:

(1) Expansion of graduate medical education (GME) payments to outpatient costs and services,
(2) Modifications to cost-finding and reimbursement formulas that incentivize rural hospitals to participate in education programs, and
(3) Options in physician reimbursement to incentivize participation, including a graduate medical education or geographic add-on for rural areas of the State.

An interim report is due October 1, 2018 and a final report is due October 1, 2019.

GME funding supports the training for residencies across North Carolina. NCAHEC works in concert with NC's teaching hospitals to create these training opportunities, and GME funding is provided to each teaching hospital to finance residency training. The distribution of GME funding is complex and, as compared to Medicare, North Carolina's GME Medicaid dollars comprise a smaller portion of the total funding received by our state residency programs to train new physicians.

To fully examine the “levers” available to modify the current NC residency training structure, a thorough review of GME funding is necessary. For that reason, DHHS has combined the two reports requested by the NCGA (in Sections 1 and 2 of Part I of HB 998) into one report. DHHS hopes to support the cross-committee work of the Joint Legislative Oversight Committee on Health and Human Services as well as the Joint Oversight Committee on Medicaid and NC Health Choice, and their efforts to address, strategize and align issues affecting access to care and rural residency training. This combined report is informed by the ongoing collaboration and the exchange of data provided by the North Carolina Area Health Education (NCAHEC) system, Cecil G. Sheps Research Center at UNC-Chapel Hill (Sheps Center) and NC Medicaid.

PART I. GME AND NEW TEACHING HOSPITALS

The following report provides current information on GME funding provided by DHHS Medicaid and the US Centers for Medicare and Medicaid Services (CMS) to inform options to modify, enhance or make further changes to graduate medical education payments to increase access to rural health care providers in North Carolina's rural communities. The report is informed by the collaboration and the exchange of data provided by the North Carolina Area Health Education (AHEC) system, Cecil G. Sheps Research Center at UNC-Chapel Hill (Sheps Center) and NC Medicaid.

Section 1 (a) (1) Changes in Medicaid Graduate Medical Education Reimbursement and Funding Sources

Current State: Medicaid GME Reimbursement under Medicaid FFS

North Carolina Medicaid currently reimburses hospitals for Graduate Medical Education (GME) costs under a two-tiered system:

- **Diagnosis-Related Group (DRG) Base Payments**. Teaching hospitals receive a GME "add-on" payment for each inpatient discharge. The State provides the non-federal share for these add-on payments.
- **Supplemental Payments**. The State's Medicaid Reimbursement Initiative (MRI) reimburses teaching hospitals for the difference between their Medicaid DRG base payments and costs, including GME costs. As a result, the MRI pays these hospitals for any GME costs that not covered by the base rate add-on. Hospitals fund the non-federal share of MRI payments through intergovernmental transfers (IGTs) and/or provider assessments.

Future State: Medicaid GME Reimbursement after Managed Care Transition

DHHS will continue to make GME payments *directly* to hospitals after the managed care transition but will use a different methodology compared to the current approach. Specifically:

- GME will no longer be included as a base payment add-on (in either Medicaid FFS or managed care).
- DHHS will reimburse hospitals using separate methodologies for direct (DGME) and indirect (IME) medical education:
  - **DGME.** Will be calculated based on the statewide per-resident-average of salary/fringe benefit costs, multiplied by each hospital's number of residents and adjusted for share of Medicaid days.[1]

[1] DGME payments for primary affiliated teaching hospitals for each University of North Carolina medical school will be calculated using hospital-specific salary/fringe benefit costs rather than the statewide per-resident average.

- **IME.** Will be calculated using the Medicare IME formula,[2] multiplied by each hospital's number of Medicaid discharges and case mix index.

- Both Medicaid DGME and IME **will not** be subject to Medicare caps on the number of residents per hospital.
- DHHS will recalculate each hospital's GME payment amounts annually.

Incentives for Urban and Rural Hospitals

The DGME Medicaid payment methodology may benefit rural hospitals compared to the current state. That's because costs tend to be lower in rural areas, and the statewide per-resident average of salary/fringe benefits may be higher than actual per-resident DGME costs in many rural areas. As a result, some rural hospitals could see DGME payments **above** their costs.

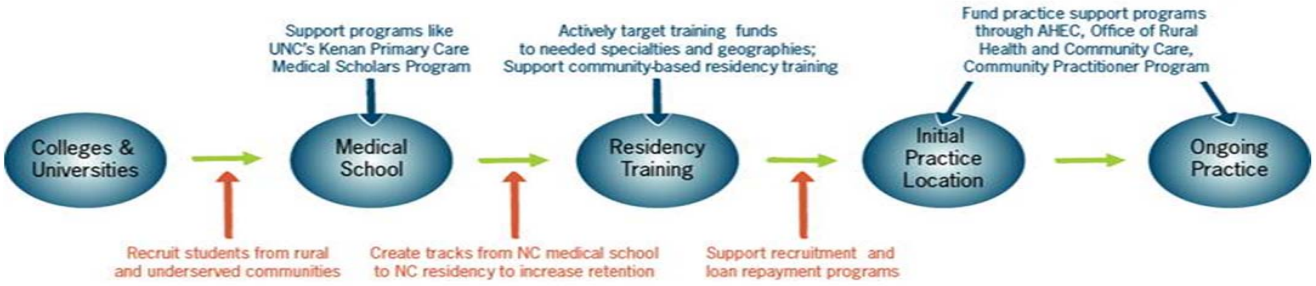
Otherwise, the new methodology will have little impact on the distribution of GME payments among urban and rural hospitals.

Section 1 (a) (2) Options to Coordinate North Carolina Area Health Education Centers to Create Incentives and Ensuring Maximum Benefit

Graduate Medical Education (GME) funding and its impact on the production of an increased number of rural health care providers is an intricate analysis. To fully examine the options to align GME with this mission, the following information is offered to provide context for the recommendations contained in this report.

Creating opportunities and experiences which encourage more healthcare providers to serve in rural areas has been researched and reported on extensively by the Cecil G. Sheps Research Center at UNC-Chapel Hill. The below Figure (**Figure 1**) illustrates several of the strategies and levers to incentivize the development of more rural providers. The process begins with recruiting more students from North Carolina's rural and underserved communities and supporting their academic development through residency. It also includes creating opportunities for intentional and innovative pairing of the training process occurring in the NC AHEC system with the application of loan repayment programs like the National Health Service Corp, the NC Loan Repayment Program and the NC Medical Society Foundation's Community Practitioner Program.

Figure 1 – Rural Provider Recruitment and Support

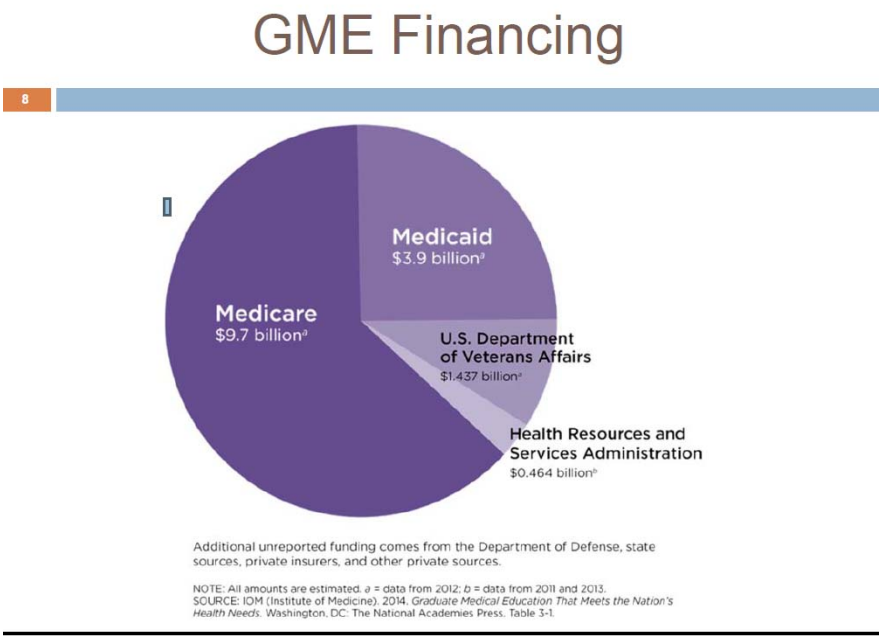


[2] 42 CFR §412.105.

HB 998 Part I and II are interdependent in the ways for which they work to incentivize rural healthcare providers to serve in our rural communities.

The below Figure (**Figure 2)** illustrates the funding for Graduate Medical Education and its complex blend of federal and state monies including Medicare, Medicaid, Veterans Administration, Department of Defense, Health Resources and Services Administration (HRSA) and Self-funding by resident training institutions. Total federal GME funding exceeds $15 billion per year. The financial underpinnings of the GME enterprise are complex and largely undocumented.[3]

Figure 2 – Total Federal GME Funding



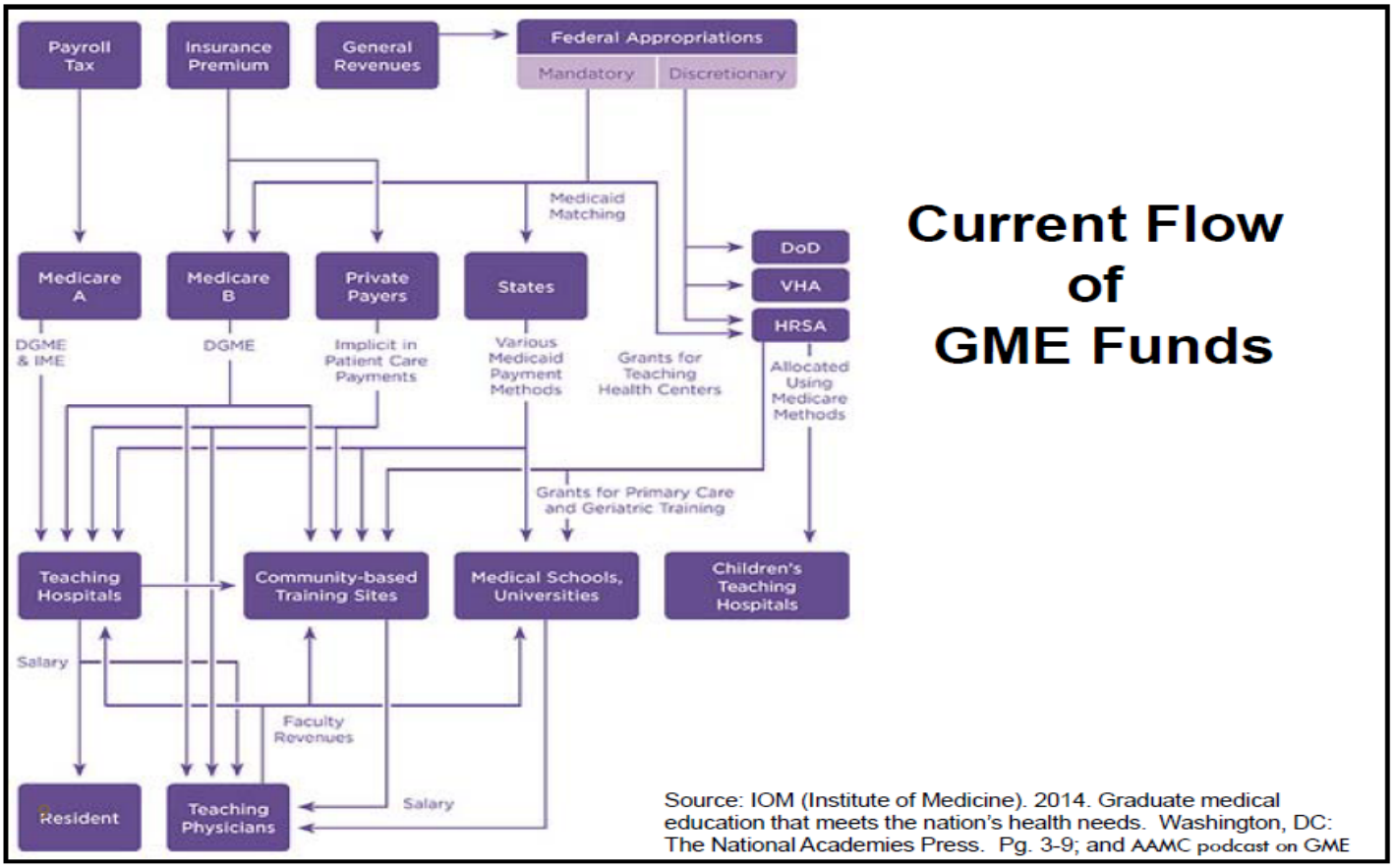
NC specific GME information is provided later in this report and describes GME funding received by NC institutions to support residency training. The opportunity to modify GME payment to incentivize rural residency training – to ultimately impact access to care for rural communities – includes an examination of GME funding and its path to and within the institutions providing the training. The below Figure (**Figure 3)** illustrates the complexity of GME funding and its flow to teaching institutions and residents themselves.

GME is also supported by private sources. Private funding is difficult to quantify but may be significant. Private insurers support GME implicitly by paying higher rates to teaching institutions. Hospitals, universities, physicians' organizations, and faculty practice plans also support residencies and fellowships. Private philanthropy and gifts or grants from industry (primarily pharmaceutical and

[3] Education, C. o., Services, B. o., Medicine, I. o., & Eden J, B. D. (2014). Graduate Medical Education That Meets the Nation's Health Needs. Washington (DC): National Academies Press (US).

medical device companies) are another source of financial support [4] [5]. Many of these GME funding streams individually represent a minor fraction of GME funding nationally, but for some teaching programs they may support most, if not all, of the operating budget.

Figure 3 – Current Flow of GME Funds



The Source and Estimated GME is provided in the following Table (Table 1) represent the most recent available estimates of GME funding by source. The single largest, explicit contributor to GME is Medicare ($9.7 billion), followed by Medicaid ($3.9 billion) and the Veterans Health Administration (VHA) ($1.4 billion). HRSA distributes approximately $0.5 billion through a variety of GME-related programs (HRSA, 2013).

[4] Spero JC, F. E. (2013). *United States: A review of state initiatives.* Chapel Hill: Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill.

[5] Wynn BO, G. C. (2013, August 6). Alternative ways of financing graduate medical education. Retrieved from DHHS: http://aspe.dhhs.gov/health/reports/06/AltGradMedicalEdu/report.pdf

Table 1. Source and Amount of GME Funding, Selected Years

Funding Source	Fiscal Year	Funding (in billions)
Medicare (total)	2012	**$9.7**
Acute care hospitals		$9.6
Indirect payments		6.8
Direct payments		2.6
Specialty hospitals		0.1
Medicaid	2012	**3.9**
Veterans Health Administration (VHA) (total)	2012	**1.437**
Indirect payments		0.816
Direct payments		0.621
Department of Defense		NA
HRSA (total ~$.464)		
Children's Hospitals GME	2013	0.251
NHSC Loan Repayments	2011	0.096
Teaching Health Centers GME	2011	0.046
Title VII Primary Care Programs	2011	0.071
Other state funding		NA
Private insurers		NA
Other private sources		NA

NOTES: VA indirect payments include training of all health professionals. Medicaid includes federal and state shares. CHGME estimate is from its operating budget while under sequestration in 2013. NA=not available.
SOURCES: Henderson, 2013; HRSA, 2013b. Medicare estimates provided by Marc Hartstein, Director, Hospital and Ambulatory Policy Group, Center for Medicare, CMS, September 4, 2013 (personal communication). VHA estimates provided by Barbara K. Chang, Director of Medical and Dental Education, VHA Office of Academic Affiliations, July 15, 2013 (personal communication).

To more completely understand the impact of funds provided by Medicaid, the following details are important regarding the distribution and use of GME funds:

- Direct Graduate Medical Education Payment (DCGME or DME) funds a variety of activities including resident stipends and benefits, faculty salary and benefits, accreditation fees, institutional overhead costs and administrative costs of those working directly in the GME office of participating institutions.
- Indirect Medical Education Payments (IME) subsidizes hospitals for expenses associated with training resident physicians such as higher utilization of services and longer inpatient stays.
- Medicare DME payments are computed as follows:
  DME = Per Resident Amount x Resident FTEs x Proportion of Medicare Patients Seen.
- Medicare Indirect Medical Education Payments are payments received in addition to traditional Medicare inpatient payment for an individual institution. These additional payments are calculated by multiplying three factors[6] as outlined below:

  Weighted resident count x Per-resident amount x Medicare bed-day ratio

  (1) Weighted resident count: A 3-year rolling average of the hospital's weighted number of full-time equivalent (FTE) residents in accredited programs in the most recent 3-year period (after taking into account the cap on allopathic and osteopathic residents). “Weighted” refers

[6] Wynn BO, G. C. (2013, August 6). *Alternative ways of financing graduate medical education*. Retrieved from DHHS: http://aspe.dhhs.gov/health/reports/06/AltGradMedicalEdu/report.pdf

to the following: Only trainees in their initial residency period (i.e., the minimum time required for board eligibility or 5 years, whichever is shorter) are counted as 1.0 FTE. Other residents or fellows are counted as 0.5 FTE.

(2) Per-resident amount (PRA): A dollar amount calculated by dividing the individual hospital's base year (i.e., 1984 or 1985) DGME costs by the weighted residents count (adjusted for geographic differences and inflation).

(3) Medicare day ratio: The ratio of the hospital's Medicare inpatient days to total inpatient days (to approximate Medicare's share of the training costs).

States have considerable flexibility in how they use Medicaid funds for GME purposes, including which professions and which settings and organizations are eligible to receive support for health professions education[7] [8] [9] [10]. In 2007, US Centers for Medicare & Medicaid Services (CMS) issued a Proposed Rule to end federal matching funds for all Medicaid GME payments, citing inconsistency with federal statute[11]. However, after several moratoriums imposed by Congress, as well as a *Sense of the Senate* resolution, the rule was not implemented[12]. Medicaid regulations do not recognize specifically, although the (CMS) does allow, GME as an approved component of inpatient and outpatient hospital services[13].

Because the federal government does not require separate reporting for Medicaid GME expenditures and most Medicaid funding is subsumed in payment for patient services, quantifying the overall level of Medicaid GME payments is problematic. Policy makers, including federal Medicaid officials, look to privately sponsored surveys of state Medicaid programs for estimates of spending data.[14] Unless otherwise indicated, the data in this section draws from a 2012 survey sponsored by the Association

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[8] COGME. (2004, June 27). Resource paper: State and managed care support for graduate medical education: Innovations and implications for federal policy. Retrieved from HRSA: http://www.hrsa.gov/advisorycommittees/bhpradvisory/cogme/Publications/managedcarerpt.pdf

[9] GAO. (1997, July 16). Medicaid graduate medical education. Retrieved from http://www.gao.gov/assets/90/86259.pdf

[10] Herz E, T. S. (2009, September 29). CRS report: Medicaid and graduate medical education. Retrieved from http://aging.senate.gov/crs/medicaid8.pdf

[11] Herz E, T. S. (2009, September 29). *CRS report: Medicaid and graduate medical education.* Retrieved from http://aging.senate.gov/crs/medicaid8.pdf

[12] Henderson TM. (2010). *Medicaid direct and indirect graduate medical education payments: A 50-state survey.* Washington: AAMC.

[13] CMS. (2007, June 27). *Proposed Rule.* Retrieved from Medicaid program: Graduate medical education.: http://www.gpo.gov/fdsys/pkg/FR-2007-05-23/html/07-2576.htm

of American Medical Colleges (AAMC)[15]. Data from previous years are available from AAMC.[16] Both represent the most recent data available.

Under an approved Medicaid State Plan Amendment, North Carolina hospitals receive an add-on amount to their base rate. The add-on amount is specific to each hospital and represents a portion of their teaching costs. Additionally, teaching hospitals receive reimbursement through the MRI/GAP supplemental payments. Other States may have a different reimbursement method that would be approved by CMS.

Once NC Medicaid transitions to managed care, the MRI/GAP supplemental payments will not be allowed under 42 CFR 438 for those Medicaid beneficiaries covered under the managed care health plan. As stated previously on page 3, CMS does allow all states to make direct payments to hospitals for GME and not require them to be built into the base rates. The advantage to the state is the GME direct payments will not be part of the 1115 Waiver budget neutrality calculation.

Table 2, below, shows the FFY 2016 Medicaid GME expenditures for North Carolina as compared to several surrounding states.

Table 2 – FFY 2016 GME Expenditures

FFY 2016 GME Medicaid Expenditures Source: FFY 2016 CMS 64 Expenditure Report https://data.medicaid.gov			
State	**Total Computable**	**Federal Share**	**State Share**
North Carolina	$ 81,878,379	$ 54,314,351	$ 27,564,028
Alabama	No Payment reported		
Florida	$180,676,656	$109,616,527	$ 71,060,129
Georgia	No Payment reported		
South Carolina	$ 69,040,404	$ 49,073,919	$ 19,966,485
Tennessee	$ 49,999,963	$ 32,524,977	$ 17,474,986
Virginia	$264,619,223	$132,309,612	$132,309,611

[15] [15] [17] Henderson TM. (2013, June 22). Retrieved from Medicaid graduate medical education payments: A 50-state survey.: https://members.aamc.org/eweb/upload/Medicaid%20Graduate%20Medical%20Education%20Payments%20A%2050-State%20Survey.pdf

Table 3, below, provides an overview of the funding provided to NC hospitals for GME based on Hospital Paid Inpatient Claims data for State Fiscal Year 2017 (July 1, 2016 to June 30, 2017).

Table 3 - North Carolina Hospital Medical Education Factors for FFY 2017
Calculated from Hospital Paid Inpatient Claims Data, State Fiscal Year End 2017
(07/01/2016 – 06/30/2017)

	Summary	*Summary*
Hospital Name	**Number of Discharges**	**GME Amount**
Blue Ridge Healthcare Hospital	2,089	$ 506,715.97
Cape Fear Valley Medical Center	10,065	$ 735,694.89
Carolinas Medical Center	16,822	$ 8,062,434.48
Carolinas Medical Center - Mercy	5	$ 165.06
Carolinas Medical Center - Northeast	5,327	$ 534,327.54
Carolinas Medical Center - Union	2,310	$ 110,010.16
Carolinas Rehabilitation	-	$ -
Duke Regional Hospital	2,983	$ 471,351.06
Duke University Hospital	11,504	$ 14,556,576.31
Forsyth Memorial Hospital	10,138	$ 513,394.13
Harnett Health	-	$ -
Margaret R. Pardee Memorial Hospital	1,011	$ 67,059.98
Mission Hospital	8,859	$ 1,450,875.12
Moses H. Cone Memorial Hospital	10,469	$ 1,305,385.92
New Hanover Regional Medical Center	7,681	$ 1,621,425.84
North Carolina Baptist Hospital	7,010	$ 15,355,228.11
Novant Health-Huntersville	-	$ -
Pitt County Memorial Hospital	9,434	$ 10,820,214.84
Sampson Regional Medical Center	686	$ 27,421.52
Southeastern Regional Medical Center	2,963	$ 85,648.35
University of North Carolina Hospital	10,804	$ 22,729,127.99
Wake Medical Center	10,530	$ 1,643,295.62
GRADUATE MEDICAL EDUCATION TOTALS	130,690	$ 80,596,352.89

Recently published work from the Sheps Center, entitled **The Workforce Outcomes of Physicians Completing Residency Programs in North Carolina**[17] for NC Session Law 2017-57 the Current Operations Appropriations Act of 2017 provides additional data regarding the number of residents trained by each institution and the number of physicians practicing in rural NC upon graduation. (**See Appendix A**).

Drawn from the recent Sheps Center report, **Table 5** (*condensed)*, depicted below, shows the number of residents by institution, type of program (MD or DO) and location in the state. There were 3,774 residents or fellows in training in NC in 2017. The clear majority (95%) of residents in training in NC are in MD programs but 5% are in DO programs.

[17] Fraher E., S. J. (2018). The Workforce Outcomes of Physicians Completing Residency Programs in North Carolina. Chapel Hill.

Table 5 *(Condensed)* Number of Residents and Fellows in Training by Sponsor Location, NC, 2017

Institution Name	Location	DO or MD	Number of Residents and Fellows
Cabarrus Family Medicine	Concord	MD	25
Campbell University	Buies Creek	MD	2
Cape Fear Valley Medical Center (Campbell Affiliated)	Fayetteville	DO	32
Carolinas HealthCare System Blue Ridge	Morganton	DO	35
Carolinas Medical Center	Charlotte	MD	317
Cone Health	Greensboro	MD	48
Duke University Medical Center	Durham	MD	1,038
Harnett Health (Campbell Affiliated)	Dunn	DO	23
MAHEC/Mission Health System	Asheville	MD	66
MAHEC/Mission Health System	Henderson	MD	13
Novant Health	Cornelius	MD	12
Sampson Regional Medical Center (Campbell Affiliated)	Clinton	DO	19
South East AHEC/ New Hanover Regional Medical Center	Wilmington	MD	74
Southeastern Health (Campbell Affiliated)	Lumberton	DO	78
Southern Regional AHEC	Fayetteville	MD	24
UNC Health Care	Chapel Hill	MD	856
Vidant Health	Greenville	MD	398
Wake Forest Baptist Medical Center	Winston-Salem	MD	714
Total			**3,774**

Source: Data obtained from the respective residency programs and are based on the institutions' list of include residents and fellows as of October 2017.

[1] Accreditation Council for Graduate Medical Education Public Advanced Program Search Tool. Accessed October 15, 2017 at: https://apps.acgme.org/ads/Public/Programs/Search?stateId=34&specialtyId=&city=

Table 6, below, shows the retention for residents that completed training in 2008, 2009, 2010 or 2011 by specialty in North Carolina and in rural counties five years after graduation. Psychiatry programs had the highest retention in NC and in rural counties with 57.3% of residents remaining in-state and 10.9% going into practice in rural areas. About half (49.6%) of family medicine graduates were retained in-state and nearly 5% practiced in rural counties five years after completing training. Pediatrics and internal medicine retained 44.3% and 40.5% but only 1.1% and 1.4% in rural practice respectively. Surgery residency programs had lower retention rates in state, with 33.9% of residents practicing in North Carolina after five years but a relatively high retention rate in communities with 4.4% of residents in practice in rural communities. Neurological surgery training programs had the lowest retention rates in the state and in rural counties.

Table 6 (*Condensed)*. Resident Retention Five Years After Graduation for Residents Graduation in 2008, 2009, 2010 or 2011

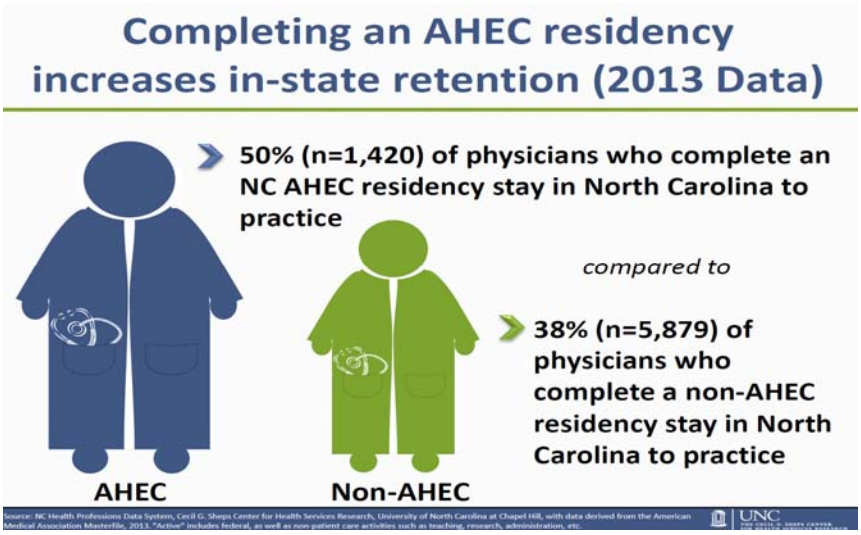
	Total Number of Residents	Retention of Residents in North Carolina After Five Years		Retention of Residents in Rural North Carolina After Five Years	
		#	%	#	%
Psychiatry	110	63	57.3%	12	10.9%
Internal Medicine/Pediatrics	62	33	53.2%	3	4.8%
Family Medicine	351	174	49.6%	17	4.8%
Pediatrics	262	116	44.3%	3	1.1%
Anesthesiology	152	63	41.4%	5	3.3%
Internal Medicine	662	268	40.5%	9	1.4%
Neurology	46	17	37.0%	3	6.5%
Urology	26	9	34.6%	1	3.8%
Obstetrics and Gynecology	145	50	34.5%	4	2.8%
Surgery	183	62	33.9%	8	4.4%
Neurological Surgery	18	3	16.7%	0	0.0%

Notes: The values in this table are derived from aggregating the workforce outcomes of four cohorts of residents who completed training in 2008, 2009, 2010, or 2011. We used North Carolina Medical Board licensure data to determine the location and primary area of practice for each physician five years after graduation, e.g., for a resident who completed training in 2008, we used 2013 NC Medical Board data to determine his/her location and primary area of practice. Rural areas are based on 2015 Office of Management and Budget metropolitan status codes and 2010 US Census Bureau Rural-Urban Commuting Area (RUCA) codes. Rural areas are either a) in a nonmetropolitan county or b) in an area within a metropolitan county that has a RUCA code of 4 or greater.

One of the factors leading to the retention of physicians in NC is where residents receive their training. **Figure 4**, below, illustrates the higher number of residents who received their training in a

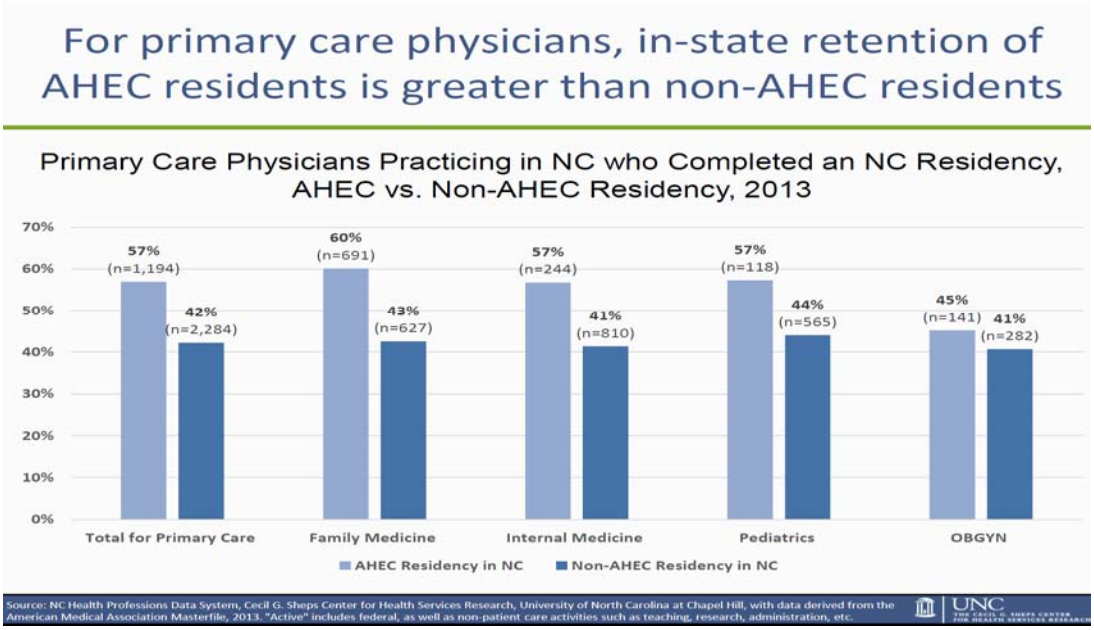
NC AHEC residency stay in NC compared to non-AHEC training. This is evident in the numbers of primary care residents who choose to practice in NC after their residency as well.

Figure 4 – AHEC Residency In-State Retention



Furthermore, residents who completed their residency training with AHEC are retained at a higher rate than their non-AHEC counterparts. **Figure 5,** below, provides a 2013 summary (the most recent data available) for primary residents including family medicine, pediatrics, internal medicine and OB/GYN.

Figure 5- Retention of AHEC Residents Compared to Non-AHEC Residents



Funding for Residency Training Programs and Current AHEC Programs

This report thus far has outlined North Carolina's Medicaid reimbursement for GME as well as the structure and payment methodology for GME and the latest data outlining physician GME training and retention. **Table 7,** below, provides data regarding Medicare payments provided to each of the NC teaching hospitals, Medicaid GME and GME funds received by AHEC to support residency training. As previously discussed, Medicare represents the largest portion of funds received by hospitals for GME. **Figure 6**, below, further exemplifies the distribution of GME funding in North Carolina.

Table 7– Medicare, Medicaid, and AHEC Graduate Medical Education Payments to NC Teaching Hospitals, FY 2016

Medicare, Medicaid, and AHEC Graduate Medical Education (GME) Payments to NC Teaching Hospitals, FY 2016

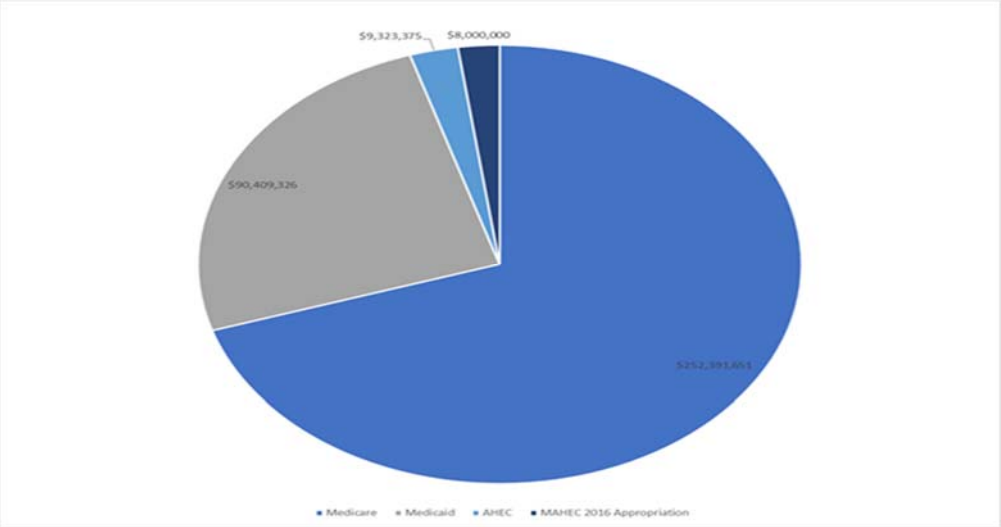
Produced by: Program on Health Workforce Research and Policy, Cecil G. Sheps Center for Health Services Research, UNC-Chapel Hill.

Source: Medicare GME data exerpted from Robert Graham Center data: 2000-2016 Graduate Medical Education For Teaching Hospitals, downloaded 6 Sept 2018 at URL: https://www.graham-center.org/rgc/maps-data-tools/data-tables/gme/00-16.html. Medicaid GME data, Personal Communication, Maggie Sauer, Director, NC Office of Rural Health, 10/28/18. AHEC GME Funding FY16-17. Personal communication, Pratyush Mehta, Finance Director, NC AHEC Program, 9/20/18.

		Medicare GME Funds					Medicaid GME Funds		AHEC GME Funds	
Fiscal Year	Teaching Hospital Name	Teaching Hospital Fiscal Year Beginning Date	Teaching Hospital Fiscal Year End Date	DGME	IME	Total GME Payments from Medicare	Hospital Facility	SFY 16-17 GME Amount *7/1/16-6/30/17*	Associated AHEC	FY 16-17 AHEC GME Expenses* *7/1/16-6/30/17*
2016	CAROLINAS MEDICAL CENTER	1/1/2016	12/31/2016	$6,793,248	$19,900,000	$26,700,000	Carolinas Medical Center	8,062,434		
							Carolinas Medical Center - Mercy	165		
2016	CAROLINAS HEALTHCARE SYSTEM NORTHEAST	1/1/2016	12/31/2016	$1,063,893	$2,324,958	$3,388,851	Carolinas Medical Center - Northeast	534,328	Charlotte	$ 840,414
2016	CAROLINAS REHABILITATION	1/1/2016	12/31/2016	$553,965		$553,965	Carolinas Rehabilitation	-		
2016	CAROLINAS HEALTHCARE SYSTEM UNION	1/1/2016	12/31/2016	$254,949	$411,404	$666,353	Carolinas Medical Center - Union	110,010		
2016	DUKE UNIVERSITY HOSPITAL	7/1/2016	6/30/2017	$13,900,000	$58,000,000	$71,900,000	Duke University Hospital	14,556,576	Duke Univ.	$ 711,953
2016	DUKE REGIONAL HOSPITAL	7/1/2016	6/30/2017	$1,159,173	$2,746,149	$3,905,322	Duke Regional Hospital	471,351		
2016	PITT COUNTY MEMORIAL HOSPITAL	10/1/2015	9/30/2016	$16,600,000	$21,800,000	$38,400,000	Pitt County Memorial Hospital	10,820,215	Eastern	$ 539,982
2016	THE MOSES H. CONE MEMORIAL HOSPITAL	10/1/2015	9/30/2016	$2,792,910	$6,161,229	$8,954,139	Moses H. Cone Memorial Hospital	1,305,386	Greensboro	$ 1,929,741
2016	MARGARET R. PARDEE MEMORIAL HOSPITAL	10/1/2015	9/30/2016	$374,089	$645,777	$1,019,866	Margaret R. Pardee Memorial Hospital	67,060	MAHEC	
2016	MISSION HOSPITAL INC	10/1/2015	9/30/2016	$1,918,444	$6,843,542	$8,761,986	Mission Hospital	1,450,875		$ 10,263,984
2016	BLUE RIDGE HEALTHCARE HOSPITALS	1/1/2016	12/31/2016	$1,181,102	$2,493,441	$3,674,543	Blue Ridge Healthcare Hospitals	506,716	Northwest	
2016	FORSYTH MEMORIAL HOSPITAL INC	1/1/2016	12/31/2016	$903,289	$2,868,274	$3,771,563	Forsyth Memorial Hospital	513,394		$ 805,986
2016	NEW HANOVER REGIONAL MEDICAL CENTER	10/1/2015	9/30/2016	$2,266,351	$7,673,452	$9,939,803	New Hanover Regional Medical Center	1,621,426	South East	$ 298,287
2016	CAPE FEAR VALLEY MEDICAL CENTER	10/1/2015	9/30/2016	$865,095	$2,850,510	$3,715,605	Cape Fear Valley Medical Center	735,695		
2016	S.E. REGL MEDICAL CENTER	10/1/2015	9/30/2016	$1,236,788	$2,652,188	$3,888,976	Southeastern Regional Medical Center	85,648	Southern Regional	$ 299,659
2016	SAMPSON REGIONAL MEDICAL CENTER	10/1/2015	9/30/2016	$422,171	$500,146	$922,317	Sampson Regional Medical Center	27,422		
2016	UNIVERSITY OF NORTH CAROLINA HOSPITALS	7/1/2016	6/30/2017	$14,500,000	$39,500,000	$54,000,000	University of North Carolina Hospital	22,729,128	UNC Hospitals	$ 523,525
2016	WAKEMED RALEIGH CAMPUS	10/1/2015	9/30/2016	$2,423,825	$5,804,537	$8,228,362	Wake Medical Center	1,643,296	Wake	$ 685,404
2016	NORTH CAROLINA BAPTIST HOSPITAL	7/1/2016	6/30/2017	$18,800,000	$48,500,000	$67,300,000	North Carolina Baptist Hospital	15,355,228	Wake Forest Univ.	$ 424,440
TOTAL				**$69,209,292**	**$183,175,607**	**$252,391,651**		**80,596,353**		**$ 17,323,375**

*AHEC GME expenses include: A) $3,455,649 in state funds allocated for residency stipends (293.1 slots@ $11,790/slot, B) $8 million allocated to MAHEC in state funds for family medicine, psychiatry, and surgery residencies in the MAHEC region, and C) $5,867,726 in funds AHECs self-reported spending on GME-related activities. This amount fluctuates annually.

Figure 6 – Total Funding for NC GME Funding Including Medicaid, Medicare, AHEC and MAHEC Rural Residency Training Program



Tools to Identify Rural Hospitals as New Teaching Hospitals by Centers for Medicare

1. In Part I Section 2 (a) of HB 988, the North Carolina General Assembly (NCGA) directed the Department of Health and Human Services (DHHS) to conduct a study to (i) identify rural hospitals that desire to be designated as new teaching hospitals by the Centers for Medicare and Medicaid Services; (ii) determine the technical assistance those hospitals require in order to be designated as new teaching hospitals by the Center for Medicare and Medicaid Services. The Health Resources and Services Administration created the **Rural Graduate Medical Education Analyzer** to enable rural hospitals to determine possible qualification for Medicare Graduate Medical Education payments. For rural hospitals to newly qualify for Medicare Direct Graduate Medical Education (DGME) and Indirect Medical Education (IME) payments, hospitals must:

   - Be located in a rural area. For the purposes of this tool, 'rural' is defined as all counties that are not designated as parts of Metropolitan Areas (MA), as specified at 42 CFR 412.64(b)(1)(ii)(C).
   - Have no prior evidence of resident training since 1996 and/or thereafter as reported on Center for Medicare & Medicaid Services (CMS) Cost Reports (Hospital Form 2552-96 and Hospital Form 2552-10) (i.e. no DGME payments, no IME payments, no Training Costs)

   Facilities included in the tool are those that have CMS Cost Reports (Hospital Form 2552-96 and Hospital Form 2552-10) (such as PPS hospitals, Sole Community Hospitals, etc.). Critical Access Hospitals (CAHs) are not included. CAHs and their hospital owned clinics receive only direct cost reimbursement for allowable teaching costs, not IME, and are not subject to a Medicare cap for resident training.

2. A national team led by Cristy Page, MD, MPH, Chair of UNC Family Medicine has been awarded $2.4 million of funding in a cooperative agreement by HRSA's Federal Office of Rural Health Policy. The funding will support the development of a national technical assistance center that will engage with HRSA Rural Residency Planning and Development (RRPD) Program awardees to help them develop new, accredited residency programs in family medicine, general internal medicine and psychiatry in rural communities in the United States. North Carolina is fortunate that this technical assistance center is located in state and will provide opportunities for analysis and technical assistance as strategies are identified to more deeply analyze the technical assistance hospitals and other sites will require to be designated as new teaching hospitals/sites by the US Center of Medicare & Medicaid Services. **(See Appendix B - HRSA Rural Residency Planning and Development (RRPD) Program)**

Conclusion

The information provided in this combined report, Part I Section I (a) and Section 2 (a) of Session Law 2018-88 House Bill 998, is a culmination of North Carolina specific GME data and further outlines opportunities for further examination. The combined report is the foundation for a final report to the North Carolina General Assembly (NCGA) by October 1, 2019 that more clearly addresses the questions posed by the NCGA utilizing the vast resources for additional analysis available to our State. GME payments and their ability to incentivize the development of rural providers and rural health care access is a matter of state and national interest. Medicaid represents a fraction of the funds in total GME funding. Further analysis in the coming year will lead to more reliable and sustainable conclusions to guide planning.

Recommended Next Steps:

1. Review and, if necessary modify, Residency Curricula to better meet the needs of rural residencies:
    a. **By May 31, 2019*,*** Central AHEC will create a report to DHHS containing a review of the current curricula and capacity in the Central AHEC program to support the development of rural residency training programs in rural communities - broad scope of practice, team-based care, behaviorally integrated care, population health, and quality improvement, with close linkage to community resources. The report will include recommendations to standardize programs across AHEC to support the development of a curricula to meet the needs of rural residencies.

2. Link available datasets to track the outcome of residency programs.
    a. The Sheps Center will serve as the central point for uniform data collection, analysis, and reporting on all existing and new GME sites. The ongoing data collection and analysis will link these data to other sources of information to track the outcomes of residency program graduates, including where graduates practice and in what specialty they are practicing five and ten years after completing residency training. It is further recommended that the NCGA allocate funds to support this analysis for the October 1, 2019 report and thereafter to ensure North Carolina maintains current and up-to-date information regarding the Return on Investment (ROI) for state Medicaid funds used to support rural communities and the need to train, recruit and retain healthcare providers in rural North Carolina.
    b. **By October 1, 2019,** DHHS will review Sheps Center data and incorporate this review as part of the final report to the NCGA.

3. Develop strategies to more closely link rural training programs at AHEC, rural residency training sites (small rural hospitals), the NC Loan Repayment at the Office of Rural Health and other best practices identified by the newly established HRSA Rural Residency Training and Development Program (RRPD).

a. By October 1, 2019, ORH and AHEC will identify and report best practices in current rural residency training programs to link residency training opportunities with rural practice incentives to support the rural primary care pipeline.
b. By October 1, 2019, DHHS will report on recommendations provided by DHHS, AHEC and the Sheps Center in partnership with the RRPD to:
    i. Identify rural hospitals interested in being designated as new teaching hospitals by the US Centers for Medicare & Medicaid Services;
    ii. Determine the technical assistance those hospitals will require to be designated as new teaching hospitals by the Center for Medicare & Medicaid Services;
    iii. Calculate the expected cost for those hospitals to be designated as new teaching hospitals by US Centers for Medicare & Medicaid Services, to examine, new, accredited residency programs in family medicine, general internal medicine and psychiatry in rural communities in North Carolina;
    iv. Examine and report on the possible expansion of Graduate Medical Education (GME) payments to outpatient costs and services;
    v. Examine and report on the modifications to cost-finding and reimbursement formulas that incentivize rural hospitals to participate in education programs; and
    vi. Review physician reimbursement strategies to incentivize participation, including a graduate medical education or geographic add-on for rural areas of the State.

APPENDICES

APPENDIX A - The Workforce Outcomes of Physicians Completing Residency Programs in North Carolina

APPENDIX B – HRSA Rural Residency Planning and Development (RRPD) Program

UNC
THE CECIL G. SHEPS CENTER
FOR HEALTH SERVICES RESEARCH

The Workforce Outcomes of Physicians Completing Residency Programs in North Carolina

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January 11, 2018

INTRODUCTION

North Carolina Session Law 2017-57, the Current Operations Appropriations Act of 2017, directed the North Carolina Department of Health and Human Services (DHHS) and The University of North Carolina (UNC) to provide a report on the workforce outcomes of medical school and graduate medical education (GME) programs in North Carolina. The report will be reviewed by subcommittees appointed by the Joint Legislative Oversight Committee on Health and Human Services and the Joint Legislative Education Oversight Committee to assess the degree to which state support of physician training programs meet the health care needs of North Carolina's citizens.

The Program on Health Workforce Research and Policy at the Cecil G. Sheps Center for Health Services Research at the University of North Carolina at Chapel Hill was asked to provide data for the report. This document focuses on graduate medical education (GME or "residency training") outcomes; a separate report addresses medical school outcomes in North Carolina.

This report responds to the legislation which asked DHHS and UNC to:

1. determine the identity, location, and number of positions for graduate medical education training programs in the state, broken down by location;
2. identify the number of graduates from GME programs in the state that are in practice in North Carolina in 2016 in anesthesiology, neurology, neurosurgery, obstetrics and gynecology, primary care, psychiatry, surgery and urology;
3. track the outcomes of graduates of North Carolina residency training programs in primary care, obstetrics and gynecology, and psychiatry five years after completing residency training.

BACKGROUND

Graduate medical education (GME), commonly referred to as "medical residency" or "residency," occurs after medical school. After graduating from medical school, physicians complete a residency to gain skills and competencies in a particular branch of medicine, for example, family medicine, obstetrics and gynecology, or general surgery. Both allopathic (MD) and osteopathic (DO) physicians must complete medical residencies to become fully licensed by the NC Medical Board. The length of a medical residency depends on the specialty, with most residencies lasting between three to seven years.

The majority of public funding for residencies in NC and the nation comes from Medicare. Other funding sources include the Veterans Administration, Medicaid, state appropriations, and hospitals. North Carolina's Medicaid program provides a greater amount of GME funding than most other states. In 2012, North Carolina ranked fifth among all 50 states and DC in the amount of GME funding provided by Medicaid, with a total of $116 million in GME support.[1] During the 2015 legislative session, the NC General Assembly reduced the state's contribution toward Medicaid GME funding (NC Session Law 2015-241, SECTION 12H.23.(a), but language in the Current Operations Appropriations Act of 2017 noted the intent of the General Assembly to continue to appropriate funds for GME as part of Medicaid transformation (NC Session Law 2017-57, SECTION 11H.13.(b)). Despite the relatively high investment of state funds in GME in NC, there are no accountability measures attached to these monies. The lack of transparency and accountability for public investments in GME is not unique to North Carolina; it has been identified as a major flaw in the system by numerous reports.[2,3] Without accountability for funds, North Carolina and the nation are unable to target GME investments to ensure the training pipeline produces the workforce necessary to meet population health needs.

Prior efforts evaluating the workforce outcomes of residency programs reported results at the institution level, rather than the program level.[4] This report builds on prior work conducted by Sheps Center researchers, including two national studies of state level GME reform focusing on Medicaid GME,[5,6] a report on GME tracking efforts in NC,[7] and a study of the possible effects of expanding or reallocating GME positions on the supply of physicians.[8]

METHODS

Overview of Study Design

The information requested by the legislature required two different methodological approaches. A cross-sectional approach was used to determine the identity, location, and number of positions in graduate medical education training programs in the state, and identify the number of graduates from GME programs in the state that were in practice in North Carolina in 2016. A cohort approach was used to track the outcomes of graduates of North Carolina residency training programs five years after completing residency training.

Cross-Sectional Approach

Using a ***cross-sectional approach***, we identified the number of graduates from NC GME programs that were in active practice in North Carolina in 2016 in family medicine, general internal medicine, obstetrics and gynecology, general pediatrics, general surgery, anesthesiology, neurology, neurological surgery, psychiatry, pediatric psychiatry, addiction psychiatry, geriatrics, urology, urgent care, and hospitalist practice in rural and urban counties of the state. These data are derived from the NC Medical Board's annual licensure file. This analysis reflects a "snapshot" of all physicians in practice in the state in a single year (2016). Because the data are captured in a single year, they include residents who may have completed training as recently as the prior year or decades earlier. This study also includes data on the total number of residents in training in NC residency programs in 2017. These data were obtained directly from residency institutions across the state.

Using a ***cohort study design***, we assessed the number and percent of residency program graduates who completed training in 2008, 2009, 2010, and 2011 who were in practice *in NC and in rural areas five years after graduation*. We also examined the number and percent of physicians who completed

residency training in NC that were in practice in anesthesiology, neurology, neurological surgery, obstetrics and gynecology, family medicine, general internal medicine, internal medicine/pediatrics, general pediatrics, psychiatry, surgery, and urology five years after completing training. These specialties were identified by the legislature as experiencing "a shortage" (NC Session Law 2017-57, SECTION 11J.2.(a)(3)).

Data and Analysis

Data on the number of residents in each program were collected by contracting the residency institutions directly. The data include residents and fellows in training as of October 2017. For the osteopathic medical residencies affiliated with Campbell University School of Osteopathic Medicine (CUSOM) (Campbell University, Cape Fear Valley Medical Center, Harnett Health, Sampson Regional Medical Center, and Southeastern Health) we obtained information directly from CUSOM office of post-graduate affairs.

The number of graduates of NC residency institutions in practice in the state by primary area of practice was derived from the NC Medical Board's annual licensure file maintained in the NC Health Professions Data System (HPDS). The data include active, licensed physicians with a primary practice address in NC who are not in residency training and are not employed by the federal government as of October 31, 2016. Primary area of practice is self-reported and may be the same as the physician's specialty (e.g. internal medicine, neurological surgery, or dermatology) but may also correspond to the physician's area of work (e.g. hospitalist, urgent care, or student health). For the purposes of this analysis, we use the terms "primary area of practice" and "specialty" interchangeably. Physicians were coded as practicing in a rural area if the primary practice location is in either a) a non-metropolitan county according to the 2015 federal Office of Management and Budget (OMB) classification, or b) a metropolitan county in an area with a Rural Urban Community Area (RUCA) code of 4 or greater.

To evaluate return on investment in terms of residency programs' contributions to the NC workforce, we developed a methodology to track annual cohorts of NC GME graduates in active practice in the state five years after graduation. Data were merged from three different sources to create the analytic datasets for the cohort analysis, which tracked graduates from NC residency programs in 2008, 2009, 2010, and 2011 graduating cohorts. To identify the graduates from NC GME programs in each year, we obtained National Graduate Medical Education Census (GMETrack) data, housed at the Association of American Medical Colleges (AAMC). GMETrack includes a survey of residents on duty in December of each year in programs accredited by the Accreditation Council for Graduate Medical Education.[9] GMETrack is called a "census" but the data are survey data. Most, but not all, GME programs complete the survey, and it is the best-known data source on GME programs (Personal Communication, Karen Jones, Senior Data Analyst, AAMC, 9 Jan 2017). Traditionally, the data have included residents in ACGME and ACGME/AOA jointly accredited programs. The data have excluded the ~5% residents in AOA only programs. This will change in the future with the "All-in" policy.

GMETrack data were used to identify the names of GME graduates from residency programs in NC in 2008, 2009, 2010, and 2011. These data were merged with licensure data from 2013, 2014, 2015 and 2016 to determine the workforce outcomes of GME program graduates five years after completing training. These data were merged with two additional files. First, a list of ACGME programs and the cities in which they were located, since the GMETrack data did not initially include residency

institution city.[i] Second, OMB county status definitions and RUCAs, which we used to classify primary practice locations as rural or urban.

Data were analyzed at the residency program level to determine outcomes five years later in terms of practice in NC, practice in rural NC, and practice in a generalist specialty (e.g., general pediatrics vs. sub-specialty pediatrics). Specifically, we evaluated the workforce outcomes of graduates of North Carolina residency training programs in anesthesiology, neurology, neurosurgery, obstetrics and gynecology, primary care, psychiatry, surgery and urology in 2008, 2009, 2010, and 2011, including the number and percent retained in North Carolina. Because many residency programs have only a few graduates each year, outcomes for multiple years were combined to increase the sample size and "smooth" the data. This analysis generated data that indicates, for each residency program in NC, the number (and percent) of residency program graduates that are in practice in NC.

FINDINGS OF CROSS-SECTIONAL ANALYSIS:

How many residents do we have in NC and where are they training?

Table 1 *(condensed)* shows the number residents by institution, type of program (MD or DO) and location in the state. There were 3,774 residents or fellows in training in NC in 2017. The vast majority (95%) of residents in training in NC are in MD programs but 5% are in DO programs. **Table 1 in the appendix** details the numbers of residents in each training program and specialty by institution.

Table 1 *(Condensed)*. Number of Residents and Fellows in Training by Sponsor Location, NC, 2017

Institution Name	Location	DO or MD	Number of Residents and Fellows
Cabarrus Family Medicine	Concord	MD	25
Campbell University	Buies Creek	MD	2
Cape Fear Valley Medical Center (Campbell Affiliated)	Fayetteville	DO	32
Carolinas HealthCare System Blue Ridge	Morganton	DO	35
Carolinas Medical Center	Charlotte	MD	317
Cone Health	Greensboro	MD	48
Duke University Medical Center	Durham	MD	1,038
Harnett Health (Campbell Affiliated)	Dunn	DO	23
MAHEC/Mission Health System	Asheville	MD	66
MAHEC/Mission Health System	Henderson	MD	13
Novant Health	Cornelius	MD	12
Sampson Regional Medical Center (Campbell Affiliated)	Clinton	DO	19
South East AHEC/ New Hanover Regional Medical Center	Wilmington	MD	74
Southeastern Health (Campbell Affiliated)	Lumberton	DO	78
Southern Regional AHEC	Fayetteville	MD	24
UNC Health Care	Chapel Hill	MD	856
Vidant Health	Greenville	MD	398
Wake Forest Baptist Medical Center	Winston-Salem	MD	714
Total			**3,774**

Source: Data obtained from the respective residency programs and are based on the institutions' list of include residents and fellows as of October 2017.

[i] Accreditation Council for Graduate Medical Education Public Advanced Program Search Tool. Accessed October 15, 2017 at: https://apps.acgme.org/ads/Public/Programs/Search?stateId=34&specialtyId=&city=

The Current NC Workforce: Where Did They Train?

The majority of physicians in the NC workforce completed residency training outside the state. 16% of physicians who completed residency training out-of-state practice in rural areas compared to 11% of NC-trained physicians.

Table 2 in the appendix shows in greater detail where the current North Carolina physician workforce completed training and, based on where they completed training and their specialty, the number and percent who are in rural counties in the state. New Hanover Regional Medical Center had the largest percent of residents in practice in rural areas (28%, or 50 of 177 residents) and a relatively high proportion of physicians in family medicine, OB/GYN and surgery in rural areas compared to other training programs. But New Hanover is among the smaller residency training programs in NC.

Vidant Health, one of the larger residency programs in the state, consistently rank at or near the top of in terms of the proportion of their residents practicing in rural areas. Compared to other programs in North Carolina,

- 30% of Vidant's family medicine residents (45 of 149 residents) are in rural areas compared to an average 17% for all NC residency training programs
- 26% of Vidant's internal medicine residents (21 of 80 residents) are in rural areas compared to an average to 12% for all NC residency training programs
- 28% of Vidant's pediatrics residents (23 of 81 residents) are in rural areas compared to an average 10% for all NC residency training programs
- 33% of Vidant's obstetrics and gynecology residents (15 of 46 residents) are in rural areas compared to an average 16% for all NC residency training programs
- 41% of Vidant's general surgery residents (7 of 17 residents) are in rural areas compared to an average 26% for all NC residency training programs
- 25% of Vidant's total residents (211 of 859) in rural areas compared to an average 11% for all NC residency training programs

UNC Health Care, the largest psychiatry residency program in the state, has the highest proportion of psychiatry residents practicing in rural areas with 16%, or 30 of 193 residents, in rural counties in North Carolina.

The cross-sectional snapshot in Table 2 of graduates by residency institution in active practice in NC in 2016 does not show the percentage of graduates from each residency institution that were retained in practice in the state. To do this, we would need to use a national data file, such as the American Medical Association Physician Masterfile, which would allow us to identify a denominator of all graduates from a given residency institution that are in practice in the U.S. These data would include physicians who completed residency over an approximately 25-year period. Because all the residency cohorts are pooled, we are unable to determine how retention varies by graduating cohort; earlier or later residency program cohorts may be more or less likely to be retained in practice in North Carolina.

FINDINGS OF COHORT ANALYSIS

How many residents practice in North Carolina and in rural areas five years after graduation? How do these retention rates differ by program and specialty?

Table 3 shows the retention in North Carolina and in rural counties five years after graduation for residents that completed training in 2008, 2009, 2010 or 2011 by specialty. Psychiatry programs had the highest retention in NC and in rural counties with 57.3% of residents remaining in-state and 10.9% going into practice in rural areas. About half (49.6%) of family medicine graduates were retained in-state and nearly 5% practiced in rural counties five years after completing training. Pediatrics and internal medicine programs retained 44.3% and 40.5% in-state but only 1.1% and 1.4% in rural practice respectively. Surgery residency programs had lower retention rates in state, with 33.9% of residents practicing in North Carolina after five years but a relatively high retention rate in rural communities with 4.4% of residents in practice in rural counties. Neurological surgery training programs had the lowest retention rates in the state and in rural counties.

Table 3 *(Condensed)*. Resident Retention Five Years After Graduation for Residents Graduating in 2008, 2009, 2010 or 2011

	Total Number of Residents	Retention of Residents in North Carolina After Five Years		Retention of Residents in Rural North Carolina After Five Years	
		#	%	#	%
Psychiatry	110	63	57.3%	12	10.9%
Internal Medicine/Pediatrics	62	33	53.2%	3	4.8%
Family Medicine	351	174	49.6%	17	4.8%
Pediatrics	262	116	44.3%	3	1.1%
Anesthesiology	152	63	41.4%	5	3.3%
Internal Medicine	662	268	40.5%	9	1.4%
Neurology	46	17	37.0%	3	6.5%
Urology	26	9	34.6%	1	3.8%
Obstetrics and Gynecology	145	50	34.5%	4	2.8%
Surgery	183	62	33.9%	8	4.4%
Neurological Surgery	18	3	16.7%	0	0.0%

Notes: The values in this table are derived from aggregating the workforce outcomes of four cohorts of residents who completed training in 2008, 2009, 2010, or 2011. We used North Carolina Medical Board licensure data to determine the location and primary area of practice for each physician five years after graduation, e.g., for a resident who completed training in 2008, we used 2013 NC Medical Board data to determine his/her location and primary area of practice. Rural areas are based on 2015 Office of Management and Budget metropolitan status codes and 2010 US Census Bureau Rural-Urban Commuting Area (RUCA) codes. Rural areas are either a) in a nonmetropolitan county or b) in an area within a metropolitan county that has a RUCA code of 4 or greater.

The data in Table 3 show *average* retention rates across all training programs for different specialties. Table 3 in the appendix shows that there is significant variation in retention in North Carolina and in rural areas between training programs with some programs doing considerably better than average. For example, the UNC and Wake Forest psychiatry residency training programs retained nearly 70% of their residents in North Carolina five years after graduation. Vidant Medical Center had a lower retention rate of psychiatrists instate with 50% in practice but a relatively high rural rate with 13% in rural counties. 15% of UNC's of psychiatry residency graduates ended up in practice in rural areas.

In family medicine, the Mountain Area Health Education Center Program (MAHEC) in Asheville retained nearly three-quarters of its residents in state five years after graduation but only 3.2% were in practice in rural counties. Carolinas Medical Center retained 71% of graduates and 6.5% in rural counties. Vidant/East Carolina's family medicine program had lower retention rates in-state with 45% of residents in practice in NC five years after graduation but relatively high retention in rural counties compared to other family medicine programs with 10.5% in rural counties.

In internal medicine, Cone Health retained 65% of residents in state and 3.5% in rural counties which were the highest retention rates among programs. The UNC program retained more than half (51.3%) of its residents in-state and 2.5% in rural areas. Surgery residency programs showed considerable variation. Carolinas Medical Center's and New Hanover Regional Medical Center's surgical residency programs were relatively more successful than other programs, retaining 47% and 42% of residents in state and 18% and 17% of surgery residents in rural counties respectively. UNC's surgery program was also relatively successful, retaining 39.2% of residents in-state and nearly 4% in rural counties five years after graduation.

What percent of residents trained in North Carolina practice in the specialty in which they trained?

Table 4 ***(condensed)*** shows for residents who finished training in 2008, 2009, 2010 or 2011, the number who were retained in North Carolina by specialty and the percent of these NC physicians who remained in general practice five years after completing training. For example, Table 3 shows that of the 351 residents who trained in family medicine over those four years, nearly half, or 174, remained in practice in North Carolina five years after completing training. Table 4 *(condensed)* below shows that of these 174 physicians, 74% remained in practice in family medicine five years later. The remaining 26% reported that they were practicing in urgent care (12 physicians), geriatrics (9 physicians), as hospitalists (7 physicians), sports medicine (6 physicians), emergency medicine (3 physicians), addiction psychiatry (2 physicians) and psychiatry (1 physician).

A smaller percent (16%, n=42) of internal medicine physicians remained in general internal medicine five years after completing training, while another 17% practiced as hospitalists. Of the 116 pediatric residents in practice in the state five years after graduation, 58% were practicing in general pediatrics. About one in three (31%) general surgeons practiced general surgery. Of the 63 psychiatrists in practice in North Carolina five years after completing training, 73% were in general psychiatry and 25% were in child psychiatry. Obstetrics and gynecology has few subspecialties that branch from it and the data in Table 4 show the majority of obstetricians and gynecologists (Ob/Gyn) do not specialize.

Table 4 ***(Condensed).*** **Primary Area of Practice Five Years After Graduation for Residents Graduating in 2008, 2009, 2010 or 2011**

Specialty	Total # in Practice in NC	% in Generalist Practice
Family Medicine	174	74%
Internal Medicine	268	16%
-- Hospitalist	45	17%
General Pediatrics	116	58%
General Surgery	62	31%
General Psychiatry	63	73%
-- Child Psychiatry	16	25%
Ob/Gyn	50	94%

Table 4 in the appendix shows that the number of residents who did not go onto subspecialize but remained in practice in general internal medicine, general pediatrics and general surgery five years after completing training differs considerably between training programs and institutions. Five years after completing training, 40% of residents who trained at Carolinas Medical Center were in practice as general internists compared to residents who completed internal medicine training at Duke and UNC where just 8% and 7% respectively ended up in practice as general internists. Residents from Carolinas Medical Center who completed training in general pediatrics and general surgery were also more likely to remain in generalist practice. Eighty-four percent (84%) of pediatricians were practicing general pediatrics and 63% of surgeons were practicing general surgery five years after completing training.

CONCLUSION

This analysis builds on the work of Chen and colleagues[10] and, to our knowledge, is the first to report the workforce outcomes for all residencies in a state at the residency program level using a cohort approach. Reporting at the program level, rather than the institutional level, shows the high level of variation that exists between programs in the number of residency graduates who ultimately end up in practice in the state, in rural settings, and as generalist physicians.

As state policy makers consider ways to increase the number of physicians practicing in North Carolina by expanding residency training opportunities, it is important to evaluate retention in specialties required to meet North Carolina's health care needs. This requires not only examining retention in North Carolina and in rural areas, but also in specialties in high demand in the state. Physicians are increasingly subspecializing and fewer are practicing in "generalist" specialties such as family medicine, general internal medicine, general pediatrics, general surgery, and general psychiatry. While the state needs subspecialists, maintaining an adequate supply of generalist physicians is necessary to meet demand for primary care, mental health, obstetric care, child health, and general surgery services.

We used a cohort approach for this analysis because the legislation specified that the subcommittees reviewing this report would be charged with developing an evaluation protocol for residency programs. A cohort approach, which evaluates workforce outcomes at regular intervals, allows the state to determine whether changes to GME financing policy influence the state's physician workforce. At present, with only four years of data which were combined due to small numbers at many residency programs, we are unable to determine trends or changes in the data. To see change over time, this project would need to be conducted on an annual basis. This would enable researchers to refine the methodologies used, but will also require an investment of resources due to time and effort required for data collection, management, and analyses. Furthermore, it takes 3-7 years for residents to complete training, and this methodology evaluates practice outcomes at five years post-graduation. In other words, it will take a long time to evaluate the effects of policy changes due to the long training time for physicians.

For this analysis, we were limited to the use of the NC medical board licensure file, a rich source of data, but limited to information on physicians licensed in NC only. To conduct a more extensive cross-sectional study of NC residency program outcomes over the past few decades, we would need to use the American Medical Association physician Masterfile or another data source that contains information on the location of physicians nationwide. This would allow us to determine the number of

graduates of each residency program in the national workforce, which we could then compare to the number of graduates in NC. We were unable to do such an analysis for the present study due to the resources required to obtain the AMA Masterfile, which is costly, and to develop a data use agreement with the AMA.

Even with these methodological limitations, this study represents an important first step in helping North Carolina evaluate the degree to which different training programs and institutions are producing the workforce required to meet the needs of the state.

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Appendix, Table 1. Number of Residents in NC Residency Programs, by Location, 2017

Institution Name	Residency Program	Location	DO or MD	# of Positions	Residency or Fellowship
Cabarrus Family Medicine	Family Medicine	Concord	MD	24	Residency
Cabarrus Family Medicine	Family Medicine-Sports Medicine	Concord	MD	1	Fellowship
Campbell University	Sports Medicine	Buies Creek	MD	2	Fellowship
Cape Fear Valley Medical Center (Campbell Affiliated)	Emergency Medicine	Fayetteville	DO	7	Residency
Cape Fear Valley Medical Center (Campbell Affiliated)	General Surgery	Fayetteville	DO	4	Residency
Cape Fear Valley Medical Center (Campbell Affiliated)	Internal Medicine	Fayetteville	DO	8	Residency
Cape Fear Valley Medical Center (Campbell Affiliated)	OBGYN	Fayetteville	DO	3	Residency
Cape Fear Valley Medical Center (Campbell Affiliated)	Traditional Rotating Intern	Fayetteville	DO	10	Residency
Carolinas HealthCare System Blue Ridge	Family Medicine	Morganton	DO	7	Residency
Carolinas HealthCare System Blue Ridge	Gastroenterology	Morganton	DO	4	Fellowship
Carolinas HealthCare System Blue Ridge	Geriatric Medicine	Morganton	DO	1	Fellowship
Carolinas HealthCare System Blue Ridge	Internal Medicine	Morganton	DO	23	Residency
Carolinas Medical Center	Brain Injury	Charlotte	MD	1	Fellowship
Carolinas Medical Center	Emergency Medicine	Charlotte	MD	43	Residency
Carolinas Medical Center	Emergency Medicine - Medical Toxicology	Charlotte	MD	2	Fellowship
Carolinas Medical Center	Emergency Medicine - Operational and Disaster Medicine	Charlotte	MD	1	Fellowship
Carolinas Medical Center	Emergency Medicine - Pediatric Emergency Medicine	Charlotte	MD	5	Fellowship
Carolinas Medical Center	Emergency Medicine EMS	Charlotte	MD	1	Fellowship
Carolinas Medical Center	Emergency Medicine Ultrasound	Charlotte	MD	1	Fellowship
Carolinas Medical Center	Family Medicine	Charlotte	MD	33	Residency
Carolinas Medical Center	Female Pelvic Medicine & Reconstructive Surgery	Charlotte	MD	2	Fellowship
Carolinas Medical Center	Geriatrics	Charlotte	MD	1	Fellowship
Carolinas Medical Center	Internal Medicine	Charlotte	MD	43	Residency
Carolinas Medical Center	Internal Medicine - Advanced Endoscopy	Charlotte	MD	1	Fellowship
Carolinas Medical Center	Internal Medicine - Gastroenterology	Charlotte	MD	6	Fellowship
Carolinas Medical Center	Internal Medicine - Hematology and Medical Oncology	Charlotte	MD	9	Fellowship
Carolinas Medical Center	Internal Medicine - Hepatology Research	Charlotte	MD	1	Fellowship
Carolinas Medical Center	Internal Medicine - Transplant Hepatology	Charlotte	MD	1	Fellowship
Carolinas Medical Center	Internal Medicine Chief Resident	Charlotte	MD	1	Fellowship
Carolinas Medical Center	Neurological Surgery	Charlotte	MD	4	Residency
Carolinas Medical Center	Obstetrics and Gynecology	Charlotte	MD	24	Residency
Carolinas Medical Center	Orthopaedic Surgery	Charlotte	MD	26	Residency
Carolinas Medical Center	Orthopaedic Trauma	Charlotte	MD	3	Fellowship
Carolinas Medical Center	Pediatric Chief Resident	Charlotte	MD	2	Fellowship
Carolinas Medical Center	Pediatrics	Charlotte	MD	36	Residency

Institution Name	Residency Program	Location	DO or MD	# of Positions	Residency or Fellowship
Carolinas Medical Center	Physical Medicine and Rehabilitation	Charlotte	MD	15	Residency
Carolinas Medical Center	Psychiatry	Charlotte	MD	3	Residency
Carolinas Medical Center	Sports Medicine	Charlotte	MD	2	Fellowship
Carolinas Medical Center	Surgery	Charlotte	MD	31	Residency
Carolinas Medical Center	Surgery - Acute Care Surgery	Charlotte	MD	1	Fellowship
Carolinas Medical Center	Surgery - Advanced GI Fellowship - Clinical	Charlotte	MD	2	Fellowship
Carolinas Medical Center	Surgery - Advanced GI Fellowship - Research	Charlotte	MD	1	Fellowship
Carolinas Medical Center	Surgery - Breast Surgical Oncology	Charlotte	MD	1	Fellowship
Carolinas Medical Center	Surgery - GI and Minimally Invasive Bariatrics	Charlotte	MD	3	Fellowship
Carolinas Medical Center	Surgery - Hepato-Pancreato-Biliary	Charlotte	MD	2	Fellowship
Carolinas Medical Center	Surgery - Surgical Critical Care	Charlotte	MD	2	Fellowship
Carolinas Medical Center	Urological Oncology	Charlotte	MD	1	Fellowship
Carolinas Medical Center	Urology	Charlotte	MD	2	Residency
Carolinas Medical Center	Vascular Surgery	Charlotte	MD	4	Fellowship
Cone Health	Family Medicine	Greensboro	MD	24	Residency
Cone Health	Internal Medicine	Greensboro	MD	22	Residency
Cone Health	Sports Medicine	Greensboro	MD	2	Fellowship
Duke University Medical Center	Abdominal Transplant Surgical Fellowship	Durham	MD	2	Fellowship
Duke University Medical Center	Adult and Pediatric Rheumatology	Durham	MD	3	Fellowship
Duke University Medical Center	Adult Cardiothoracic Anesthesiology	Durham	MD	13	Fellowship
Duke University Medical Center	Adult Congenital Heart Disease	Durham	MD	1	Fellowship
Duke University Medical Center	Adult Reconstructive Orthopaedics	Durham	MD	2	Fellowship
Duke University Medical Center	Advanced Heart Failure and Transplant Cardiology	Durham	MD	3	Fellowship
Duke University Medical Center	Advanced Surgical Urologic Oncology	Durham	MD	1	Fellowship
Duke University Medical Center	Advanced Training in Cardiology	Durham	MD	5	Fellowship
Duke University Medical Center	Advanced Training in Cardiothoracic Surgery	Durham	MD	3	Fellowship
Duke University Medical Center	Allergy and Immunology	Durham	MD	4	Fellowship
Duke University Medical Center	Allergy and Immunology Advanced Research Training	Durham	MD	1	Fellowship
Duke University Medical Center	Anesthesiology	Durham	MD	57	Residency
Duke University Medical Center	Biomedical Scholars Program	Durham	MD	1	Fellowship
Duke University Medical Center	Cardiovascular Disease	Durham	MD	25	Fellowship
Duke University Medical Center	Child Abuse Pediatrics	Durham	MD	1	Fellowship
Duke University Medical Center	Child and Adolescent Psychiatry	Durham	MD	6	Fellowship
Duke University Medical Center	Child Neurology	Durham	MD	6	Fellowship
Duke University Medical Center	Clinical Cardiac Electrophysiology	Durham	MD	5	Fellowship
Duke University Medical Center	Clinical Fellowship in Multiple Sclerosis and Neuroimmunology	Durham	MD	2	Fellowship

Institution Name	Residency Program	Location	DO or MD	# of Positions	Residency or Fellowship
Duke University Medical Center	Clinical Informatics	Durham	MD	2	Fellowship
Duke University Medical Center	Clinical Investigator Pathway-Cardiovascular Disease	Durham	MD	1	Fellowship
Duke University Medical Center	Clinical Neurophysiology	Durham	MD	4	Fellowship
Duke University Medical Center	Critical Care Medicine	Durham	MD	8	Fellowship
Duke University Medical Center	Cytopathology	Durham	MD	2	Fellowship
Duke University Medical Center	Dermatology	Durham	MD	10	Fellowship
Duke University Medical Center	Dermatology Clinical Research Fellowship	Durham	MD	1	Fellowship
Duke University Medical Center	Dermatopathology	Durham	MD	2	Fellowship
Duke University Medical Center	Diagnostic Radiology	Durham	MD	48	Residency
Duke University Medical Center	Emergency Medicine	Durham	MD	30	Residency
Duke University Medical Center	Endocrine Surgery Fellowship	Durham	MD	1	Fellowship
Duke University Medical Center	Endocrinology, Diabetes and Metabolism	Durham	MD	6	Fellowship
Duke University Medical Center	Endocrinology, Metabolism and Nutrition	Durham	MD	1	Fellowship
Duke University Medical Center	Family Medicine	Durham	MD	16	Residency
Duke University Medical Center	Fellowship in Neuro-Oncology	Durham	MD	1	Fellowship
Duke University Medical Center	Female Pelvic Medicine and Reconstructive Surgery	Durham	MD	3	Fellowship
Duke University Medical Center	Foot and Ankle Orthopaedics	Durham	MD	3	Fellowship
Duke University Medical Center	Gastroenterology	Durham	MD	15	Fellowship
Duke University Medical Center	Geriatric Medicine	Durham	MD	6	Fellowship
Duke University Medical Center	Geriatric Psychiatry	Durham	MD	2	Fellowship
Duke University Medical Center	Geriatrics Physician Fellowship	Durham	MD	2	Fellowship
Duke University Medical Center	Global Health - Infectious Disease Pathway	Durham	MD	2	Residency
Duke University Medical Center	Global Health - Internal Medicine Pathway	Durham	MD	3	Residency
Duke University Medical Center	Global Health - Psychiatry Pathway	Durham	MD	1	Residency
Duke University Medical Center	Global Health Pediatric Cardiology Pathway	Durham	MD	1	Fellowship
Duke University Medical Center	Global Health Residency/Fellowship	Durham	MD	3	Fellowship
Duke University Medical Center	Gynecologic Oncology	Durham	MD	3	Fellowship
Duke University Medical Center	Hand Surgery	Durham	MD	3	Fellowship
Duke University Medical Center	Hematology (Hematopathology) Fellowship	Durham	MD	1	Fellowship
Duke University Medical Center	Hematology/Medical Oncology	Durham	MD	16	Fellowship
Duke University Medical Center	Hepatopancreatobiliary (HPB) Fellowship	Durham	MD	1	Fellowship
Duke University Medical Center	Hospice and Palliative Medicine	Durham	MD	3	Fellowship
Duke University Medical Center	Infectious Disease	Durham	MD	5	Fellowship
Duke University Medical Center	Infectious Diseases Fellowship	Durham	MD	5	Fellowship
Duke University Medical Center	Internal Medicine	Durham	MD	122	Residency
Duke University Medical Center	Internal Medicine (P)	Durham	MD	10	Residency

Institution Name	Residency Program	Location	DO or MD	# of Positions	Residency or Fellowship
Duke University Medical Center	Internal Medicine/Pediatrics	Durham	MD	24	Residency
Duke University Medical Center	Internal Medicine/Psychiatry	Durham	MD	11	Residency
Duke University Medical Center	International Neonatal-Perinatal Medicine Fellowship	Durham	MD	1	Fellowship
Duke University Medical Center	Interventional Cardiology	Durham	MD	3	Fellowship
Duke University Medical Center	Interventional Pulmonology Fellowship	Durham	MD	1	Fellowship
Duke University Medical Center	Joint General Surgery and Thoracic Surgery	Durham	MD	6	Fellowship
Duke University Medical Center	Management and Leadership Pathway for Residents - Internal Medicine	Durham	MD	3	Fellowship
Duke University Medical Center	Maternal - Fetal Medicine	Durham	MD	6	Fellowship
Duke University Medical Center	Medical Biochemical Genetics	Durham	MD	1	Fellowship
Duke University Medical Center	Minimally Invasive and Bariatric Surgery Fellowship	Durham	MD	1	Fellowship
Duke University Medical Center	Neonatal-Perinatal Medicine	Durham	MD	9	Fellowship
Duke University Medical Center	Nephrology	Durham	MD	7	Fellowship
Duke University Medical Center	Neurocritical Care Fellowship	Durham	MD	4	Fellowship
Duke University Medical Center	Neurocritical Care Program	Durham	MD	1	Fellowship
Duke University Medical Center	Neurological Surgery	Durham	MD	19	Fellowship
Duke University Medical Center	Neurology	Durham	MD	18	Fellowship
Duke University Medical Center	Neuromuscular Medicine	Durham	MD	3	Fellowship
Duke University Medical Center	Neuropathology	Durham	MD	1	Fellowship
Duke University Medical Center	Neuroradiology	Durham	MD	8	Fellowship
Duke University Medical Center	Neurosurgical Anesthesiology	Durham	MD	1	Fellowship
Duke University Medical Center	Obstetric Anesthesiology	Durham	MD	1	Fellowship
Duke University Medical Center	Obstetrics and Gynecology	Durham	MD	32	Residency
Duke University Medical Center	Ophthalmology	Durham	MD	18	Fellowship
Duke University Medical Center	Orthopaedic Surgery	Durham	MD	41	Residency
Duke University Medical Center	Orthopaedics Sports Medicine	Durham	MD	3	Fellowship
Duke University Medical Center	Otolaryngology	Durham	MD	15	Fellowship
Duke University Medical Center	Pain Medicine	Durham	MD	4	Fellowship
Duke University Medical Center	Parkinson's Disease and Movement Disorders	Durham	MD	2	Fellowship
Duke University Medical Center	Pathology - Anatomic and Clinical	Durham	MD	21	Residency
Duke University Medical Center	Pediatric Anesthesiology	Durham	MD	2	Fellowship
Duke University Medical Center	Pediatric Bone Marrow Transplant	Durham	MD	1	Fellowship
Duke University Medical Center	Pediatric Cardiology	Durham	MD	5	Fellowship
Duke University Medical Center	Pediatric Critical Care Medicine	Durham	MD	9	Fellowship
Duke University Medical Center	Pediatric Endocrinology	Durham	MD	3	Fellowship
Duke University Medical Center	Pediatric Hematology-Oncology	Durham	MD	6	Fellowship
Duke University Medical Center	Pediatric Infectious Diseases	Durham	MD	4	Fellowship

Institution Name	Residency Program	Location	DO or MD	# of Positions	Residency or Fellowship
Duke University Medical Center	Pediatric Nephrology	Durham	MD	1	Fellowship
Duke University Medical Center	Pediatric Radiology	Durham	MD	1	Fellowship
Duke University Medical Center	Pediatric Rheumatology	Durham	MD	1	Fellowship
Duke University Medical Center	Pediatrics	Durham	MD	50	Residency
Duke University Medical Center	Plastic Surgery	Durham	MD	3	Residency
Duke University Medical Center	Plastic Surgery - Integrated	Durham	MD	15	Residency
Duke University Medical Center	Preventive Medicine - Occupational Medicine	Durham	MD	2	Fellowship
Duke University Medical Center	Psychiatry	Durham	MD	38	Residency
Duke University Medical Center	Pulmonary Diseases/Critical Care Medicine	Durham	MD	18	Fellowship
Duke University Medical Center	Radiation Oncology	Durham	MD	12	Fellowship
Duke University Medical Center	Reconstructive Urology and Genitourinary Cancer Survivorship	Durham	MD	1	Fellowship
Duke University Medical Center	Regional Anesthesiology and Acute Pain Medicine	Durham	MD	4	Fellowship
Duke University Medical Center	Reproductive Endocrinology and Fertility	Durham	MD	3	Fellowship
Duke University Medical Center	Rheumatology	Durham	MD	6	Fellowship
Duke University Medical Center	Sleep Medicine	Durham	MD	2	Fellowship
Duke University Medical Center	Special Infant Care	Durham	MD	1	Fellowship
Duke University Medical Center	Sports Medicine (FP)	Durham	MD	3	Fellowship
Duke University Medical Center	Surgery	Durham	MD	29	Residency
Duke University Medical Center	Surgery (P)	Durham	MD	8	Residency
Duke University Medical Center	Surgery Research Fellowship	Durham	MD	19	Fellowship
Duke University Medical Center	Surgical Critical Care	Durham	MD	1	Fellowship
Duke University Medical Center	Thoracic Surgery	Durham	MD	4	Fellowship
Duke University Medical Center	Thoracic Surgery - Integrated	Durham	MD	3	Fellowship
Duke University Medical Center	Transplant Hepatology	Durham	MD	1	Fellowship
Duke University Medical Center	Transplant Infectious Diseases Research	Durham	MD	3	Fellowship
Duke University Medical Center	Undersea and Hyperbaric Med.-Prev. Med.	Durham	MD	2	Fellowship
Duke University Medical Center	Urology	Durham	MD	16	Fellowship
Duke University Medical Center	Urology Surgeon Scientist Year	Durham	MD	4	Fellowship
Duke University Medical Center	Vascular Neurology	Durham	MD	1	Fellowship
Duke University Medical Center	Vascular Surgery	Durham	MD	2	Fellowship
Duke University Medical Center	Vascular/Interventional Radiology	Durham	MD	5	Fellowship
Harnett Health (Campbell Affiliated)	Family Medicine	Dunn	DO	2	Residency
Harnett Health (Campbell Affiliated)	Internal Medicine	Dunn	DO	13	Residency
Harnett Health (Campbell Affiliated)	Traditional Rotating Intern	Dunn	DO	8	Residency
MAHEC/Mission Health System	Family Medicine	Asheville	MD	34	Residency
MAHEC/Mission Health System	General Surgery	Asheville	MD	8	Residency

Institution Name	Residency Program	Location	DO or MD	# of Positions	Residency or Fellowship
MAHEC/Mission Health System	Hospice Fellowship	Asheville	MD	2	Fellowship
MAHEC/Mission Health System	Obstetrics and Gynecology	Asheville	MD	16	Residency
MAHEC/Mission Health System	Psychiatry	Asheville	MD	4	Residency
MAHEC/Mission Health System	Sports Medicine Fellowship	Asheville	MD	2	Fellowship
MAHEC/Mission Health System	Family Medicine	Henderson	MD	13	Residency
Novant Health	Family Medicine - MD	Cornelius	MD	4	Residency
Novant Health	Family Medicine- DO	Cornelius	MD	8	Residency
Sampson Regional Medical Center (Campbell Affiliated)	Dermatology	Clinton	DO	6	Residency
Sampson Regional Medical Center (Campbell Affiliated)	Family Medicine	Clinton	DO	9	Residency
Sampson Regional Medical Center (Campbell Affiliated)	Traditional Rotating Intern	Clinton	DO	4	Residency
South East AHEC/ New Hanover Regional Medical Center	Family Medicine	Wilmington	MD	18	Residency
South East AHEC/ New Hanover Regional Medical Center	Internal Medicine	Wilmington	MD	23	Residency
South East AHEC/ New Hanover Regional Medical Center	Obstetrics and Gynecology	Wilmington	MD	17	Residency
South East AHEC/ New Hanover Regional Medical Center	Surgery	Wilmington	MD	16	Residency
Southeastern Health (Campbell Affiliated)	Emergency Medicine	Lumberton	DO	12	Residency
Southeastern Health (Campbell Affiliated)	Family Medicine	Lumberton	DO	24	Residency
Southeastern Health (Campbell Affiliated)	Internal Medicine	Lumberton	DO	30	Residency
Southeastern Health (Campbell Affiliated)	Traditional Rotating Intern	Lumberton	DO	12	Residency
Southern Regional AHEC	Family Medicine - MD	Fayetteville	MD	11	Residency
Southern Regional AHEC	Family Medicine- DO	Fayetteville	MD	13	Residency
UNC Health Care	Allergy & Immunology	Chapel Hill	MD	5	Fellowship
UNC Health Care	Anesthesiology	Chapel Hill	MD	52	Residency
UNC Health Care	Anesthesiology/Obstetrics	Chapel Hill	MD	1	Fellowship
UNC Health Care	Anesthesiology/Pain Medicine	Chapel Hill	MD	3	Fellowship
UNC Health Care	Anesthesiology/Pediatrics	Chapel Hill	MD	3	Fellowship
UNC Health Care	Combined Anesthesiology/Pediatrics	Chapel Hill	MD	3	Residency
UNC Health Care	Dermatology	Chapel Hill	MD	16	Residency
UNC Health Care	Dermatology/Procedural Dermatology	Chapel Hill	MD	1	Fellowship
UNC Health Care	Emergency Medicine	Chapel Hill	MD	29	Residency
UNC Health Care	Emergency Medicine/Emergency Medical Services	Chapel Hill	MD	2	Fellowship
UNC Health Care	Emergency Medicine/Pediatrics	Chapel Hill	MD	4	Fellowship
UNC Health Care	Family Medicine	Chapel Hill	MD	32	Residency
UNC Health Care	Family Medicine/Sports Medicine	Chapel Hill	MD	2	Fellowship
UNC Health Care	McLendon Labs	Chapel Hill	MD	10	Fellowship
UNC Health Care	Medical Genetics	Chapel Hill	MD	1	Fellowship
UNC Health Care	Medicine	Chapel Hill	MD	82	Residency

Institution Name	Residency Program	Location	DO or MD	# of Positions	Residency or Fellowship
UNC Health Care	Medicine/Advanced Heart Failure and Transplant Cardiology	Chapel Hill	MD	1	Fellowship
UNC Health Care	Medicine/Cardiology	Chapel Hill	MD	18	Fellowship
UNC Health Care	Medicine/Clinical Cardiac Electrophysiology	Chapel Hill	MD	1	Fellowship
UNC Health Care	Medicine/Endocrinology	Chapel Hill	MD	4	Fellowship
UNC Health Care	Medicine/Gastroenterology	Chapel Hill	MD	14	Fellowship
UNC Health Care	Medicine/Geriatrics	Chapel Hill	MD	3	Fellowship
UNC Health Care	Medicine/Hematology & Oncology	Chapel Hill	MD	18	Fellowship
UNC Health Care	Medicine/Hospice & Palliative Medicine	Chapel Hill	MD	3	Fellowship
UNC Health Care	Medicine/Infectious Diseases	Chapel Hill	MD	5	Fellowship
UNC Health Care	Medicine/Interventional Cardiology	Chapel Hill	MD	3	Fellowship
UNC Health Care	Medicine/Nephrology	Chapel Hill	MD	6	Fellowship
UNC Health Care	Medicine/Pediatrics	Chapel Hill	MD	23	Residency
UNC Health Care	Medicine/Pulmonology	Chapel Hill	MD	12	Fellowship
UNC Health Care	Medicine/Rheumatology	Chapel Hill	MD	4	Fellowship
UNC Health Care	Neurology	Chapel Hill	MD	20	Residency
UNC Health Care	Neurology/Child	Chapel Hill	MD	3	Residency
UNC Health Care	Neurosurgery	Chapel Hill	MD	11	Residency
UNC Health Care	OB/GYN	Chapel Hill	MD	28	Residency
UNC Health Care	OB/GYN/Female Pelvic Medicine & Reconstructive Surgery	Chapel Hill	MD	3	Fellowship
UNC Health Care	OB/GYN/Gynecologic Oncology	Chapel Hill	MD	6	Fellowship
UNC Health Care	OB/GYN/Maternal Fetal Medicine	Chapel Hill	MD	6	Fellowship
UNC Health Care	OB/GYN/Reproductive Endocrinology and Infertility	Chapel Hill	MD	3	Fellowship
UNC Health Care	Ophthalmology	Chapel Hill	MD	12	Residency
UNC Health Care	Oral & Maxillofacial Surgery	Chapel Hill	MD	17	Residency
UNC Health Care	Orthopaedics	Chapel Hill	MD	27	Residency
UNC Health Care	Otolaryngology	Chapel Hill	MD	22	Residency
UNC Health Care	Pathology	Chapel Hill	MD	16	Residency
UNC Health Care	Pathology/Cytopathology	Chapel Hill	MD	2	Fellowship
UNC Health Care	Pathology/Forensic	Chapel Hill	MD	1	Fellowship
UNC Health Care	Pediatric Dentistry	Chapel Hill	MD	9	Residency
UNC Health Care	Pediatrics	Chapel Hill	MD	61	Residency
UNC Health Care	Pediatrics/Critical Care	Chapel Hill	MD	6	Fellowship
UNC Health Care	Pediatrics/Endocrinology	Chapel Hill	MD	3	Fellowship
UNC Health Care	Pediatrics/Gastroenterology	Chapel Hill	MD	1	Fellowship
UNC Health Care	Pediatrics/Hematology Oncology	Chapel Hill	MD	5	Fellowship
UNC Health Care	Pediatrics/Infectious Diseases	Chapel Hill	MD	1	Fellowship

Institution Name	Residency Program	Location	DO or MD	# of Positions	Residency or Fellowship
UNC Health Care	Pediatrics/Neonatology	Chapel Hill	MD	7	Fellowship
UNC Health Care	Pediatrics/Nephrology	Chapel Hill	MD	2	Fellowship
UNC Health Care	Pediatrics/Pulmonology	Chapel Hill	MD	5	Fellowship
UNC Health Care	Physical Medicine & Rehabilitation	Chapel Hill	MD	12	Residency
UNC Health Care	Plastic Surgery	Chapel Hill	MD	12	Residency
UNC Health Care	Preventive Medicine	Chapel Hill	MD	10	Residency
UNC Health Care	Psychiatry	Chapel Hill	MD	53	Residency
UNC Health Care	Psychiatry/Child	Chapel Hill	MD	10	Residency
UNC Health Care	Psychiatry/Forensic	Chapel Hill	MD	3	Fellowship
UNC Health Care	Psychiatry/Psychosomatic	Chapel Hill	MD	2	Fellowship
UNC Health Care	Radiation Oncology	Chapel Hill	MD	9	Residency
UNC Health Care	Radiology	Chapel Hill	MD	32	Residency
UNC Health Care	Radiology/Interventional Radiology Integrated	Chapel Hill	MD	2	Fellowship
UNC Health Care	Radiology/Neuroradiology	Chapel Hill	MD	4	Fellowship
UNC Health Care	Radiology/Vascular	Chapel Hill	MD	3	Fellowship
UNC Health Care	Sleep Medicine	Chapel Hill	MD	2	Fellowship
UNC Health Care	Surgery	Chapel Hill	MD	46	Residency
UNC Health Care	Surgery/Cardiothoracic	Chapel Hill	MD	1	Fellowship
UNC Health Care	Surgery/Critical Care	Chapel Hill	MD	2	Fellowship
UNC Health Care	Surgery/Surgical Oncology	Chapel Hill	MD	2	Fellowship
UNC Health Care	Surgery/Vascular	Chapel Hill	MD	1	Fellowship
UNC Health Care	Urology	Chapel Hill	MD	12	Residency
Vidant Health	Acute Care Surgery	Greenville	MD	2	Residency
Vidant Health	Cardiovascular Disease	Greenville	MD	12	Residency
Vidant Health	Child & Adolescent Psychiatry	Greenville	MD	1	Fellowship
Vidant Health	Critical Care	Greenville	MD	2	Residency
Vidant Health	Cytopathology	Greenville	MD	1	Residency
Vidant Health	Dermatology	Greenville	MD	5	Residency
Vidant Health	Diabetes	Greenville	MD	2	Residency
Vidant Health	Emergency Medical Services	Greenville	MD	1	Residency
Vidant Health	Emergency Medicine	Greenville	MD	37	Residency
Vidant Health	Endocrinology	Greenville	MD	4	Residency
Vidant Health	Family Medicine	Greenville	MD	36	Residency
Vidant Health	Gastroenterology	Greenville	MD	6	Residency
Vidant Health	Geriatric Medicine	Greenville	MD	2	Residency
Vidant Health	Hematology Oncology	Greenville	MD	12	Residency

Institution Name	Residency Program	Location	DO or MD	# of Positions	Residency or Fellowship
Vidant Health	Infectious Disease	Greenville	MD	4	Residency
Vidant Health	Internal Med/Emergency Med Critical Care	Greenville	MD	2	Residency
Vidant Health	Internal Medicine	Greenville	MD	54	Residency
Vidant Health	Internal Medicine/Emergency	Greenville	MD	10	Residency
Vidant Health	Internal Medicine/Pediatrics	Greenville	MD	23	Residency
Vidant Health	Internal Medicine/Psychiatry	Greenville	MD	10	Residency
Vidant Health	Interventional Cardiology	Greenville	MD	2	Residency
Vidant Health	Neonatal - Perinatal	Greenville	MD	7	Residency
Vidant Health	Nephrology	Greenville	MD	3	Residency
Vidant Health	Obstetrics & Gynecology	Greenville	MD	21	Residency
Vidant Health	Pathology	Greenville	MD	9	Residency
Vidant Health	Pediatrics	Greenville	MD	30	Residency
Vidant Health	Physical Medicine & Rehab	Greenville	MD	20	Residency
Vidant Health	Psychiatry	Greenville	MD	30	Residency
Vidant Health	Pulmonary Critical Care	Greenville	MD	12	Residency
Vidant Health	Sports Medicine	Greenville	MD	1	Residency
Vidant Health	Surgery-General	Greenville	MD	31	Residency
Vidant Health	Surgical Critical Care	Greenville	MD	2	Residency
Vidant Health	Thoracic Surgery	Greenville	MD	2	Residency
Vidant Health	Vascular Surgery	Greenville	MD	2	Residency
Wake Forest Baptist Medical Center	Allergy Immunology - Allergy Immunology	Winston-Salem	MD	2	Fellowship
Wake Forest Baptist Medical Center	Anesthesiology - Adult Cardiothoracic Anesthesia	Winston-Salem	MD	2	Fellowship
Wake Forest Baptist Medical Center	Anesthesiology - Anesthesiology	Winston-Salem	MD	56	Residency
Wake Forest Baptist Medical Center	Anesthesiology - Obstetric Anesthesiology	Winston-Salem	MD	2	Fellowship
Wake Forest Baptist Medical Center	Anesthesiology - Pain Medicine	Winston-Salem	MD	6	Fellowship
Wake Forest Baptist Medical Center	Dermatology - Dermatology	Winston-Salem	MD	10	Residency
Wake Forest Baptist Medical Center	Emergency Medicine - Emergency Medicine	Winston-Salem	MD	45	Residency
Wake Forest Baptist Medical Center	Emergency Medicine - Emergency Medicine Services Fellowship	Winston-Salem	MD	2	Fellowship
Wake Forest Baptist Medical Center	Emergency Medicine - Pediatric Emergency Medicine	Winston-Salem	MD	3	Fellowship
Wake Forest Baptist Medical Center	Family Medicine - Family Medicine	Winston-Salem	MD	31	Residency
Wake Forest Baptist Medical Center	Family Medicine - Sports Medicine - Family Medicine	Winston-Salem	MD	2	Fellowship
Wake Forest Baptist Medical Center	Internal Medicine - Cardiovascular Disease	Winston-Salem	MD	16	Fellowship
Wake Forest Baptist Medical Center	Internal Medicine - Clinic Cardiac Electrophysiology	Winston-Salem	MD	1	Fellowship
Wake Forest Baptist Medical Center	Internal Medicine - Critical Care Medicine IM	Winston-Salem	MD	4	Fellowship
Wake Forest Baptist Medical Center	Internal Medicine - Endocrinology	Winston-Salem	MD	4	Fellowship
Wake Forest Baptist Medical Center	Internal Medicine - Gastroenterology	Winston-Salem	MD	9	Fellowship

Institution Name	Residency Program	Location	DO or MD	# of Positions	Residency or Fellowship
Wake Forest Baptist Medical Center	Internal Medicine - Geriatric Medicine	Winston-Salem	MD	4	Fellowship
Wake Forest Baptist Medical Center	Internal Medicine - Hematology Oncology	Winston-Salem	MD	14	Fellowship
Wake Forest Baptist Medical Center	Internal Medicine - Hospice Palliative Medicine	Winston-Salem	MD	1	Fellowship
Wake Forest Baptist Medical Center	Internal Medicine - Infectious Disease	Winston-Salem	MD	6	Fellowship
Wake Forest Baptist Medical Center	Internal Medicine - Internal Medicine	Winston-Salem	MD	105	Residency
Wake Forest Baptist Medical Center	Internal Medicine - Interventional Cardiology	Winston-Salem	MD	2	Fellowship
Wake Forest Baptist Medical Center	Internal Medicine - Nephrology	Winston-Salem	MD	6	Fellowship
Wake Forest Baptist Medical Center	Internal Medicine - Pulmonary Disease and Critical Care Medicine	Winston-Salem	MD	11	Fellowship
Wake Forest Baptist Medical Center	Internal Medicine - Rheumatology	Winston-Salem	MD	3	Fellowship
Wake Forest Baptist Medical Center	Neurological Surgery - Neurological Surgery	Winston-Salem	MD	13	Residency
Wake Forest Baptist Medical Center	Neurology - Child Neurology	Winston-Salem	MD	3	Residency
Wake Forest Baptist Medical Center	Neurology - Clinical Neurophysiology	Winston-Salem	MD	1	Fellowship
Wake Forest Baptist Medical Center	Neurology - Epilepsy	Winston-Salem	MD	1	Fellowship
Wake Forest Baptist Medical Center	Neurology - Neurology	Winston-Salem	MD	15	Residency
Wake Forest Baptist Medical Center	Neurology - Neuromuscular Medicine	Winston-Salem	MD	2	Fellowship
Wake Forest Baptist Medical Center	Neurology - Sleep Medicine	Winston-Salem	MD	1	Fellowship
Wake Forest Baptist Medical Center	Neurology - Vascular Neurology	Winston-Salem	MD	1	Fellowship
Wake Forest Baptist Medical Center	Obstetrics and Gynecology - Maternal-Fetal Health	Winston-Salem	MD	3	Fellowship
Wake Forest Baptist Medical Center	Obstetrics and Gynecology - Obstetrics and Gynecology	Winston-Salem	MD	24	Residency
Wake Forest Baptist Medical Center	Ophthalmology - Ophthalmology	Winston-Salem	MD	12	Residency
Wake Forest Baptist Medical Center	Orthopaedic Surgery - Hand Surgery Orthopaedics	Winston-Salem	MD	3	Fellowship
Wake Forest Baptist Medical Center	Orthopaedic Surgery - Orthopaedic Surgery	Winston-Salem	MD	25	Residency
Wake Forest Baptist Medical Center	Orthopaedic Surgery - Orthopaedics Sports Medicine	Winston-Salem	MD	2	Fellowship
Wake Forest Baptist Medical Center	Orthopaedic Surgery - Podiatry	Winston-Salem	MD	6	Residency
Wake Forest Baptist Medical Center	Otolaryngology - Dentistry	Winston-Salem	MD	5	Residency
Wake Forest Baptist Medical Center	Otolaryngology - Otolaryngology	Winston-Salem	MD	14	Residency
Wake Forest Baptist Medical Center	Pathology - Cytopathology	Winston-Salem	MD	1	Fellowship
Wake Forest Baptist Medical Center	Pathology - Dermatopathology	Winston-Salem	MD	1	Fellowship
Wake Forest Baptist Medical Center	Pathology - Forensic Pathology	Winston-Salem	MD	1	Fellowship
Wake Forest Baptist Medical Center	Pathology - Hematology	Winston-Salem	MD	1	Fellowship
Wake Forest Baptist Medical Center	Pathology - Pathology	Winston-Salem	MD	19	Residency
Wake Forest Baptist Medical Center	Pediatrics - Neonatal Perinatal Medicine	Winston-Salem	MD	7	Fellowship
Wake Forest Baptist Medical Center	Pediatrics - Pediatrics	Winston-Salem	MD	41	Residency
Wake Forest Baptist Medical Center	Plastic Surgery-integrated - Plastic Surgery-integrated	Winston-Salem	MD	12	Residency
Wake Forest Baptist Medical Center	Psychiatry - Child Adolescent Psychiatry	Winston-Salem	MD	5	Residency
Wake Forest Baptist Medical Center	Psychiatry - Psychiatry	Winston-Salem	MD	27	Residency

Institution Name	Residency Program	Location	DO or MD	# of Positions	Residency or Fellowship
Wake Forest Baptist Medical Center	Radiation Oncology - Radiation Oncology	Winston-Salem	MD	7	Residency
Wake Forest Baptist Medical Center	Radiology Diagnostic - Abdominal Radiology	Winston-Salem	MD	4	Fellowship
Wake Forest Baptist Medical Center	Radiology Diagnostic - Musculoskeletal Radiology	Winston-Salem	MD	3	Fellowship
Wake Forest Baptist Medical Center	Radiology Diagnostic - Neuroradiology	Winston-Salem	MD	4	Fellowship
Wake Forest Baptist Medical Center	Radiology Diagnostic - Nuclear Radiology	Winston-Salem	MD	1	Fellowship
Wake Forest Baptist Medical Center	Radiology Diagnostic - Radiology Diagnostic	Winston-Salem	MD	41	Residency
Wake Forest Baptist Medical Center	Surgery - Complex General Surgical Oncology	Winston-Salem	MD	2	Fellowship
Wake Forest Baptist Medical Center	Surgery - Surgery	Winston-Salem	MD	40	Residency
Wake Forest Baptist Medical Center	Surgery - Surgical Critical Care	Winston-Salem	MD	2	Fellowship
Wake Forest Baptist Medical Center	Surgery - Vascular Surgery	Winston-Salem	MD	4	Fellowship
Wake Forest Baptist Medical Center	Thoracic Surgery - Thoracic Surgery	Winston-Salem	MD	2	Fellowship
Wake Forest Baptist Medical Center	Urology - Female Pelvic Medicine and Reconstructive Surgery	Winston-Salem	MD	1	Fellowship
Wake Forest Baptist Medical Center	Urology - Urology	Winston-Salem	MD	10	Residency
TOTAL				**3,774**	

Source: Program on Health Workforce and Policy, Sheps Center for Health Services Research, University of North Carolina at Chapel Hill with data gathered from individual programs.

Appendix, Table 2. Physician Primary Area of Practice and Urban/Rural
Primary Practice Location of NC Residency Program Graduates in Practice in NC in 2016

Residency Program	Urban/Rural	Family Medicine		Internal Medicine		Obstetrics & Gynecology		Pediatrics		General Surgery		Anesthesiology	
		#	%	#	%	#	%	#	%	#	%	#	%
1. Duke University Medical Center	**Total**	76		78		42		87		15		101	
	Rural	*20*	*26%*	*8*	*10%*	*5*	*12%*	*4*	*5%*	*0*	*0%*	*8*	*8%*
	Urban	*56*	*74%*	*70*	*90%*	*37*	*88%*	*83*	*95%*	*15*	*100%*	*92*	*91%*
2. UNC Health Care	**Total**	112		97		44		178		33		107	
	Rural	*17*	*15%*	*3*	*3%*	*3*	*7%*	*15*	*8%*	*7*	*21%*	*9*	*8%*
	Urban	*95*	*85%*	*93*	*96%*	*41*	*93%*	*6*	*92%*	*26*	*79%*	*98*	*92%*
3. Wake Forest Baptist Medical Center	**Total**	153		91		60		129		27		120	
	Rural	*24*	*16%*	*14*	*15%*	*1*	*2%*	*9*	*7%*	*6*	*22%*	*2*	*2%*
	Urban	*128*	*84%*	*76*	*84%*	*59*	*98%*	*120*	*93%*	*20*	*74%*	*118*	*98%*
4. Vidant Health	**Total**	149		80		46		81		17		1	
	Rural	*45*	*30%*	*21*	*26%*	*15*	*33%*	*23*	*28%*	*7*	*41%*	*0*	*0%*
	Urban	*104*	*70%*	*59*	*74%*	*31*	*67%*	*57*	*70%*	*10*	*59%*	*1*	*100%*
5. Carolinas Medical Center	**Total**	144		94		63		102		24		0	
	Rural	*14*	*10%*	*6*	*6%*	*8*	*13%*	*7*	*7%*	*8*	*33%*	*0*	*0%*
	Urban	*130*	*90%*	*88*	*94%*	*55*	*87%*	*95*	*93%*	*16*	*67%*	*0*	*0%*
6. Cone Health	**Total**	116		51		0		9		0		0	
	Rural	*14*	*12%*	*5*	*10%*	*0*	*0%*	*3*	*33%*	*0*	*0%*	*0*	*0%*
	Urban	*102*	*88%*	*46*	*90%*	*0*	*0%*	*6*	*67%*	*0*	*0%*	*0*	*0%*
7. New Hanover Regional Medical Center	**Total**	35		33		31		1		9		0	
	Rural	*10*	*29%*	*5*	*15%*	*14*	*45%*	*0*	*0%*	*4*	*44%*	*0*	*0%*
	Urban	*24*	*69%*	*28*	*85%*	*17*	*55%*	*1*	*100%*	*5*	*56%*	*0*	*0%*
8. MAHEC/Mission Health System, Asheville	**Total**	148		0		26		1		0		0	
	Rural	*22*	*15%*	*0*	*0%*	*5*	*19%*	*1*	*100%*	*0*	*0%*	*0*	*0%*
	Urban	*125*	*84%*	*0*	*0%*	*21*	*81%*	*0*	*0%*	*0*	*0%*	*0*	*0%*
9. Cabarrus Family Medicine Residency	**Total**	67		0		0		1		0		0	
	Rural	*10*	*15%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*
	Urban	*57*	*85%*	*0*	*0%*	*0*	*0%*	*1*	*100%*	*0*	*0%*	*0*	*0%*

Residency Program	Urban/Rural	Family Medicine		Internal Medicine		Obstetrics & Gynecology		Pediatrics		General Surgery		Anesthesiology	
		#	%	#	%	#	%	#	%	#	%	#	%
10. Southern Regional AHEC	**Total**	64		0		0		0		0		0	
	Rural	*7*	*11%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*
	Urban	*57*	*89%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*
11. Womack Army Medical Center	**Total**	12		0		0		0		0		0	
	Rural	*3*	*25%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*
	Urban	*9*	*75%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*
12. MAHEC/Mission Health System, Hendersonville	**Total**	12		2		0		3		0		0	
	Rural	*2*	*17%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*
	Urban	*10*	*83%*	*2*	*100%*	*0*	*0%*	*3*	*100%*	*0*	*0%*	*0*	*0%*
13. Camp LeJeune Naval Hospital	**Total**	5		0		0		0		0		0	
	Rural	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*
	Urban	*5*	*100%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*
14. Other NC Residency Program	**Total**	7		5		0		1		0		0	
	Rural	*0*	*0%*	*1*	*20%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*
	Urban	*7*	*100%*	*4*	*80%*	*0*	*0%*	*1*	*100%*	*0*	*0%*	*0*	*0%*
99. Non-NC Residency Program	**Total**	1,418		1,443		555		985		479		688	
	Rural	*327*	*23%*	*284*	*20%*	*109*	*20%*	*177*	*18%*	*121*	*25%*	*79*	*11%*
	Urban	*1082*	*76%*	*1,149*	*80%*	*445*	*80%*	*799*	*81%*	*354*	*74%*	*607*	*88%*
NC RESIDENCY PROGRAM TOTALS	**Total**	1,100		531		312		593		125		329	
	Rural	*188*	*17%*	*63*	*12%*	*51*	*16%*	*62*	*10%*	*32*	*26%*	*19*	*6%*
	Urban	*909*	*83%*	*466*	*88%*	*261*	*84%*	*530*	*89%*	*92*	*74%*	*309*	*94%*
2016 NC PHYSICIAN TOTALS	**Total**	2,518		1,974		867		1,578		604		1,017	
	Rural	*515*	*20%*	*347*	*18%*	*160*	*18%*	*239*	*15%*	*153*	*25%*	*98*	*10%*
	Urban	*1991*	*79%*	*1615*	*82%*	*706*	*81%*	*1329*	*84%*	*446*	*74%*	*916*	*90%*

Source: Program on Health Workforce and Policy, Sheps Center for Health Services Research, University of North Carolina at Chapel Hill with data gathered from the North Carolina Medical Board.

Residency Program	Urban/Rural	Neurology		Neurological Surgery		Psychiatry		Pediatric Psychiatry		Addiction Psychiatry		Geriatrics		Urology	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%
1. Duke University Medical Center	**Total**	43		11		131		26		7		9		24	
	Rural	*1*	*2%*	*0*	*0%*	*18*	*14%*	*1*	*4%*	*0*	*0%*	*1*	*11%*	*1*	*4%*
	Urban	*41*	*95%*	*11*	*100%*	*113*	*86%*	*24*	*92%*	*7*	*100%*	*8*	*89%*	*23*	*96%*
2. UNC Health Care	**Total**	22		7		193		51		12		15		26	
	Rural	*1*	*5%*	*0*	*0%*	*30*	*16%*	*6*	*12%*	*1*	*8%*	*0*	*0%*	*3*	*12%*
	Urban	*21*	*95%*	*7*	*100%*	*163*	*84%*	*45*	*88%*	*11*	*92%*	*15*	*100%*	*23*	*88%*
3. Wake Forest Baptist Medical Center	**Total**	43		12		73		14		3		15		22	
	Rural	*3*	*7%*	*1*	*8%*	*10*	*14%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*4*	*18%*
	Urban	*40*	*93%*	*11*	*92%*	*63*	*86%*	*14*	*100%*	*3*	*100%*	*15*	*100%*	*17*	*77%*
4. Vidant Health	**Total**	1		0		61		10		3		13		0	
	Rural	*0*	*0%*	*0*	*0%*	*8*	*13%*	*2*	*20%*	*0*	*0%*	*3*	*23%*	*0*	*0%*
	Urban	*1*	*100%*	*0*	*0%*	*53*	*87%*	*8*	*80%*	*3*	*100%*	*10*	*77%*	*0*	*0%*
5. Carolinas Medical Center	**Total**	0		1		0		0		5		8		4	
	Rural	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*1*	*13%*	*0*	*0%*
	Urban	*0*	*0%*	*1*	*100%*	*0*	*0%*	*0*	*0%*	*5*	*100%*	*7*	*88%*	*4*	*####*
6. Cone Health	**Total**	0		0		0		0		0		12		0	
	Rural	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*1*	*8%*	*0*	*0%*
	Urban	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*11*	*92%*	*0*	*0%*
7. New Hanover Regional Medical Center	**Total**	0		0		0		0		1		1		0	
	Rural	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*1*	*100%*	*0*	*0%*
	Urban	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*1*	*100%*	*0*	*0%*	*0*	*0%*
8. MAHEC/Mission Health System, Asheville	**Total**	0		0		0		0		0		7		0	
	Rural	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*1*	*14%*	*0*	*0%*
	Urban	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*6*	*86%*	*0*	*0%*
9. Cabarrus Family Medicine Residency	**Total**	0		0		0		0		0		1		0	
	Rural	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*
	Urban	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*1*	*100%*	*0*	*0%*

Residency Program	Urban/Rural	Neurology		Neurological Surgery		Psychiatry		Pediatric Psychiatry		Addiction Psychiatry		Geriatrics		Urology	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%
10. Southern Regional AHEC	**Total**	0		0		0		0		1		1		0	
	Rural	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*
	Urban	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*1*	*100%*	*1*	*100%*	*0*	*0%*
11. Womack Army Medical Center	**Total**	0		0		0		0		0		1		0	
	Rural	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*
	Urban	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*1*	*100%*	*0*	*0%*
12. MAHEC/Mission Health System, Hendersonville	**Total**	0		0		0		0		0		0		0	
	Rural	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*
	Urban	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*
13. Camp LeJeune Naval Hospital	**Total**	0		0		0		0		0		0		0	
	Rural	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*
	Urban	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*
14. Other NC Residency Program	**Total**	0		0		1		0		0		1		0	
	Rural	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*
	Urban	*0*	*0%*	*0*	*0%*	*1*	*100%*	*0*	*0%*	*0*	*0%*	*1*	*100%*	*0*	*0%*
99. Non-NC Residency Program	**Total**	313		113		533		103		52		166		259	
	Rural	*33*	*11%*	*4*	*4%*	*71*	*13%*	*8*	*8%*	*7*	*13%*	*23*	*14%*	*64*	*25%*
	Urban	*279*	*89%*	*109*	*96%*	*461*	*86%*	*95*	*92%*	*45*	*87%*	*142*	*86%*	*194*	*75%*
NC RESIDENCY PROGRAM TOTALS	**Total**	109		31		459		101		32		84		76	
	Rural	*5*	*5%*	*1*	*3%*	*66*	*14%*	*9*	*9%*	*1*	*3%*	*8*	*10%*	*8*	*11%*
	Urban	*103*	*94%*	*30*	*97%*	*393*	*86%*	*91*	*90%*	*31*	*97%*	*76*	*90%*	*67*	*88%*
2016 NC PHYSICIAN TOTALS	**Total**	422		144		992		204		84		250		335	
	Rural	*38*	*9%*	*5*	*3%*	*137*	*14%*	*17*	*8%*	*8*	*10%*	*31*	*12%*	*72*	*21%*
	Urban	*382*	*91%*	*139*	*97%*	*854*	*86%*	*186*	*91%*	*76*	*90%*	*218*	*87%*	*261*	*78%*

Source: Program on Health Workforce and Policy, Sheps Center for Health Services Research, University of North Carolina at Chapel Hill with data gathered from the North Carolina Medical Board.

Residency Program	Urban/Rural	Hospitalist		Urgent Care		Other Specialty		Total All Residency Programs		Total Primary Care	Total Psychiatry
		#	%	#	%	#	%	#	%	#	#
1. Duke University Medical Center	**Total**	51		5		892		1598		283	164
	Rural	*4*	*8%*	*0*	*0%*	*43*	*5%*	*114*	*7%*	*37*	*19*
	Urban	*47*	*92%*	*5*	*100%*	*847*	*95%*	*1479*	*93%*	*246*	*144*
2. UNC Health Care	**Total**	53		13		846		1809		431	256
	Rural	*2*	*4%*	*0*	*0%*	*52*	*6%*	*149*	*8%*	*38*	*37*
	Urban	*50*	*94%*	*13*	*100%*	*793*	*94%*	*1657*	*92%*	*392*	*219*
3. Wake Forest Baptist Medical Center	**Total**	47		8		690		1507		433	90
	Rural	*5*	*11%*	*0*	*0%*	*56*	*8%*	*135*	*9%*	*48*	*10*
	Urban	*42*	*89%*	*8*	*100%*	*629*	*91%*	*1363*	*90%*	*383*	*80*
4. Vidant Health	**Total**	62		24		311		859		356	74
	Rural	*23*	*37%*	*9*	*38%*	*55*	*18%*	*211*	*25%*	*104*	*10*
	Urban	*39*	*63%*	*15*	*63%*	*256*	*82%*	*647*	*75%*	*251*	*64*
5. Carolinas Medical Center	**Total**	23		14		259		741		403	5
	Rural	*0*	*0%*	*0*	*0%*	*20*	*8%*	*64*	*9%*	*35*	*0*
	Urban	*23*	*100%*	*14*	*100%*	*237*	*92%*	*675*	*91%*	*368*	*5*
6. Cone Health	**Total**	20		11		64		283		176	0
	Rural	*5*	*25%*	*0*	*0%*	*5*	*8%*	*33*	*12%*	*22*	*0*
	Urban	*15*	*75%*	*11*	*100%*	*59*	*92%*	*250*	*88%*	*154*	*0*
7. New Hanover Regional Medical Center	**Total**	17		4		45		177		100	1
	Rural	*3*	*18%*	*1*	*25%*	*12*	*27%*	*50*	*28%*	*29*	*0*
	Urban	*14*	*82%*	*3*	*75%*	*33*	*73%*	*126*	*71%*	*70*	*1*
8. MAHEC/Mission Health System, Asheville	**Total**	2		2		14		200		175	0
	Rural	*0*	*0%*	*0*	*0%*	*2*	*14%*	*31*	*16%*	*28*	*0*
	Urban	*2*	*100%*	*2*	*100%*	*12*	*86%*	*168*	*84%*	*146*	*0*
9. Cabarrus Family Medicine Residency	**Total**	11		1		6		87		68	0
	Rural	*0*	*0%*	*0*	*0%*	*1*	*17%*	*11*	*13%*	*10*	*0*
	Urban	*11*	*100%*	*1*	*100%*	*5*	*83%*	*76*	*87%*	*58*	*0*

Residency Program	Urban/Rural	Hospitalist		Urgent Care		Other Specialty		Total All Residency Programs		Total Primary Care	Total Psychiatry
		#	%	#	%	#	%	#	%	#	#
10. Southern Regional AHEC	**Total**	4		2		8		80		64	1
	Rural	*1*	*25%*	*0*	*0%*	*4*	*50%*	*12*	*15%*	*7*	*0*
	Urban	*3*	*75%*	*2*	*100%*	*4*	*50%*	*68*	*85%*	*57*	*1*
11. Womack Army Medical Center	**Total**	0		0		6		19		12	0
	Rural	*0*	*0%*	*0*	*0%*	*2*	*33%*	*5*	*26%*	*3*	*0*
	Urban	*0*	*0%*	*0*	*0%*	*4*	*67%*	*14*	*74%*	*9*	*0*
12. MAHEC/Mission Health System, Hendersonville	**Total**	3		1		2		23		17	0
	Rural	*1*	*33%*	*0*	*0%*	*1*	*50%*	*4*	*17%*	*2*	*0*
	Urban	*2*	*67%*	*1*	*100%*	*1*	*50%*	*19*	*83%*	*15*	*0*
13. Camp LeJeune Naval Hospital	**Total**	0		0		0		5		5	0
	Rural	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0%*	*0*	*0*
	Urban	*0*	*0%*	*0*	*0%*	*0*	*0%*	*5*	*100%*	*5*	*0*
14. Other NC Residency Program	**Total**	0		0		6		21		13	1
	Rural	*0*	*0%*	*0*	*0%*	*1*	*17%*	*2*	*10%*	*1*	*0*
	Urban	*0*	*0%*	*0*	*0%*	*5*	*83%*	*19*	*90%*	*12*	*1*
99. Non-NC Residency Program	**Total**	869		151		8,333		16,460		4,401	688
	Rural	*214*	*25%*	*16*	*11%*	*1,078*	*13%*	*2,615*	*16%*	*897*	*86*
	Urban	*650*	*75%*	*134*	*89%*	*7,223*	*87%*	*13,768*	*84%*	*3,475*	*601*
NC RESIDENCY PROGRAM TOTALS	**Total**	293		85		3,149		7,409		2,536	592
	Rural	*44*	*15%*	*10*	*12%*	*254*	*8%*	*821*	*11%*	*364*	*76*
	Urban	*248*	*85%*	*75*	*88%*	*2,885*	*92%*	*6,566*	*89%*	*2,166*	*515*
2016 NC PHYSICIAN TOTALS	**Total**	1,162		236		11,482		23,869		6,937	1280
	Rural	*258*	*22%*	*26*	*11%*	*1,332*	*12%*	*3,436*	*14%*	*1,261*	*162*
	Urban	*898*	*77%*	*209*	*89%*	*10,108*	*88%*	*20,334*	*85%*	*5,641*	*1116*

Source: Program on Health Workforce and Policy, Sheps Center for Health Services Research, University of North Carolina at Chapel Hill with data gathered from the North Carolina Medical Board.

Appendix, Table 3.
Resident Retention Five Years After Graduation
for Residents Graduating in 2008, 2009, 2010 or 2011

Residency Specialty Institution	Total Residents	Retention of Residents in North Carolina After Five Years		Retention of Residents in Rural North Carolina After Five Years	
	#	#	%	#	%
Anesthesiology					
Duke University Hospital Program	47	19	40%	0	0%
University of North Carolina Hospitals Program	51	15	29%	2	4%
Wake Forest University School of Medicine Program	54	29	54%	3	6%
Family Medicine					
Carolinas HealthCare System-NorthEast (Northeast-Cabarrus) Program	29	19	66%	1	3%
Carolinas Medical Center Program	31	22	71%	2	6%
Carolinas Medical Center Union Program	8	5	63%	0	0%
Cone Health Program	32	21	66%	1	3%
Duke University Hospital Program	10	4	40%	1	10%
Mountain Area Health Education Center Program - Asheville	31	23	74%	1	3%
Mountain Area Health Education Center Program - Hendersonville	12	3	25%	0	0%
Naval Hospital (Camp Lejeune) Program	29	6	21%	1	3%
New Hanover Regional Medical Center Program	13	7	54%	1	8%
Southern Regional Area Health Education Center/Duke University Hospital Program	24	10	42%	1	4%
University of North Carolina Hospitals Program	33	16	48%	3	9%
Vidant Medical Center/East Carolina University Program	38	17	45%	4	11%
Wake Forest University School of Medicine Program	39	18	46%	0	0%
Womack Army Medical Center Program	22	3	14%	1	5%
Internal Medicine					
Carolinas Medical Center Program	66	28	42%	0	0%
Cone Health Program	29	19	66%	1	3%
Duke University Hospital Program	195	71	36%	0	0%
New Hanover Regional Medical Center Program	35	12	34%	1	3%
University of North Carolina Hospitals Program	119	61	51%	3	3%
Vidant Medical Center/East Carolina University Program	78	26	33%	2	3%
Wake Forest University School of Medicine Program	140	51	36%	2	1%

Appendix, Table 3.
Resident Retention Five Years After Graduation for Residents Graduating in 2008, 2009, 2010 or 2011

Residency Specialty Institution	Total Residents #	Retention of Residents in North Carolina After Five Years #	 %	Retention of Residents in Rural North Carolina After Five Years #	 %
Internal Medicine/Pediatrics					
Duke University Hospital Program	23	9	39%	0	0%
University of North Carolina Hospitals Program	19	12	63%	0	0%
Vidant Medical Center/East Carolina University Program	20	12	60%	3	15%
Neurological Surgery					
Duke University Hospital Program	9	1	11%	0	0%
University of North Carolina Hospitals Program	4	1	25%	0	0%
Wake Forest University School of Medicine Program	5	1	20%	0	0%
Neurology					
Duke University Hospital Program	15	7	47%	0	0%
University of North Carolina Hospitals Program	15	3	20%	1	7%
Wake Forest University School of Medicine Program	16	7	44%	2	13%
Obstetrics and Gynecology					
Carolinas Medical Center Program	22	11	50%	0	0%
Duke University Hospital Program	30	6	20%	0	0%
Mountain Area Health Education Center Program	15	5	33%	1	7%
New Hanover Regional Medical Center Program	16	4	25%	1	6%
University of North Carolina Hospitals Program	25	9	36%	0	0%
Vidant Medical Center/East Carolina University Program	19	9	47%	2	11%
Wake Forest University School of Medicine Program	18	6	33%	0	0%
Pediatrics					
Carolinas Medical Center Program	36	19	53%	0	0%
Duke University Hospital Program	61	24	39%	0	0%
University of North Carolina Hospitals Program	73	32	44%	1	1%
Vidant Medical Center/East Carolina University Program	40	12	30%	2	5%
Wake Forest University School of Medicine Program	52	29	56%	0	0%
Psychiatry					
Duke University Hospital Program	33	13	39%	2	6%
University of North Carolina Hospitals Program	48	33	69%	7	15%
Vidant Medical Center/East Carolina University Program	16	8	50%	2	13%
Wake Forest University School of Medicine Program	13	9	69%	1	8%

Appendix, Table 3.
Resident Retention Five Years After Graduation for Residents Graduating in 2008, 2009, 2010 or 2011

Residency Specialty / Institution	Total Residents	Retention of Residents in North Carolina After Five Years		Retention of Residents in Rural North Carolina After Five Years	
	#	#	%	#	%
Surgery					
Carolinas Medical Center Program	17	8	47%	3	18%
Duke University Hospital Program	39	12	31%	0	0%
New Hanover Regional Medical Center Program	12	5	42%	2	17%
University of North Carolina Hospitals Program	51	20	39%	2	4%
Vidant Medical Center/East Carolina University Program	22	4	18%	0	0%
Wake Forest University School of Medicine Program	42	13	31%	1	2%
Urology					
Duke University Hospital Program	12	4	33%	0	0%
University of North Carolina Hospitals Program	8	3	38%	0	0%
Wake Forest University School of Medicine Program	6	2	33%	1	17%

Notes: The values in this table are derived from aggregating the workforce outcomes of four cohorts of residents who completed training in 2008, 2009, 2010, or 2011. We used North Carolina Medical Board licensure data to determine the location and primary area of practice for each physician five years after graduation, e.g., for a resident who completed training in 2008, we used 2013 NC Medical Board data to determine his/her location and primary area of practice. Rural areas are based on 2015 Office of Management and Budget metropolitan status codes and 2010 US Census Bureau Rural-Urban Commuting Area (RUCA) codes. Rural areas are either a) in a nonmetropolitan county or b) in an area within a metropolitan county that has a RUCA code of 4 or greater.

Source: Program on Health Workforce and Policy, Sheps Center for Health Services Research, University of North Carolina at Chapel Hill with data from the Accreditation Council for Graduate Medical Education and the North Carolina Medical Board.

Appendix, Table 4.
Primary Area of Practice Five Years After Graduation for Residents Graduating in 2008, 2009, 2010 or 2011

Family Medicine

Institution	Number of Residents in North Carolina After Five Years	Percent of Residents in North Carolina After Five Years by Primary Area of Practice: Family Medicine	Other Specialty
Carolinas HealthCare System-NorthEast (Northeast-Cabarrus) Program	19	78.95%	21.05%
Carolinas Medical Center Program	22	59.09	40.91
Carolinas Medical Center Union Program	5	80.00	20.00
Cone Health Program	21	71.43	28.57
Duke University Hospital Program	4	100.00	0.00
Mountain Area Health Education Center Program	23	78.26	21.74
Mountain Area Health Education Center Rural Program	3	33.33	66.67
Naval Hospital (Camp Lejeune) Program	6	83.33	16.67
New Hanover Regional Medical Center Program	7	71.43	28.57
Southern Regional Area Health Education Center/Duke University Hospital Program	10	80.00	20.00
University of North Carolina Hospitals Program	16	75.00	25.00
Vidant Medical Center/East Carolina University Program	17	64.71	35.29
Wake Forest University School of Medicine Program	18	88.89	11.11
Womack Army Medical Center Program	3	33.33	66.67

Internal Medicine

Institution	Number of Residents in North Carolina After Five Years	Percent of Residents in North Carolina After Five Years by Primary Area of Practice: General Internal Medicine	Hospitalist	Other Specialty
Carolinas Medical Center Program	28	39.29%	10.71%	50.00%
Cone Health Program	19	21.05	21.05	57.89
Duke University Hospital Program	71	8.45	15.49	76.06
New Hanover Regional Medical Center Program	12	16.67	25.00	58.33
University of North Carolina Hospitals Program	61	6.56	18.03	75.41
Vidant Medical Center/East Carolina University Program	26	11.54	34.62	53.85
Wake Forest University School of Medicine Program	51	23.53	7.84	68.63

Pediatrics

Institution	Number of Residents in North Carolina After Five Years	Percent of Residents in North Carolina After Five Years by Primary Area of Practice: General Pediatrics	Other Specialty
Carolinas Medical Center Program	19	84.21%	15.79%
Duke University Hospital Program	24	45.83	54.17
University of North Carolina Hospitals Program	32	34.38	65.62
Vidant Medical Center/East Carolina University Program	12	83.33	16.67
Wake Forest University School of Medicine Program	29	65.52	34.48

Internal Medicine-Pediatrics

Institution	Number of Residents in North Carolina After Five Years	Percent of Residents in North Carolina After Five Years by Primary Area of Practice: Internal Medicine	General Pediatrics	Other Specialty
Duke University Hospital Program	9	0.00%	22.22%	77.78%
University of North Carolina Hospitals Program	12	16.67	25.00	58.33
Vidant Medical Center/East Carolina University Program	12	33.33	25.00	41.67

General Surgery

Institution	Number of Residents in North Carolina After Five Years	Percent of Residents in North Carolina After Five Years by Primary Area of Practice: General Surgery	Other Specialty
Carolinas Medical Center Program	8	62.50%	37.50%
Duke University Hospital Program	12	25.00	75.00
New Hanover Regional Medical Center Program	5	40.00	60.00
University of North Carolina Hospitals Program	20	30.00	70.00
Vidant Medical Center/East Carolina University Program	4	25.00	75.00
Wake Forest University School of Medicine Program	13	15.38	84.62

Obstetrics and Gynecology

Institution	Number of Residents in North Carolina After Five Years	Percent of Residents in North Carolina After Five Years by Primary Area of Practice: General Obstetrics and Gynecology	Other Specialty
Carolinas Medical Center Program	11	100.00%	0.00%
Duke University Hospital Program	6	66.67	33.33
Mountain Area Health Education Center Program	5	100.00	0.00
New Hanover Regional Medical Center Program	4	100.00	0.00
University of North Carolina Hospitals Program	9	88.89	11.11
Vidant Medical Center/East Carolina University Program	9	100.00	0.00
Wake Forest University School of Medicine Program	6	100.00	0.00

Psychiatry

Institution	Number of Residents in North Carolina After Five Years	Percent of Residents in North Carolina After Five Years by Primary Area of Practice: General Psychiatry	Pediatric Psychiatry	Other Specialty
Duke University Hospital Program	13	92.31%	7.69%	0.00%
University of North Carolina Hospitals Program	33	57.58	42.42	0.00
Vidant Medical Center/East Carolina University Program	8	87.50	12.50	0.00
Wake Forest University School of Medicine Program	9	88.89	0.00	11.11

Anesthesiology

Institution	Number of Residents in North Carolina After Five Years	Percent of Residents in North Carolina After Five Years by Primary Area of Practice: Anesthesiology	Other Specialty
Duke University Hospital Program	19	78.95%	21.05%
University of North Carolina Hospitals Program	15	66.67	33.33
Wake Forest University School of Medicine Program	29	68.97	31.03

Neurology

Institution	Number of Residents in North Carolina After Five Years	Percent of Residents in North Carolina After Five Years by Primary Area of Practice: Neurology	Other Specialty
Duke University Hospital Program	7	85.71%	14.29%
University of North Carolina Hospitals Program	3	100.00	0.00
Wake Forest University School of Medicine Program	7	100.00	0.00

Neurosurgery

Institution	Number of Residents in North Carolina After Five Years	Percent of Residents in North Carolina After Five Years by Primary Area of Practice: Neurosurgery	Other Specialty
Duke University Hospital Program	1	0.00%	100.00%
University of North Carolina Hospitals Program	1	100.00	0.00
Wake Forest University School of Medicine Program	1	0.00	100.00

Urology

Institution	Number of Residents in North Carolina After Five Years	Percent of Residents in North Carolina After Five Years by Primary Area of Practice: Urology	Other Specialty
Duke University Hospital Program	4	100.00%	0.00%
University of North Carolina Hospitals Program	3	100.00	0.00
Wake Forest University School of Medicine Program	2	100.00	0.00

Notes: The values in this table are derived from aggregating the workforce outcomes of four cohorts of residents who completed training in 2008, 2009, 2010, or 2011. We used North Carolina Medical Board licensure data to determine the location and primary area of practice for each physician five years after graduation, e.g., for a resident who completed training in 2008, we used 2013 NC Medical Board data to determine his/her location and primary area of practice.

Source: Program on Health Workforce and Policy, Sheps Center for Health Services Research, University of North Carolina at Chapel Hill with data from the Accreditation Council for Graduate Medical Education and the North Carolina Medical Board.

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APPENDIX B – HRSA Rural Residency Planning and Development (RRPD) Program