

Outcomes of NC Medical School Graduates: How Many Stay in Practice in NC, in Primary Care, and in High Needs Areas?

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EXECUTIVE SUMMARY

In 1993, the General Assembly mandated an annual report on the progress of medical school graduates going into primary care. North Carolina AHEC and the Sheps Center produce this report each year using state licensure databases as well as national databases.

North Carolina is a national model for tracking annual workforce outcomes of its medical school graduates. Increasingly, the North Carolina General Assembly has been interested in knowing the workforce outcomes of medical schools and residency programs to better evaluate return on investment of state funds.

New analyses were conducted for this year's report that were not conducted in prior reports. The new analyses included tracking:

- NC medical school graduates with a primary practice location in a NC DHHS safety net setting, where a significant proportion of care is delivered to uninsured, Medicaid and other vulnerable populations
- NC medical school graduates with a primary practice location in a most economically distressed neighborhood, as determined by the Area Deprivation Index, a national metric of socio-economic distress at the census block level
- Outcomes of NC medical school graduates at ten years post-graduation, which better measures specialty after fellowship training is completed and likely permanent geographic practice location. Historically, we have looked at five years post-graduation only, while this report assesses outcomes at both five- and ten-years post-graduation.

The data show:

- Of the 446 NC medical school graduates from the class of 2014, 54 (12%) were in practice in primary care in NC in 2019, 12 (3%) of whom practice in a rural NC county.
- Five-year outcome data have been consistent for the cohorts from 2008-2014, with ECU tending to retain the largest proportion of graduates in practice in NC, followed by UNC, Wake Forest, and Duke.
- For the class of 2014, a greater percentage of public medical school graduates were practicing in primary care in-state five years after graduating (ECU: 27%, n=21; UNC: 14%, n=22), compared to private medical school graduates (Wake Forest: 7%, n=8; Duke: 3%, n=3).
- Six graduates (1%) from the class of 2014 were in practice in safety net settings in NC in 2019, including four UNC graduates, and one ECU graduate, and one Wake Forest graduate.
- Compared to the private medical school graduates in the class of 2014, a greater proportion of public medical school graduates reporting a practice location in a most economically distressed neighborhood in 2019. 23% (n=7/31) ECU graduates, 13% (n=9/67) UNC graduates, 7% (n=1/15) of Duke graduates, and 3% (n=1/31) of Wake Forest graduates practiced in a most economically distressed neighborhood.
- For the graduating cohorts of 2008-2014, in-state primary care retention was highest for family medicine physicians, with 60% (n=178/296) of family medicine graduates practicing in-state five years later. Family medicine physicians are less likely than other physicians to subspecialize.

- Findings for the 2008 NC medical school graduating class (n=420) at 10-years post-graduation showed that 16% (n=66) were in primary care in NC, with 3% (n=13) in rural primary care.
- Eight 2008 graduates (2%) were practicing in rural safety net settings in 2018, four of whom in specialties other than primary care.
- Twenty-eight percent (44/156) of the 2008 graduates practicing in NC in 2018 reported a practice location in a least economically distressed neighborhoods, while 13% (n=20/156) worked in a most economically distressed neighborhood.
- Thirteen percent (n=53/420) of the 2008 NC medical school graduate cohort matched to a general surgery residency, but only 1% (n=5) were in practice in general surgery in NC ten years later.
- For the class of 2014, two physicians who reported a primary practice address in an urban county in 2019 reported a secondary practice address in a rural county. Similarly, for the class of 2008, three physicians reported a primary practice address in an urban county in 2018 and reported a secondary practice address in a rural county. These data suggest that few NC medical school graduates who primarily practice in an urban county are also practicing part time in a rural county. Notably, these data are based on self-reported practice location and are not based on billing information.

With a new school of medicine (Campbell) now graduating students annually, increased attention to GME expansion in rural areas, and the implementation of the Medicaid 1115 waiver, it will be important to continue collecting and tracking data on NC medical education outcomes so that the state can monitor trends and identify best practices. GME is an important component of health workforce development but to develop and sustain access to care, GME should be partnered with loan repayment, continuous professional and practice support, technology and other investments. It is unclear what the effects of the coronavirus pandemic will be on the health care system, on medical education, and on physician practice patterns.

BACKGROUND

In 1993, the North Carolina General Assembly expressed interest in expanding the pool of generalist physicians for the state. In N.C.S.L.1993-321, the General Assembly required each of the state's four medical schools to develop a plan to expand the percent of medical school graduates choosing residency positions in primary care. Primary care was defined as family practice, general internal medicine, general pediatric medicine, internal medicine-pediatrics, and obstetrics-gynecology. It set the goal for the East Carolina University (ECU) and UNC Schools of Medicine at 60% of graduates entering primary care. For the Wake Forest University and Duke University Schools of Medicine, it set the goal at 50%. Campbell University School of Osteopathic Medicine graduated its first class in 2017 and was therefore not included. Since 1994, the Cecil G. Sheps Center for Health Services Research at the University of North Carolina at Chapel Hill ("Sheps Center") and the NC Area Health Education Centers program (AHEC) have collaborated to produce this report. This annual report is the primary method that the state uses to track workforce outcomes for NC medical schools. As a result of the legislative mandate, NC is a national model for tracking medical student outcomes. Data from this report were featured in the New England Journal of Medicine as an example of how to track these outcomes in John Iglehart's 2018 article on "The challenging quest to improve rural health care."¹

While the original legislation ensured that the report is conducted annually, the legislative language lacked some needed specificity. It required tracking medical school graduates that practice in primary care, but made no mention of practice in North Carolina, in rural areas, or in underserved areas. The focus on primary care ignored the specialties of psychiatry and general surgery, which are also high needs specialties in NC. While not required in the legislation, the Sheps Center and AHEC has modified the annual report to address the need for this information. As in prior years, this report tracks NC medical school graduate outcomes for physicians who practice in NC and in rural NC counties. However, previous reports focused primarily on practice in rural areas and did not examine whether NC medical school graduates served high needs populations outside of rural counties. In response, this year's report includes two new analyses: A) practice in NC safety net settings² that deliver care to uninsured, Medicaid, and vulnerable populations, and B) practice in socioeconomically disadvantaged neighborhoods, as defined by the Area Deprivation Index (ADI).³

Given the national trend of increasing physician specialization, it is unrealistic to expect that the schools will meet the goals set in 1993 of 50%-60% of graduates entering primary care specialties. ECU met the NCGA's goal five times since the inception of the report, most recently for the class of 2005 (when 59% of that year's graduates reported practicing in primary care specialties in 2010). Since then, no medical school has reached the legislated benchmark.

Historically, this has report examined NC medical school graduates at five years following graduation per the legislative mandate. However, this period is not ideal given the timing to complete residency (3-6 years). In particular, at five-years post-graduation from medical school, physicians in psychiatry, obstetrics & gynecology (ob/gyn), surgery, medicine/pediatrics are just completing residency, may be in

¹ Iglehart J. The challenging quest to improve rural health care. NEJM, 2018. 378(5):473-479.
<https://www.nejm.org/doi/full/10.1056/NEJMr1707176>

² NC DHHS Office of Rural Health. Safety Net Resources website. Accessed September 15, 2020.
<https://www.ncdhhs.gov/divisions/office-rural-health/safety-net-resources>

³ University of Wisconsin School of Medicine Public Health. 2015 Area Deprivation Index v2.0. Downloaded from
<https://www.neighborhoodatlas.medicine.wisc.edu/> September 15, 2020.

fellowship/specialty training, and may not have settled in a permanent practice location. This is typically the case for general surgeons, whose standard training period is five years, and for ob/gyns, psychiatrists and medicine/pediatrics residents who often do a fellowship after a four-year residency. Ten years following graduation from medical school is a more reasonable timeframe for outcomes tracking, as it allows for fellowship training following residency. In addition to tracking outcomes for the 2014 cohort, this year's report also includes outcomes for the 2008 cohort at ten years post-graduation from an NC medical school.

DATA SOURCES AND METHODS

Data Sources

Data included in this report come from several sources:

- North Carolina Medical Board's annual licensure file, maintained by the NC Health Professions Data System
- GMETrack, the graduate medical education tracking file of Association of American Medical Colleges (AAMC)
- Physician Masterfile of the American Medical Association (AMA), available only for the 2008 graduating cohort
- Data from the alumni and student affairs offices from Duke University School of Medicine, the Brody School of Medicine at East Carolina University, the University of North Carolina at Chapel Hill School of Medicine, and Wake Forest University School of Medicine
- the Federal Office of Management and Budget for population and core based statistical area data, which are used to determine which counties in NC are classified as metropolitan (urban) or non-metropolitan (rural)
- NC Department of Health and Human Services (DHHS) list of safety net sites, updated March 16, 2020
- The University of Wisconsin School of Medicine and Public Health 2015 Area Deprivation Index, which ranks census block groups based on income, education, employment, and housing quality on a scale of (1) least disadvantaged to (10) most disadvantaged

This year is the first year we are including outcomes of NC medical school graduates at ten years post-graduation from medical school, in addition to outcomes at five years post-graduation. The reason 2008 data were used for the ten-year analysis instead of 2009 data was due to data availability. The data are released annually by the AAMC in early to mid-September. This report is due to the UNC BOG annually in early October. Because of the time required for data cleaning and analysis, we are unable to complete both the 5-year and 10-year post-graduation analyses in a single month.

Campbell University School of Osteopathic Medicine (Campbell) is not mandated to provide data for this report, as the school did not exist when the 1993 legislation was passed. Campbell's first class graduated in 2017. In prior years, this report has not emphasized initial residency match data, as some physicians change residency specialties or locations over the course of their GME training. Outcomes are better measured after graduation from residency. However, given that workforce outcomes five years following graduation will only be available for Campbell starting in 2022, we began reporting initial match data in the 2017 report.

Methods

The format for the information on medical students is consistent with and comparable to the baseline information provided in the May 1994 report “Expanding the Pool of Generalist Physicians for North Carolina.”

GMETrack data from the AAMC were merged with the NCMB annual licensure file to determine physician practice outcomes at five- or ten-years post-graduation from medical school. We conducted descriptive statistics to determine where physicians were practicing and in which specialties.

This is the first year of this report in which we have reported on practice in safety net settings. Safety net providers are defined as health care facilities that provide a significant level of health care and other health-related services to uninsured, Medicaid and other vulnerable populations. To conduct this analysis, we geocoded the file for physicians who reported a practice address in North Carolina. All but 13 cases matched to a specific street address. For the 13 misses, practice coordinates were resolved via manual lookups. We used the NC Office of Rural Health list of safety net sites to identify which physician practiced in a safety net setting.

To determine whether physicians practiced in a geographic setting that was economically disadvantaged, we used the state level scores for the Area Deprivation Index (ADI) for North Carolina. The ADI scores are maintained by the University of Wisconsin School of Medicine and Public Health, and are based on 2011-2015 American Community Survey data. The ADI scores categorize census block groups, or neighborhoods, based on income, education, employment, and housing quality, ranking each neighborhood on a scale of 1 (least distressed) to 10 (most distressed). We used the geocoded practice locations from the NC Board of Medicine data to assign physician practice location to an ADI score.

One methodological issue over the past decade has been the dramatic increase of physicians choosing full time hospitalist practice, which decreases the proportion of primary care physicians in general internal medicine and, increasingly, other specialties. Hospitalists are included in primary care counts in the findings presented in this report because we do not have a way to systematically identify them in the dataset; this is likely a substantial issue for counts of internal medicine physicians.

Data Limitations in 2020

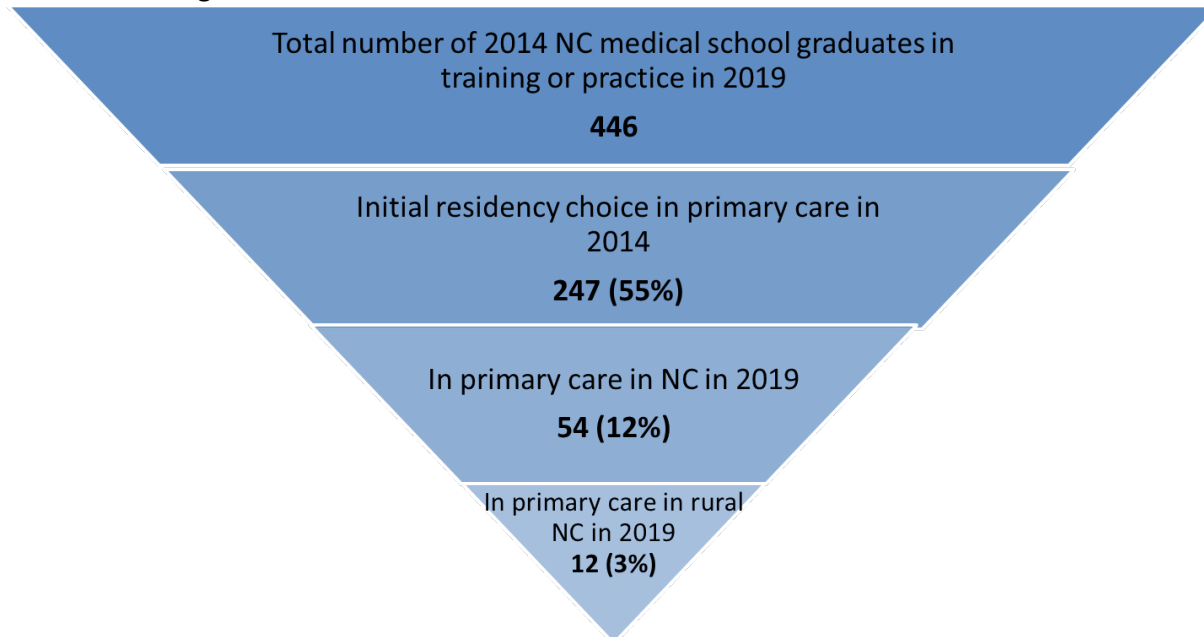
In all prior years of this report, we have reported the number and percent of NC medical school grads in training or practice in primary care, whether or not they were located in NC. These findings were possible because AAMC was able to match their data on medical school graduates to AMA physician Masterfile data on physician practice locations and specialties across the U.S. However, in 2020, the AAMC and AMA legal teams renegotiated their data use agreement for the AMA Masterfile. Per the terms of the new agreement, AAMC is no longer able to match and share AMA Masterfile data with the Sheps Center. We were made aware of this change in early September 2020. The lack of AMA Masterfile data also limits our ability to triangulate the NCMB data with AMA Masterfile data. In the past, we have used AMA data to identify physicians who had died or were no longer in practice. In addition, we compared names of physicians who practiced in NC per AMA data with the NCMB physician roster, to determine whether we were missing NC physicians due to name changes. In both cases, the corrections were small—but we were unable to make similar corrections for the graduating 2014 cohort. Our match rates for the 2014 cohort to the NCMB licensure file were in line with prior years, but it is possible that we are missing a few physicians that we would have been able to identify with the Masterfile data.

FINDINGS

Retention of Graduates in Primary Care: Class of 2014

The most valuable measure of the choice of primary care careers is retention of graduates in clinical primary care after residency. **Table 1 (page 20)** shows the graduates and the percentage that remained in primary care in NC and in rural NC five years after graduation (in 2019).

Figure 1: 2014 NC Medical School Graduates: Retention in Primary Care in NC's Rural Areas Five Years After Graduating



Produced by the Program on Health Workforce Research and Policy, Sheps Center for Health Services Research, University of North Carolina at Chapel Hill. Source: North Carolina Health Professions Data System with data derived from the Association of American Medical Colleges, and the NC Medical Board, 2019. Rural source: US Census Bureau and Office of Management and Budget, July 2017. "Core Based Statistical Area" (CBSA) is the OMB's collective term for Metropolitan and Micropolitan Statistical areas. Here, nonmetropolitan counties include micropolitan and counties outside of CBSAs.

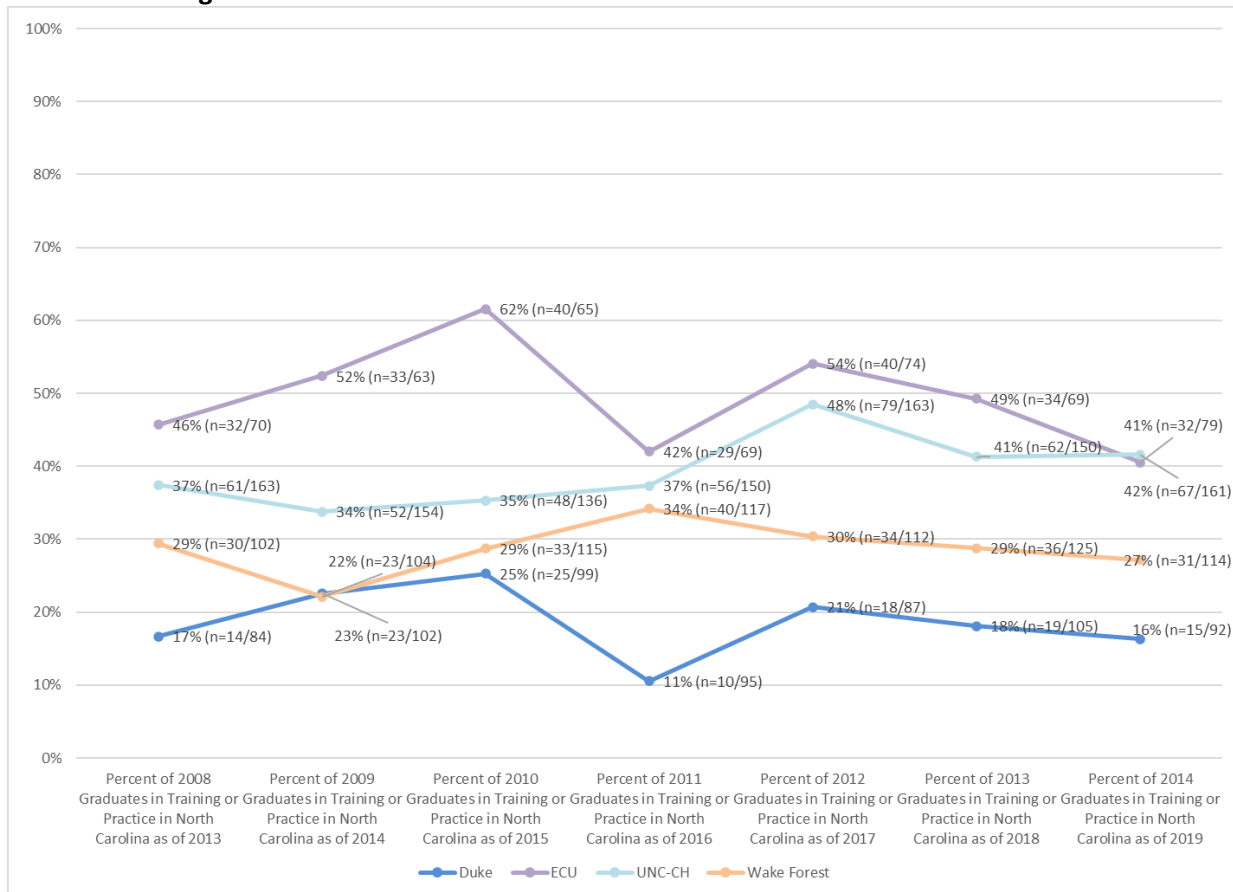
Per the 1993 legislation mandating this analysis, these primary care specialties include family medicine, general internal medicine, general pediatrics, obstetrics & gynecology, and internal medicine-pediatrics. Out of the 446 medical school graduates in 2014, 54 (12%) were in training or practice in primary care in NC as in 2019 (**Figure 1**). For purposes of comparison, between 14% and 17% of the five previous graduating cohorts (the classes of 2009-2013), were in training or practice in primary care in NC five years after graduating, and the 2014 cohort is slightly below those percentages. Three percent (n=12) of the 2014 cohort was in primary care in a rural NC county: 6 ECU graduates, 5 UNC graduates, and 1 Wake Forest graduate. This percentage is in line with prior trends. Between 1% and 3% of NC medical school graduates tend to practice in primary care in rural NC.

Retention of Graduates in North Carolina and in Rural Counties

A greater percentage of graduates from the state's public medical schools are retained in NC five years after graduating, compared to the state's private medical schools (**Figure 2**). ECU tends to retain the greatest percentage of its graduates in state five years post-graduation, followed by UNC, Wake Forest,

and Duke. For the graduating class of 2014, UNC for the first time had an in-state retention rate that was higher than ECU's—but given that the rates were within one percentage point of one another, we caution against reading too much into this finding. It is too early to determine if this is a meaningful trend.

Figure 2: Percent of NC Medical School Graduates in Training or Practice in North Carolina Five Years After Graduating



Produced by the Program on Health Workforce Research and Policy, Sheps Center for Health Services Research, University of North Carolina at Chapel Hill. Source: North Carolina Health Professions Data System with data derived from the Association of American Medical Colleges, and the NC Medical Board, 2019.

Table 2 (page 22) describes medical school graduates remaining in North Carolina. Thirty-four percent (n=145/446) of 2014 graduates from all four medical schools remained in NC five years after graduation. This percentage is right at the average for the past five years. In-state retention for the prior five medical school graduating cohorts ranged from 31% to 39%. Out of 145 graduates from the 2014 cohort practicing in NC in 2019, 16 practiced in rural counties, 4% of the total number of NC graduates and 11% of those who were in practice in NC. These numbers include physicians from all specialties, not just primary care. NC has 54 rural (or non-metropolitan) counties based on the 2017 Office of Management and Budget Core Based Statistical Area definition.

In response to questions raised by education subcommittee members at the UNC Board of Governor's meeting in 2018, we examined hours worked by week for physicians who reported a secondary practice location in a rural county and primary location in a metropolitan county. For the 2014 cohort, we

identified only two physicians for whom this was the case: an emergency medicine physician who spent one day per week in a rural county, and an oral surgeon (DDS/MD) who worked close to half-time in an oral surgery/dental implant site in a rural county (see **Table A**, below). Similarly, with the 2013 cohort, we found that only three physicians practicing in an urban area also worked in a rural practice site in 2018, all of whom spent a day per week (or fewer) in a rural practice site. These numbers are based on self-reported practice location and are not based on billing information.

Table A: Hours Worked Per Week in a Secondary Practice Location in a Rural NC County for Physicians Who Graduated from an NC Medical School in 2014 and Reported a Primary Practice Location in a Metropolitan NC County in 2019

Medical School	Primary Area of Practice	Secondary Location Hours Per Week
Duke	Emergency Medicine	8
UNC	Oral Maxillofacial Surgery (DDS/MD)	18

Practice in Safety Net Settings and Most Economically Distressed Neighborhoods

Safety net providers are defined as health care facilities that provide a significant level of health care and other health-related services to uninsured, Medicaid and other vulnerable populations. **Table B** (below) shows outcomes for 2014 graduates who were practicing in safety net settings in 2019. One percent (n=6/446) of the 2014 graduates were practicing at a safety net setting in NC five-years post-graduation: Four UNC graduates, one ECU graduate, and one Wake Forest graduate. Half (n=3/6) of the safety net settings were in a rural county and half were in an urban county. Of note is the finding that five of the physicians who practiced in these settings were in family medicine, and one was a general internist. Of the 16 graduates from the class of 2014 practicing in rural counties in 2019, three were in safety net settings in those counties.

Table B: Medical School, Primary Area of Practice, and Facility Type for Physicians Who Graduated from an NC Medical School in 2014 and Reported a Primary Practice Location in a Safety Net Setting in 2019

Medical School Primary Area of Practice	Number	Safety Net Facility Type	Rural County
ECU	1		
<i>Family Medicine</i>	1	<i>Federal CMS Certified Rural Health Clinic</i>	<i>Yes</i>
UNC-CH	4		
<i>Family Medicine</i>	1	<i>Federal CMS Certified Rural Health Clinic</i>	<i>Yes</i>
<i>Family Medicine</i>	2	<i>Federally Qualified Health Center</i>	<i>No</i>
<i>Internal Medicine</i>	1	<i>Federally Qualified Health Center</i>	<i>No</i>
Wake Forest	1		
<i>Family Medicine</i>	1	<i>Small Rural Hospital</i>	<i>Yes</i>

Figure 3 compares the Area Deprivation Index (ADI) of the neighborhoods where physicians report their primary practice location. The ADI is based on factors related to income, education, employment, and housing quality in a census block, which is the geographic equivalent of a neighborhood. Low scores indicate low levels of economic distress, and high scores indicate high levels of economic distress. ADI scores are not assigned for census block groups dominated by hospitals. ADI was not available for roughly a third (37%, n=53/144) of the graduating class of 2014 due to a primary practice location at a large hospital, which makes sense as many of these physicians are likely still in training.

Fifteen percent (n=22/144) of the class of 2014 worked in a practice location in a most economically distressed neighborhood five years after graduation. ECU had the highest proportion of 2014 graduates working in most economically distressed neighborhood in NC in 2019, with 34% (n=11/31). Thirteen percent (n=9/67) of UNC graduates, 7% (n=1/15) of Duke graduates, and 3% (n=1/31) of Wake Forest graduates practiced in most distressed neighborhoods in 2019.

Figure 3: Neighborhood Disadvantage Status of the 2019 Primary Practice Setting for Physicians Who Graduated from an NC Medical School in 2014



Produced by the Program on Health Workforce Research and Policy, Sheps Center for Health Services Research, University of North Carolina at Chapel Hill. Source: North Carolina Health Professions Data System with data derived from the Association of American Medical Colleges, and the NC Medical Board, 2019. ADI Score obtained from the University of Wisconsin School of Medicine Public Health. 2015 Area Deprivation Index v2.0. Downloaded from <https://www.neighborhoodatlas.medicine.wisc.edu/> September 15, 2020.

Retention in Psychiatry

Table 3 (page 24) shows the retention of the 2014 graduates in psychiatry. Eleven of the 2014 NC medical school graduates matched to a psychiatry residency, and four of them remained in practice in psychiatry in NC in 2019. There were eight graduates who graduated from NC medical schools in 2013 in practice in psychiatry in North Carolina in 2018, all four of whom graduated from UNC.

Differences in Retention by Practice Specialty

To determine overall retention by practice specialty, we consolidated data for all NC medical schools in **Table 4 (page 25)**. For the 2014 cohort, 55% (n=24/44) of physicians who initially matched to family medicine remained in clinical family medicine in NC five years post-graduation, with 16% (n=7/44) practicing in rural NC counties. Comparatively, 5-year retention of general internal medicine physicians was lowest of all five primary care specialties, with 8% (n=7/124) of 2014 NC med school grads who initially matched to Internal Medicine programs remaining in generalist practice in NC, and zero retained in rural counties. It is important to understand that initial internal medicine match numbers are imprecise, both inflated since they include physicians who do a preliminary year before moving on to a different residency specialty and deflated because they likely include a sizable percentage of hospitalists. Some graduates completed an internal medicine residency, completed specialty training, and remained in NC. Specialists who branched off internal medicine residencies are not included in this count of general internal medicine physicians.

Retention by Practice Specialty Combined for Multiple Graduating Class Years

Looking across NC medical schools by initial match specialty over time, some specialties result in a greater percent of graduates practicing in NC five years later than others do (see **Table C**, below). Family medicine leads in this category, with 60% (n=178/296) of graduates who match to family medicine practicing in state five years later for the graduating classes of 2008-2014. In some cases, the lack of retention is because physicians tend to subspecialize, which is one explanation for why the overall retention for general internal medicine physicians in NC was lower than other specialties, (9%, n=74/785).

Table C: NC Medical School Graduates in Primary Care or Psychiatry in North Carolina Five Years After Graduating by Initial Residency Specialty, Graduating Classes of 2008-2014

Initial Residency Specialty	Number Initially Matched to Specialty	Number in Practice in Specialty Five Years After Graduating	Percent in Practice in Specialty Five Years After Graduating
Family Medicine	296	178	60%
Internal Medicine	785	74	9%
Pediatrics	372	92	25%
IM/ Peds	86	36	42%
OBGYN	185	63	34%
Psychiatry	109	41	38%

Source: Program on Health Workforce Research and Policy at the Cecil G. Sheps Center for Health Services Research, with data derived from annual medical student tracking reports, 2013-2019.

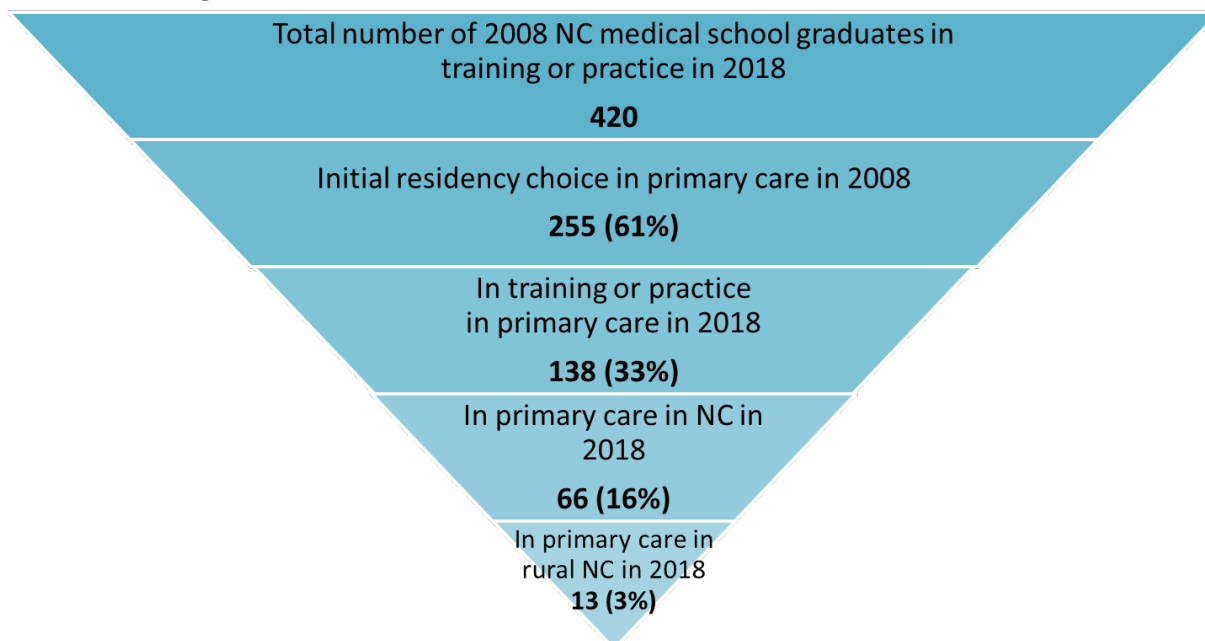
Class of 2008 Outcomes

We conducted analyses on the 2008 graduates of NC medical schools to determine where graduates were ten years following graduation from medical school. As noted previously, ten years post-graduation from medical school allows time for physicians to complete residency and fellowship training. We used data from the 2008 graduating cohort that was matched to the 2018 NCMB licensure file.

Table 5 (page 26) shows the class of 2008's initial matches to primary care residencies. **Table 6 (page 28)** shows the graduates from the class of 2008, retention in NC, in primary care in NC, and in primary care in rural NC ten years after graduation (in 2018).

Primary care specialties include family medicine, general internal medicine, general pediatrics, obstetrics/gynecology, and internal medicine-pediatrics. Out of the 420 medical school graduates from the 2008 cohort, 66 (16%) were in training or practice in primary care in NC as in 2018 (**Figure 4**). Three percent (n=13) of the 2008 cohort were practicing in primary care in a rural NC county: 8 ECU graduates and 5 UNC graduates.

Figure 4: 2008 NC Medical School Graduates: Retention in Primary Care in NC's Rural Areas Ten Years After Graduating



Produced by the Program on Health Workforce Research and Policy, Sheps Center for Health Services Research, University of North Carolina at Chapel Hill. Source: North Carolina Health Professions Data System with data derived from the Association of American Medical Colleges, and the NC Medical Board, 2018. Rural source: US Census Bureau and Office of Management and Budget, July 2017. "Core Based Statistical Area" (CBSA) is the OMB's collective term for Metropolitan and Micropolitan Statistical areas. Here, nonmetropolitan counties include micropolitan and counties outside of CBSAs.

Retention of Graduates in North Carolina and in Rural Counties

Retention of the class of 2008 in NC and in rural NC is shown in **Table 7 (page 30)**. Close to one-third (37%, n=156/420) of the class of 2008 was in practice in NC ten years after graduation. By school, this included 55% (n=39/71) of ECU graduates, 45% (n=73/163) of UNC graduates, 31% (n=32/103) of Wake

Forest graduates, and 14% (n=12/83) of Duke graduates. Twenty-six graduates (6%) from the 2008 cohort practiced in rural NC in 2008: 14% (n=10/39) of ECU graduates, 7% (n=11/73) of UNC graduates, 4% (n=4/103) Wake Forest graduates, and 1% (n=1/83) of Duke graduates.

We examined hours worked by week for physicians who reported a secondary practice location in a rural county and primary location in a metropolitan county. For the 2008 cohort, we identified three physicians for whom this was the case: a hematology/ oncology physician who spent 10 hours per week in a rural county, and an emergency medicine physician and a pediatrician who appeared to spend few hours weekly in rural settings (five hours and one hour, respectively) (see **Table D**, below).

Table D: Hours Worked Per Week in a Secondary Practice Location in a Rural NC County for Physicians Who Graduated from an NC Medical School in 2008 and Reported a Primary Practice Location in a Metropolitan NC County in 2018

Medical School	Primary Area of Practice	Secondary Location Hours Per Week
ECU	Hematology/ Oncology	10
UNC	Emergency Medicine	5
UNC	Pediatrics	1

Practice in Safety Net Settings and Most Economically Distressed Neighborhoods

Table E (below) shows outcomes for 2008 graduates who were practicing in safety net settings in 2008. Eight of the class of 2008 graduates (2%) were practicing at a safety net setting in NC ten-years post-graduation, including four ECU graduates, three UNC graduates, and one Wake Forest graduate. All eight safety net settings were in a rural county. Of note is the finding that four of the physicians who practiced in these settings were in non-primary care specialties: psychiatry, anesthesiology, emergency medicine, and critical care medicine.

Table E: Medical School, Primary Area of Practice, and Facility Type for Physicians Who Graduated from an NC Medical School in 2008 and Reported a Primary Practice Location in a Safety Net Setting in 2018

Medical School	Number	Safety Net Facility Type
<i>Primary Area of Practice</i>		
ECU	4	
Family Medicine	2	Federal CMS Certified Rural Health Clinic
IM/ Peds	1	Small Rural Hospital
Psychiatry	1	Small Rural Hospital
UNC-CH	3	
Family Medicine	1	Federal CMS Certified Rural Health Clinic
Anesthesiology	1	Small Rural Hospital
Emergency Medicine	1	Small Rural Hospital
Wake Forest	1	
Critical Care Medicine	1	ORH Supported Rural Health Center

Figure 5 compares the Area Deprivation Index (ADI) of the neighborhoods where physicians report their primary practice location.

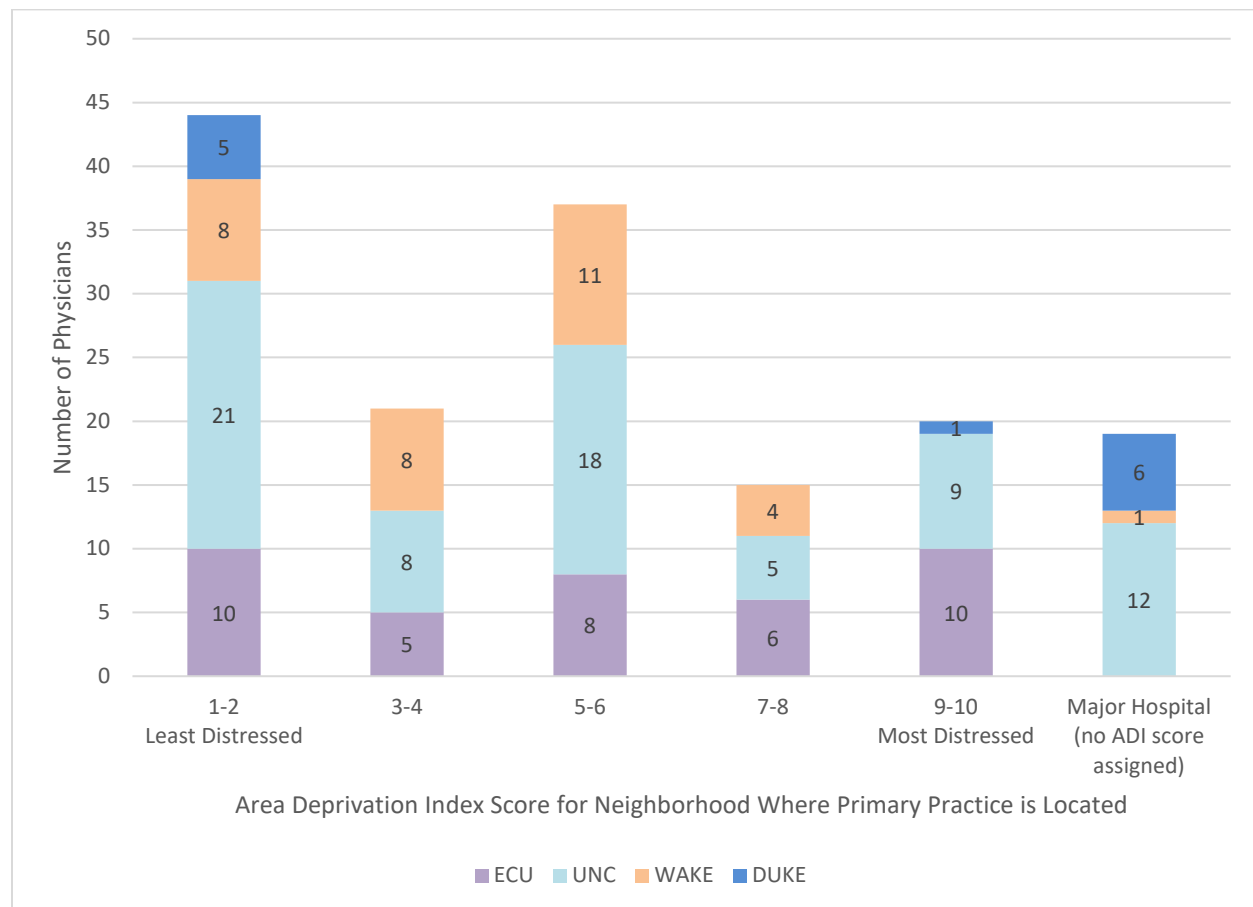
Twenty-eight percent (44/156) of the 2008 graduates practicing in NC in 2018 reported a practice location in a least economically distressed neighborhoods, while 13% (n=20/156) worked in a most economically distressed neighborhood.

None of the 2008 ECU graduates working in NC in 2018 reported a practice location in a neighborhood dominated by a major hospital. ECU graduates were spread out relatively evenly across census blocks with different levels of economic distress, with 26% (n=10/39) practicing in the most distressed neighborhoods and 26% (n=10/39) practicing in the least distressed neighborhoods.

Twenty-nine percent (n=21/73) of the 2008 UNC grads practicing in NC in 2018 worked in least distressed neighborhoods, while 12% (9/73) worked in most distressed neighborhoods. Sixteen percent (n=12/73) were working in a major hospital in a neighborhood without an assigned ADI score.

Half (50%, n=6/12) of the 2008 Duke graduates practicing in NC in 2018 worked in major hospitals, 42% (n=5/6) worked in the least distressed neighborhoods, with one graduate (8%) practicing in one of the most distressed neighborhoods.

Figure 5: Neighborhood Disadvantage Status of the 2018 Primary Practice Setting for Physicians Who Graduated from an NC Medical School in 2008



Produced by the Program on Health Workforce Research and Policy, Sheps Center for Health Services Research, University of North Carolina at Chapel Hill. Source: North Carolina Health Professions Data System with data derived from the Association of American Medical Colleges, and the NC Medical Board, 2018. ADI Score obtained from the University of Wisconsin School of Medicine Public Health. 2015 Area Deprivation Index v2.0. Downloaded from <https://www.neighborhoodatlas.medicine.wisc.edu/> September 15, 2020.

Retention in Psychiatry

Outcomes for 2008 graduates who matched to psychiatry residencies are shown in **Table 8 (page 31)**. Psychiatrist counts include physicians who report practicing in the following specialties: Psychiatry, Child and Adolescent Psychiatry, Psychoanalysis, Forensic Psychiatry, Psychosomatic Medicine, Psychiatry/Geriatric, Family Medicine-Psychiatry, Internal Medicine-Psychiatry, and Pediatrics-Psychiatry. In the 2008 cohort, 19 graduates (5%) initially matched to a psychiatry residency.

Table 9 (page 32) shows the workforce outcomes of the 2008 graduates who became psychiatrists ten-years post-graduation. Five remained in practice in NC: four ECU graduates and one Duke graduate. Two of the ECU graduates practiced in a rural county.

Retention in General Surgery

We have refrained on reporting on general surgery outcomes in the five-year post-graduation analyses because general surgery residencies typically last five years, and many general surgeons complete a sub-specialty fellowship afterwards. For this reason, reporting on general surgery practice outcomes at five-years post-graduation may be misleading. Findings at ten-years post-graduation allows us to evaluate practice outcomes for general surgeons.

In this study, physicians are considered general surgeons if they practice in the specialties of General Surgery, Abdominal Surgery, Colon & Rectal Surgery, Critical Care Surgery, Head and Neck Surgery, Oncology Surgery, Pediatric Surgery, Transplant Surgery, Trauma Surgery, or Vascular Surgery. **Table 10 (page 33)** shows that 13% (n=53/420) of the 2008 NC medical school graduate cohort matched to a general surgery residency. **Table 11 (page 34)** shows that ten years after medical school graduation, five graduates (1%) were in practice in general surgery in NC, including four graduates from UNC and one from Duke. None of these general surgeons had a primary practice location in a rural county.

Differences in Retention by Practice Specialty

When data are combined across all NC medical schools for the class of 2008 (**Table 12, page 35**), findings emerge in retention by specialty.

In the class of 2008, 41 graduates initially matched to a family medicine residency. Later, two physicians who initially matched to different specialties switched to family medicine and remained in practice in family medicine at ten-years post-graduation. All 41 graduates who initially matched to family medicine plus the two who switched residencies into family medicine were practicing family medicine in 2018, and 23 of them (56%) were practicing in NC. Eight of the family medicine physicians (20%) were practicing in rural NC ten years post-graduation. Similarly, more than half of the cohort who matched to obstetrics and gynecology (57%, n=17/30) remained in generalist practice in NC in 2018, although none of those OBGYNs practiced in rural NC. Twenty-nine percent (n=14/48) of the 2008 graduates who matched to pediatrics were practicing as generalists in NC in 2018, 8% (n=4) of whom were in rural areas. In contrast, just 5% (n=6/119) of the 2008 graduates who initially matched to internal medicine were practicing as general internists in NC in 2018, none of whom reported a primary practice location in a rural county.

Initial Match Data: 2019 Graduating Cohort

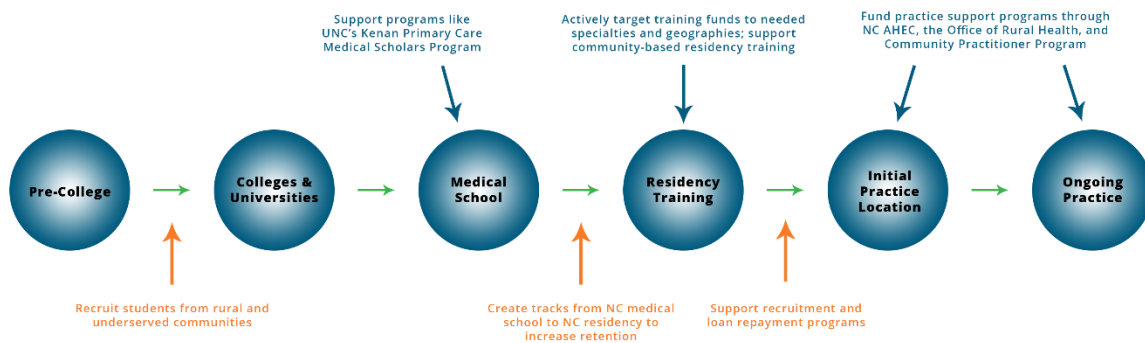
As mentioned earlier, we do not emphasize initial match data from the NC medical schools. Residents sometimes switch specialties or residency programs throughout the course of their training, and many subspecialize. However, Campbell has graduated four classes of medical students and initial match counts are the only data available thus far on Campbell's workforce outcomes. We offer a note of caution when interpreting these data and a reminder that the five-year and ten-year outcome data are more accurate in estimating the workforce outcomes for each medical school. Matches to "primary care" specialties (Family Medicine, Internal Medicine, Pediatrics, Internal Medicine-Pediatrics, and Obstetrics & Gynecology) are inflated compared to the number of graduates eventually expected to practice in those fields. We also track two other needed specialties in NC: psychiatry and general surgery. Prior trends indicate that many NC graduates, including most of those who match to Internal Medicine and General Surgery, will go on to complete fellowship training and eventually practice in a sub-specialty field. Family Medicine is an exception to this trend.

Table 13 (page 36) shows that in 2020, the public medical schools (ECU and UNC) had the highest percentage of graduates matched to an NC residency (39%, n=28/72; 39%, n=66/169 respectively), followed by Wake Forest (31%, n=35/114), Duke (29%, 32/112), and Campbell (22%, n=33/153). The highest percent of matches to a primary care, psychiatry, or general surgery residency in NC were for ECU (31%, n=22/72), UNC (25%, n=43/169), Duke (16%, n=18/112), Campbell (14%, 22/153), and Wake Forest (13%, 15/114).

DISCUSSION

While most people interact with the health system at some point in their lives and have a general understanding of the work physicians do, the majority are unaware of the specifics related to physician training—for example, the difference between a medical student and a resident. Legislators⁴ and other influential stakeholders, many of whom may be able to directly influence the health system, often come from career paths outside of healthcare. When concerns about the availability of physicians to meet the demand for healthcare arise, expanding medical education is a logical first impulse for those unfamiliar with physician training pathways. Medical school is one of multiple points along a physician's career trajectory where stakeholders can intervene to encourage practice in needed specialties and geographies (**Figure 6**).

Figure 6: Intervention Points in a Physician's Career Trajectory



Because of the legislation the NCGA passed in the early 1990's, NC has annual reports and data that indicate the trends of NC medical school graduates over decades. Data from this annual report points to the stabilization of practice patterns in primary care and in rural settings at a level that is much lower than the targets set by the NC legislature. The annual reports show the consistently small percentage of NC medical graduates that go into primary care practice in rural areas—typically between 1% and 3% annually. Knowing that this is the starting point, the state can then look to other strategies if it seeks to boost the primary care physician supply in these areas.

The new analyses added in this year's report tell an important and previously untold story about the contribution of NC medical schools to the NC physician workforce. Overall, a small percentage of the graduating cohorts were working in safety net settings. The data on practice in safety net settings for the class of 2014 show that half (n=3/6) of the NC medical school graduates working in safety net

⁴ Spero JC, Fraher EP, Ricketts TC, Rockey PH. GME in the United States: A Review of State Initiatives. Cecil G. Sheps Center for Health Services Research, The University of North Carolina at Chapel Hill. September 2013.

settings at five-years post-graduation were working in urban areas. The data for the class of 2008 show that half (n=4/8) of the NC medical school graduates working in safety net settings were not in traditional primary care specialties. These analyses demonstrate that NC medical schools are contributing to the workforce serving underserved and high needs populations. To address state workforce needs, we need to think broadly about both where those populations are geographically located—not all of them are in rural areas—and we also need to think broadly about which types of physicians serve those populations, as many work in specialties other than primary care.

There is no question that all of NC's medical schools, whether private or public, bring substantial benefits to the state in terms of nationally lauded healthcare, jobs, research dollars, etc. The findings from this report show that public medical school graduates, particularly those from ECU, more often practice in-state, in primary care specialties, in most economically distressed neighborhoods, and in rural counties than do private medical school graduates. This finding is not surprising, as ECU: A) only admits NC residents, and B) producing physicians to serve state needs is part of its mission.⁵ This project has also demonstrated that NC graduates who match to Family Medicine are more likely to be in practice in NC as generalists compared to those who match to other specialties.

While this report tracks outcomes from NC medical schools, it does not track outcomes of NC residency programs, and there is no legislative mandate to track NC residency program outcomes. While some NC medical school graduates also complete an NC residency, many residents in NC residency programs completed medical school out-of-state. It would be valuable to track the outcomes of NC residency programs for two key reasons: A) residency placement is correlated with eventual practice location, and B) NC residency programs receive financial support via Medicaid and AHEC, and it would be prudent to measure the return on investment for those dollars. Tracking NC residency program outcomes would provide information to make decisions about how to target state funds most effectively. The Sheps Center, in collaboration with AHEC, is a national leader in tracking the workforce outcomes for medical schools and GME programs at the program level. In short, there are resources within the state that can accomplish this work if legislation is passed that requires a study of NC residency outcomes.

The Role of AHEC Residencies in Primary Care

A key driver of retention of primary care physicians in North Carolina is the availability of community based primary care residencies in the state. Medical students must go through at least three years of training before being able to practice independently, and many physicians practice close to their residencies for the remainder of their careers.^{6,7,8}

AHEC primary care residencies have a better track record of keeping physicians in the state. Data from the American Medical Association physician master file demonstrate that 53% of active physicians who completed an NC AHEC residency between 1997-2017 remained in practice in NC, compared to 41%

⁵ UNC and Campbell also have a mission to serve the state.

⁶ Dorner FH, Burr RM, Tucker SL. The geographic relationships between physicians' residency sites and the locations of their first practices. *Acad Med.* 1991;66(9):540–4

⁷ Seifer SD, Vranizan K, Grumbach K. Graduate medical education and physician practice location. *JAMA.* 1995;274(9):685–91.

⁸ Fagan EB, et. al. Family medicine graduate proximity to their site of training: policy options for improving the distribution of primary care access. *Fam Med.* 2015;47(2):124-30.

who completed a non-AHEC residency.⁹ AHEC residencies, however, have grown only minimally over the last decade, and most new residency positions have been devoted to subspecialty physicians in large hospitals—often because these positions are self-funded by the hospitals themselves. In recent years, federal and philanthropic support has focused on building primary care capacity, with support for new residencies or expansions of residencies in community health center settings (Hendersonville, Greensboro, Prospect Hill and New Hanover). The legislature has supported new residencies at MAHEC and Southern Regional AHEC and has planned for residencies in the East associated with Brody School of Medicine. The Department of Health and Human Services has developed a plan for a substantial expansion of rural residencies in needed specialties and included an emphasis on creating the workforce for Medicaid in the 1115 Medicaid reform waiver.

Changes in the NC Health Care Landscape

Several contextual issues in North Carolina are important to underscore. First, hospitals and health care systems have increasingly consolidated over the last several years. This consolidation includes the increased employment of physicians. Second, in terms of the pipeline of primary care providers, the Campbell School of Medicine and many new Nurse Practitioner and Physician Assistant programs have opened over the last decade. Many of these graduates are potentially available for primary care or other needed specialties. Third, the past few years have seen a lack of certainty about the Affordable Care Act, while at the same time NC is implementing changes to the Medicaid program with the 1115 waiver. The health policy environment within the state is shifting and it is unclear what the ultimate effect will be on the supply of physicians and other health professionals. Fourth, GME alone will not ensure a sufficient volume of health professionals, especially in rural and under-resourced communities. Developing and sustaining that workforce will require a series of coordinated investments in addition to GME. Finally, the coronavirus pandemic of 2020 has upended health care delivery and medical education. One example is the increased use of telehealth to provide access to care. At the time of this report, there is no way of knowing the pandemic's long-term effects—but no doubt COVID-19 will lead to substantial changes across the health care arena.

⁹ Spero J. Compared to Non-AHEC Residents, a Higher Percentage of NC AHEC Residents are Practicing in NC. Sheps Health Workforce NC Blog, 18 March 2019. Accessed 10/8/19 at: https://nhealthworkforce.unc.edu/ahec_resident_outcomes_2017/

APPENDIX I TABLE 1

North Carolina Medical Students - Retention in Primary Care Five Years After Graduation 2014 Graduates

School Primary Care* Residency Specialty	Total Number of 2014 Graduates	Number of 2014 Graduates in Training or Practice in North Carolina as of 2019	Percent of 2014 Graduates in Training or Practice in North Carolina as of 2019	Number of 2014 Graduates in Training or Practice with an Initial Residency Choice of Primary Care*	Percent of 2014 Graduates in Training or Practice with an Initial Residency Choice of Primary Care*	Number of 2014 Graduates in Training or Practice in Primary Care** in North Carolina as of 2019	Percent of 2014 Graduates in Training or Practice in Primary Care** in North Carolina as of 2019	Number of 2014 Graduates in Training or Practice in Primary Care** in Rural*** Counties in North Carolina as of 2019	Percent of 2014 Graduates in Training or Practice in Primary Care** in Rural*** Counties North Carolina as of 2019
Duke	92	15	16%	43	47%	3	3%	0	0%
Family Medicine				0	0%	0	0%	0	0%
Internal Medicine				36	39%	3	3%	0	0%
Pediatrics				4	4%	0	0%	0	0%
IM/ Peds				0	0%	0	0%	0	0%
OBGYN				3	3%	0	0%	0	0%
ECU	79	32	41%	49	62%	21	27%	6	8%
Family Medicine				15	19%	8	10%	3	4%
Internal Medicine				10	13%	2	3%	0	0%
Pediatrics				13	16%	6	8%	2	3%
IM/ Peds				5	6%	1	1%	0	0%
OBGYN				6	8%	4	5%	1	1%
UNC-CH	161	67	42%	94	58%	22	14%	5	3%
Family Medicine				16	10%	9	6%	3	2%
Internal Medicine				45	28%	5	3%	0	0%
Pediatrics				18	11%	4	2%	1	1%
IM/ Peds				7	4%	3	2%	0	0%
OBGYN				8	5%	1	1%	1	1%
Wake Forest	114	31	27%	61	54%	8	7%	1	1%
Family Medicine				13	11%	7	6%	1	1%
Internal Medicine				33	29%	0	0%	0	0%
Pediatrics				11	10%	1	1%	0	0%
IM/ Peds				0	0%	0	0%	0	0%
OBGYN				4	4%	0	0%	0	0%
Total	446	145	33%	247	55%	54	12%	12	3%
Family Medicine				44	10%	24	5%	7	2%
Internal Medicine				124	28%	10	2%	0	0%
Pediatrics				46	10%	11	2%	3	1%
IM/ Peds				12	3%	4	1%	0	0%
OBGYN				21	5%	5	1%	2	0%

APPENDIX I

*2014 Primary Care Residency Specialty includes Family Medicine, General Pediatric Medicine, General Internal Medicine, Internal Medicine/Pediatrics, and Obstetrics/Gynecology. Source: Association of American Medical Colleges (AAMC). Internal medicine in this case also includes "medicine - preliminary," which likely overestimates the initial primary care figures.

** As of 2017, primary care definitions are based on NC Medical Board licensure data (for NC physicians) and AAMC data (for non-NC physicians) and include Family Medicine (Family Medicine, Family Medicine-Adolescent Medicine, Family Medicine-Geriatric, Family Medicine-Sports Medicine, General Practice); Internal Medicine (Internal Medicine, Internal Medicine-Geriatric); Pediatrics (Pediatrics, Pediatrics-Adolescent, Pediatric-Sports Medicine); Internal Medicine-Pediatrics (Internal Medicine-Pediatrics, Internal Medicine-Adolescent Medicine); OBGYN (Obstetrics & Gynecology, Obstetrics, Gynecology).

***"Rural" is based on 2017 Core-Based Statistical Area (CBSA) definitions, and includes counties that are "micropolitan" and "outside of CBSAs." Using this definition, NC has 54 rural counties.

Sources:

Association of American Medical Colleges

NC Medical Board

Compiled by:

NC AHEC Program

Cecil G. Sheps Center for Health Services Research

APPENDIX I
TABLE 2

North Carolina Medical Students-Retention in NC and in Rural NC
2014 Graduates

School <i>Primary Care*</i> <i>Residency Specialty</i>	Total Number of 2014 Graduates	Number of 2014 Graduates in Training or Practice in North Carolina as of 2019	Percent of 2014 Graduates in Training or Practice in North Carolina as of 2019	Number of 2014 Graduates in Training or Practice in Rural*** Counties in North Carolina as of 2019	Percent of 2014 Graduates in Training or Practice in Rural*** Counties in North Carolina as of 2019	Number of 2014 Graduates in Training or Practice in Primary Care** in Rural*** Counties in North Carolina as of 2019	Percent of 2014 Graduates in Training or Practice in Primary Care** in Rural*** Counties North Carolina as of 2019
Duke	92	15	16%	0	0%	0	0%
<i>Family Medicine</i>						0	0%
<i>Internal Medicine</i>						0	0%
<i>Pediatrics</i>						0	0%
<i>IM/ Peds</i>						0	0%
<i>OBGYN</i>						0	0%
ECU	79	32	41%	7	9%	6	8%
<i>Family Medicine</i>						3	4%
<i>Internal Medicine</i>						0	0%
<i>Pediatrics</i>						2	3%
<i>IM/ Peds</i>						0	0%
<i>OBGYN</i>						1	1%
UNC-CH	161	67	42%	6	4%	5	3%
<i>Family Medicine</i>						3	2%
<i>Internal Medicine</i>						0	0%
<i>Pediatrics</i>						1	1%
<i>IM/ Peds</i>						0	0%
<i>OBGYN</i>						1	1%
Wake Forest	114	31	27%	3	3%	1	1%
<i>Family Medicine</i>						1	1%
<i>Internal Medicine</i>						0	0%
<i>Pediatrics</i>						0	0%
<i>IM/ Peds</i>						0	0%
<i>OBGYN</i>						0	0%
Total	446	145	33%	16	4%	12	3%
<i>Family Medicine</i>						7	1.6%
<i>Internal Medicine</i>						0	0%
<i>Pediatrics</i>						3	1%
<i>IM/ Peds</i>						0	0%
<i>OBGYN</i>						2	0.4%

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*2014 Primary Care Residency Specialty includes Family Medicine, General Pediatric Medicine, General Internal Medicine, Internal Medicine/Pediatrics, and Obstetrics/Gynecology. Source: Association of American Medical Colleges (AAMC). Internal medicine in this case also includes "medicine - preliminary," which likely overestimates the initial primary care figures.

** As of 2017, primary care definitions are based on NC Medical Board licensure data (for NC physicians) and AAMC data (for non-NC physicians) and include Family Medicine (Family Medicine, Family Medicine-Adolescent Medicine, Family Medicine-Geriatric, Family Medicine-Sports Medicine, General Practice); Internal Medicine (Internal Medicine, Internal Medicine-Geriatric); Pediatrics (Pediatrics, Pediatrics-Adolescent, Pediatric-Sports Medicine); Internal Medicine-Pediatrics (Internal Medicine-Pediatrics, Internal Medicine-Adolescent Medicine); OB/GYN (Obstetrics & Gynecology, Obstetrics, Gynecology).

***"Rural" is based on 2017 Core-Based Statistical Area (CBSA) definitions, and includes counties that are "micropolitan" and "outside of CBSAs." Using this definition, NC has 54 rural counties.

				Sources:				
	Association of American Medical Colleges			NC Medical Board				
Compiled by:								
NC AHEC Program								
Cecil G. Sheps Center for Health Services Research								

APPENDIX I

TABLE 4
North Carolina Medical Students – Retention by Medical Specialty in NC
2014 Graduates

	Physician Specialty					
	Family Medicine	Internal Medicine	Pediatrics	IM/ Peds	OBGYN	Psychiatry
Number of 2014 Graduates by Initial Specialty Match*	44	124	46	12	21	11
Number <i>(Percent)</i> of 2014 Graduates in Training or Practice as Generalist** in Specialty in North Carolina as of 2019	24 <i>(55%)</i>	7 <i>(8%)</i>	11 <i>(24%)</i>	4 <i>(33%)</i>	5 <i>(24%)</i>	4 <i>(36%)</i>
Number <i>(Percent)</i> of 2014 Graduates in Training or Practice As Generalist** in Specialty in Rural*** Counties in North Carolina as of 2019	7 <i>(16%)</i>	0 <i>(0%)</i>	3 <i>(7%)</i>	0 <i>(0%)</i>	2 <i>(10%)</i>	0 <i>(0%)</i>
<p>*2014 Data Source: Association of American Medical Colleges (AAMC). Internal medicine in this case also includes "medicine - preliminary," which likely overestimates the initial match to Internal Medicine.</p> <p>**Practice specialty definitions are based on NC Medical Board licensure data (for NC physicians) and include Family Medicine (Family Medicine, Family Medicine-Adolescent Medicine, Family Medicine-Geriatric, Family Medicine-Sports Medicine, General Practice; Internal Medicine (Internal Medicine, Internal Medicine-Geriatric); Pediatrics (Pediatrics, Pediatrics-Adolescent, Pediatric-Sports Medicine); Internal Medicine-Pediatrics (Internal Medicine-Pediatrics, Internal Medicine-Adolescent Medicine); OBGYN (Obstetrics & Gynecology, Obstetrics, Gynecology); General Surgery (General Surgery, Abdominal Surgery, Colon & Rectal Surgery, Critical Care Surgery, Head and Neck Surgery, Oncology Surgery, Pediatric Surgery, Transplant Surgery, Trauma Surgery, and Vascular Surgery); and Psychiatry (Psychiatry, Child and Adolescent Psychiatry, Psychoanalysis, Forensic Psychiatry, Psychosomatic Medicine, Psychiatry/Geriatric, Family Medicine-Psychiatry, Internal Medicine-Psychiatry, and Pediatrics-Psychiatry.)</p> <p>***"Rural" is based on 2017 Core-Based Statistical Area (CBSA) definitions, and includes counties that are "micropolitan" and "outside of CBSAs." Using this definition, NC has 54 rural counties.</p>						

APPENDIX I

TABLE 5
North Carolina Medical Students – Initial Choice of Primary Care Residency
2008 Graduates

School <i>Primary Care* Residency Specialty</i>	Total Number of 2008 Graduates	Number of 2008 Graduates not in Training or Practice as of 2018	Number of 2008 Graduates in Training or Practice as of 2018	Number of 2008 Graduates in Training or Practice with an Initial Residency Choice of Primary Care*	Percent of 2008 Graduates in Training or Practice with an Initial Residency Choice of Primary Care*
Duke	86	3	83	48	58%
<i>Family Medicine</i>				2	2%
<i>Internal Medicine</i>				35	42%
<i>Pediatrics</i>				6	7%
<i>IM/ Peds</i>				2	2%
<i>OBGYN</i>				3	4%
ECU	73	2	71	45	63%
<i>Family Medicine</i>				11	15%
<i>Internal Medicine</i>				13	18%
<i>Pediatrics</i>				9	13%
<i>IM/ Peds</i>				8	11%
<i>OBGYN</i>				4	6%
UNC-CH	164	1	163	101	62%
<i>Family Medicine</i>				20	12%
<i>Internal Medicine</i>				40	25%
<i>Pediatrics</i>				19	12%
<i>IM/ Peds</i>				7	4%
<i>OBGYN</i>				15	9%
Wake Forest	103	0	103	61	59%
<i>Family Medicine</i>				8	8%
<i>Internal Medicine</i>				31	30%
<i>Pediatrics</i>				14	14%
<i>IM/ Peds</i>				0	0%
<i>OBGYN</i>				8	8%
Total	426	6	420	255	61%
<i>Family Medicine</i>				41	10%
<i>Internal Medicine</i>				119	28%
<i>Pediatrics</i>				48	11%
<i>IM/ Peds</i>				17	4%
<i>OBGYN</i>				30	7%

APPENDIX I

*2008 Primary Care Residency Specialty includes Family Medicine, General Pediatric Medicine, General Internal Medicine, Internal Medicine/Pediatrics, and Obstetrics/Gynecology. Source: Association of American Medical Colleges (AAMC). Internal medicine in this case also includes "medicine - preliminary," which likely overestimates the initial primary care figures.

Sources:					
	Association of American Medical Colleges		NC Medical Board		
Compiled by:					
NC AHEC Program					
Cecil G. Sheps Center for Health Services Research					

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TABLE 6
North Carolina Medical Students – Retention in Primary Care in NC 10 Years After Graduation
2008 Graduates

School <i>Primary Care*</i> <i>Residency Specialty</i>	Number of 2008 Graduates in Training or Practice as of 2018	Number of 2008 Graduates in Training or Practice in North Carolina as of 2018	Percent of 2008 Graduates in Training or Practice in North Carolina as of 2018	Number of 2008 Graduates in Training or Practice in Primary Care** in North Carolina as of 2018	Percent of 2008 Graduates in Training or Practice in Primary Care** in North Carolina as of 2018	Number of 2008 Graduates in Training or Practice in Primary Care** in Rural*** Counties in North Carolina as of 2018	Percent of 2008 Graduates in Training or Practice in Primary Care** in Rural*** Counties North Carolina as of 2018
Duke	83	12	14%	1	1%	0	0%
Family Medicine				0	0%	0	0%
Internal Medicine				0	0%	0	0%
Pediatrics				0	0%	0	0%
IM/ Peds				0	0%	0	0%
OBGYN				1	1%	0	0%
ECU	71	39	55%	20	28%	8	11%
Family Medicine				7	10%	4	6%
Internal Medicine				1	1%	0	0%
Pediatrics				5	7%	3	4%
IM/ Peds				4	6%	1	1%
OBGYN				3	4%	0	0%
UNC-CH	163	73	45%	32	20%	5	3%
Family Medicine				12	7%	4	2%
Internal Medicine				4	2%	0	0%
Pediatrics				6	4%	1	1%
IM/ Peds				2	1%	0	0%
OBGYN				8	5%	0	0%
Wake Forest	103	32	31%	13	13%	0	0%
Family Medicine				4	4%	0	0%
Internal Medicine				1	1%	0	0%
Pediatrics				3	3%	0	0%
IM/ Peds				0	0%	0	0%
OBGYN				5	5%	0	0%
Total	420	156	37%	66	16%	13	3%
Family Medicine				23	5%	8	2%
Internal Medicine				6	1%	0	0%
Pediatrics				14	3%	4	1%
IM/ Peds				6	1%	1	0%
OBGYN				17	4%	0	0%

APPENDIX I

*2008 Primary Care Residency Specialty includes Family Medicine, General Pediatric Medicine, General Internal Medicine, Internal Medicine/Pediatrics, and Obstetrics/Gynecology. Source: Association of American Medical Colleges (AAMC). Internal medicine in this case also includes "medicine - preliminary," which likely overestimates the initial primary care figures.

** As of 2017, primary care definitions are based on NC Medical Board licensure data (for NC physicians) and AAMC data (for non-NC physicians) and include Family Medicine (Family Medicine, Family Medicine-Adolescent Medicine, Family Medicine-Geriatric, Family Medicine-Sports Medicine, General Practice; Internal Medicine (Internal Medicine, Internal Medicine-Geriatric); Pediatrics (Pediatrics, Pediatrics-Adolescent, Pediatric-Sports Medicine); Internal Medicine-Pediatrics (Internal Medicine-Pediatrics, Internal Medicine-Adolescent Medicine); OBGYN (Obstetrics & Gynecology, Obstetrics, Gynecology).

***"Rural" is based on 2017 Core-Based Statistical Area (CBSA) definitions, and includes counties that are "micropolitan" and "outside of CBSAs." Using this definition, NC has 54 rural counties.

Note: In all cases, 2018 counts include physicians who branched in from other specialties, even if those physicians are not included in counts of initial residency matches. In the class of 2008, one UNC graduate initially matched to internal medicine and switched to a family medicine residency, and another UNC graduate matched to a physical medicine and rehabilitation residency, later completeing a family medicine/sports medicine residency.

Sources:

Association of American Medical Colleges				NC Medical Board		

Compiled by:

NC AHEC Program

Cecil G. Sheps Center for Health Services Research

APPENDIX I TABLE 7

North Carolina Medical Students-Retention in NC and in Rural NC 2008 Graduates

School Primary Care* Residency Specialty	Number of 2008 Graduates in Training or Practice as of 2018	Number of 2008 Graduates in Training or Practice in North Carolina as of 2018	Percent of 2008 Graduates in Training or Practice in North Carolina as of 2018	Number of 2008 Graduates in Training or Practice in Rural*** Counties as of 2018	Percent of 2008 Graduates in Training or Practice in Rural*** Counties as of 2018	Number of 2008 Graduates in Training or Practice in Rural*** Counties in North Carolina as of 2018	Percent of 2008 Graduates in Training or Practice in Rural*** Counties in North Carolina as of 2018	Number of 2008 Graduates in Training or Practice in Primary Care** in Rural*** Counties in North Carolina as of 2018	Percent of 2008 Graduates in Training or Practice in Primary Care** in Rural*** Counties North Carolina as of 2018
Duke	83	12	14%	1	1%	0	0%	0	0%
Family Medicine								0	0%
Internal Medicine								0	0%
Pediatrics								0	0%
IM/ Peds								0	0%
OBGYN								0	0%
ECU	71	39	55%	10	14%	9	13%	8	11%
Family Medicine								4	6%
Internal Medicine								0	0%
Pediatrics								3	4%
IM/ Peds								1	1%
OBGYN								0	0%
UNC-CH	163	73	45%	11	7%	7	4%	5	3%
Family Medicine								4	2%
Internal Medicine								0	0%
Pediatrics								1	1%
IM/ Peds								0	0%
OBGYN								0	0%
Wake Forest	103	32	31%	4	4%	2	2%	0	0%
Family Medicine								0	0%
Internal Medicine								0	0%
Pediatrics								0	0%
IM/ Peds								0	0%
OBGYN								0	0%
Total	420	156	37%	26	6%	18	4%	13	3%
Family Medicine								8	1.9%
Internal Medicine								0	0%
Pediatrics								4	1%
IM/ Peds								1	0%
OBGYN								0	0.0%

*2008 Primary Care Residency Specialty includes Family Medicine, General Pediatric Medicine, General Internal Medicine, Internal Medicine/Pediatrics, and Obstetrics/Gynecology. Source: Association of American Medical Colleges (AAMC). Internal medicine in this case also includes "medicine - preliminary," which likely overestimates the initial primary care figures.

** As of 2017, primary care definitions are based on NC Medical Board licensure data (for NC physicians) and AAMC data (for non-NC physicians) and include Family Medicine (Family Medicine, Family Medicine-Adolescent Medicine, Family Medicine-Geriatric, Family Medicine-Sports Medicine, General Practice; Internal Medicine (Internal Medicine, Internal Medicine-Geriatric); Pediatrics (Pediatrics, Pediatrics-Adolescent, Pediatric-Sports Medicine); Internal Medicine-Pediatrics (Internal Medicine-Pediatrics, Internal Medicine-Adolescent Medicine); OBGYN (Obstetrics & Gynecology, Obstetrics, Gynecology).

***"Rural" is based on 2017 Core-Based Statistical Area (CBSA) definitions, and includes counties that are "micropolitan" and "outside of CBSAs." Using this definition, NC has 54 rural counties.

Sources:

Association of American Medical Colleges

NC Medical Board

Compiled by:

NC AHEC Program

Cecil G. Sheps Center for Health Services Research

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TABLE 8
North Carolina Medical Students – Initial Choice of Psychiatry Residency
2008 Graduates

School	Number of 2008 Graduates in Training or Practice as of 2018	Number of 2008 Graduates in Training or Practice with an Initial Residency Choice of Psychiatry	Percent of 2008 Graduates in Training or Practice with an Initial Residency Choice of Psychiatry	Number of 2008 Graduates in Training or Practice in Psychiatry* as of 2018	Percent of 2008 Graduates in Training or Practice in Psychiatry* as of 2018
Duke	83	5	6%	5	6%
<i>Psychiatry</i>				2	2%
<i>Child & Adolescent Psychiatry</i>				3	4%
ECU	71	6	8%	4	6%
<i>Psychiatry</i>				2	3%
<i>Child & Adolescent Psychiatry</i>				1	1%
<i>Internal Medicine-Psychiatry</i>				1	1%
UNC-CH	163	6	4%	6	4%
<i>Psychiatry</i>				5	3%
<i>Child & Adolescent Psychiatry</i>				1	1%
Wake Forest	103	2	2%	3	3%
<i>Psychiatry</i>				2	2%
<i>Child & Adolescent Psychiatry</i>				1	1%
Total	420	19	5%	18	4%
<i>Psychiatry</i>				11	3%
<i>Child & Adolescent Psychiatry</i>				6	1%
<i>Internal Medicine-Psychiatry</i>				1	0%

*As of 2017, Psychiatry definitions are based on NC Medical Board licensure data (for NC physicians) and AAMC data (for non-NC physicians) and include Psychiatry, Child and Adolescent Psychiatry, Psychoanalysis, Forensic Psychiatry, Psychosomatic Medicine, Psychiatry/Geriatric, Family Medicine-Psychiatry, Internal Medicine-Psychiatry, and Pediatrics-Psychiatry.

Sources:

Association of American Medical Colleges

NC Medical Board

Compiled by:

NC AHEC Program

Cecil G. Sheps Center for Health Services Research

APPENDIX I

TABLE 9
North Carolina Medical Students – Retention in Psychiatry in NC 10 Years After Graduation
2008 Graduates

School	Number of 2013 Graduates in Training or Practice as of 2018	Number of 2008 Graduates in Training or Practice in North Carolina as of 2018	Percent of 2008 Graduates in Training or Practice in North Carolina as of 2018	Number of 2008 Graduates in Training or Practice in Psychiatry* in North Carolina as of 2018	Percent of 2008 Graduates in Training or Practice in Psychiatry* in North Carolina as of 2018	Number of 2008 Graduates in Training or Practice in Psychiatry* in Rural** Counties in North Carolina as of 2018	Percent of 2008 Graduates in Training or Practice in Psychiatry* in Rural** Counties North Carolina as of 2018
Duke	83	12	14%	1	1%	0	0%
<i>Psychiatry</i>				1	1%	0	0%
<i>Child & Adolescent Psychiatry</i>				0	0%	0	0%
ECU	71	39	55%	4	6%	2	3%
<i>Psychiatry</i>				2	3%	1	0%
<i>Child & Adolescent Psychiatry</i>				1	1%	0	0%
<i>Internal Medicine-Psychiatry</i>				1	1%	1	0%
UNC-CH	163	73	45%	0	0%	0	0%
<i>Psychiatry</i>				0	0%	0	0%
<i>Child & Adolescent Psychiatry</i>				0	0%	0	0%
Wake Forest	103	32	31%	0	0%	0	0%
<i>Psychiatry</i>				0	0%	0	0%
<i>Child & Adolescent Psychiatry</i>				0	0%	0	0%
Total	420	156	37%	5	1%	2	0.5%
<i>Psychiatry</i>				3	1%	1	0%
<i>Child & Adolescent Psychiatry</i>				1	0%	0	0%
<i>Internal Medicine-Psychiatry</i>				1	0%	1	0%

*As of 2017, Psychiatry definitions are based on NC Medical Board licensure data (for NC physicians) and AAMC data (for non-NC physicians) and include Psychiatry, Child and Adolescent Psychiatry, Psychoanalysis, Forensic Psychiatry, Psychosomatic Medicine, Psychiatry/Geriatric, Family Medicine-Psychiatry, Internal Medicine-Psychiatry, and Pediatrics-Psychiatry.

**"Rural" is based on 2017 Core-Based Statistical Area (CBSA) definitions, and includes counties that are "micropolitan" and "outside of CBSAs." Using this definition, NC has 54 rural counties.

Sources:

Association of American Medical Colleges

NC Medical Board

Compiled by:

NC AHEC Program

Cecil G. Sheps Center for Health Services Research

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TABLE 10
North Carolina Medical Students – Initial Choice of General Surgery Residency
2008 Graduates

School	Number of 2008 Graduates in Training or Practice as of 2018	Number of 2008 Graduates in Training or Practice with an Initial Residency Choice of General Surgery	Percent of 2008 Graduates in Training or Practice with an Initial Residency Choice of General Surgery	Number of 2008 Graduates in Training or Practice in General Surgery* as of 2018	Percent of 2008 Graduates in Training or Practice in General Surgery* as of 2018
Duke	83	12	14%	4	5%
<i>Critical Care Surgery</i>				1	1%
<i>Pediatric Surgery</i>				1	1%
<i>Surgical Oncology</i>				1	1%
<i>Vascular Surgery</i>				1	1%
ECU	71	4	6%	3	4%
<i>General Surgery</i>				1	1%
<i>Critical Care Surgery</i>				2	3%
UNC-CH	163	22	13%	11	7%
<i>General Surgery</i>				7	4%
<i>Critical Care Surgery</i>				2	1%
<i>Vascular Surgery</i>				2	1%
Wake Forest	103	15	15%	4	4%
<i>General Surgery</i>				1	1%
<i>Critical Care Surgery</i>				2	2%
<i>Pediatric Surgery</i>				1	1%
Total	420	53	13%	22	5%
<i>General Surgery</i>				9	2%
<i>Critical Care Surgery</i>				7	2%
<i>Pediatric Surgery</i>				2	0%
<i>Surgical Oncology</i>				1	0%
<i>Vascular Surgery</i>				3	1%

*As of 2014, General Surgery definitions are based on NC Medical Board licensure data (for NC physicians) and AAMC data (for non-NC physicians) and include General Surgery, Abdominal Surgery, Colon & Rectal Surgery, Critical Care Surgery, Head and Neck Surgery, Oncology Surgery, Pediatric Surgery, Transplant Surgery, Trauma Surgery, and Vascular Surgery.

Sources:

Association of American Medical Colleges

NC Medical Board

Compiled by:

NC AHEC Program

Cecil G. Sheps Center for Health Services Research

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TABLE 11
North Carolina Medical Students – Retention in General Surgery in NC 10 Years After Graduation
2008 Graduates

School	Number of 2008 Graduates in Training or Practice as of 2018	Number of 2008 Graduates in Training or Practice in North Carolina as of 2018	Percent of 2008 Graduates in Training or Practice in North Carolina as of 2018	Number of 2008 Graduates in Training or Practice in General Surgery* in North Carolina as of 2018	Percent of 2008 Graduates in Training or Practice in General Surgery* in North Carolina as of 2018	Number of 2008 Graduates in Training or Practice in General Surgery* in Rural** Counties in North Carolina as of 2018	Percent of 2008 Graduates in Training or Practice in General Surgery* in Rural** Counties North Carolina as of 2018
Duke	83	12	14%	1	1%	0	0%
Critical Care Surgery				0	0%	0	0%
Pediatric Surgery				0	0%	0	0%
Surgical Oncology				1	1%	0	0%
Vascular Surgery				0	0%	0	0%
ECU	71	39	55%	0	0%	0	0%
General Surgery				0	0%	0	0%
Critical Care Surgery				0	0%	0	0%
UNC-CH	163	73	45%	4	2%	0	0%
General Surgery				1	1%	0	0%
Critical Care Surgery				1	1%	0	0%
Vascular Surgery				2	1%	0	0%
Wake Forest	103	32	31%	0	0%	0	0%
General Surgery				0	0%	0	0%
Critical Care Surgery				0	0%	0	0%
Pediatric Surgery				0	0%	0	0%
Total	420	156	37%	5	1%	0	0%
General Surgery				1	0%	0	0%
Critical Care Surgery				1	0%	0	0%
Pediatric Surgery				0	0%	0	0%
Surgical Oncology				1	0%	0	0%
Vascular Surgery				2	0%	0	0%

* As of 2014, General Surgery definitions are based on NC Medical Board licensure data (for NC physicians) and AAMC data (for non-NC physicians) and include General Surgery, Abdominal Surgery, Colon & Rectal Surgery, Critical Care Surgery, Head and Neck Surgery, Oncology Surgery, Pediatric Surgery, Transplant Surgery, Trauma Surgery, and Vascular Surgery.

***"Rural" is based on 2017 Core-Based Statistical Area (CBSA) definitions, and includes counties that are "micropolitan" and "outside of CBSAs." Using this definition, NC has 54 rural counties.

Sources:

Association of American Medical Colleges

NC Medical Board

Compiled by:

NC AHEC Program

Cecil G. Sheps Center for Health Services Research

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TABLE 12
North Carolina Medical Students – Retention by Medical Specialty in NC
2008 Graduates

	Physician Specialty						
	Family Medicine	Internal Medicine	Pediatrics	IM/ Peds	OBGYN	General Surgery	Psychiatry
Number of 2008 Graduates by Initial Specialty Match*	41	119	48	17	30	53	19
Number (Percent) of 2008 Graduates in Training or Practice as Generalist** in Specialty as of 2018	43 (105%)	23 (19%)	28 (58%)	14 (82%)	30 (100%)	22 (42%)	18 (95%)
Number (Percent) of 2008 Graduates in Training or Practice as Generalist** in Specialty in North Carolina as of 2018	23 (56%)	6 (5%)	14 (29%)	6 (35%)	17 (57%)	5 (9%)	5 (26%)
Number (Percent) of 2008 Graduates in Training or Practice As Generalist** in Specialty in Rural*** Counties in North Carolina as of 2018	8 (20%)	0 (0%)	4 (8%)	1 (6%)	0 (0%)	0 (0%)	2 (11%)

Note: In all cases, 2018 counts include physicians who branched in from other specialties, even though those physicians are not included in counts of initial residency matches.

*2008 Data Source: Association of American Medical Colleges (AAMC). Internal medicine in this case also includes "medicine - preliminary," which likely overestimates the initial match to Internal Medicine.

**Physicians who branch from primary care or general surgery specialties into subspecialty fields are not included in these counts, even if they remain in practice in NC. Practice specialty definitions are based on NC Medical Board licensure data (for NC physicians) and AAMC data (for non-NC physicians) and include Family Medicine (Family Medicine, Family Medicine-Adolescent Medicine, Family Medicine-Geriatric, Family Medicine-Sports Medicine, General Practice; Internal Medicine (Internal Medicine, Internal Medicine-Geriatric); Pediatrics (Pediatrics, Pediatrics-Adolescent, Pediatric-Sports Medicine); Internal Medicine-Pediatrics (Internal Medicine-Pediatrics, Internal Medicine-Adolescent Medicine); OBGYN (Obstetrics & Gynecology, Obstetrics, Gynecology); General Surgery (General Surgery, Abdominal Surgery, Colon & Rectal Surgery, Critical Care Surgery, Head and Neck Surgery, Oncology Surgery, Pediatric Surgery, Transplant Surgery, Trauma Surgery, and Vascular Surgery); and Psychiatry (Psychiatry, Child and Adolescent Psychiatry, Psychoanalysis, Forensic Psychiatry, Psychosomatic Medicine, Psychiatry/Geriatric, Family Medicine-Psychiatry, Internal Medicine-Psychiatry, and Pediatrics-Psychiatry.)

***"Rural" is based on 2017 Core-Based Statistical Area (CBSA) definitions, and includes counties that are "micropolitan" and "outside of CBSAs." Using this definition, NC has 54 rural counties.

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TABLE 13
NC Medical School Graduates - Initial Residency Matches
Class of 2020

School Residency Specialty	Total Number of 2020 Graduates	Number of 2020 Graduates not in Training or Practice	Number of 2020 Graduates with an Initial Residency Match	Number of 2020 Graduates with an Initial Residency Match in NC (All Specialties)	Percent of 2020 Graduates with an Initial Residency Match in NC (All Specialties)	Number of 2020 Graduates with an Initial Residency Choice of Primary Care, Psychiatry, or General Surgery	Percent of 2020 Graduates with an Initial Residency Choice of Primary Care, Psychiatry, or General Surgery	Number of 2020 Graduates with an Initial Residency Choice of Primary Care, Psychiatry, or General Surgery in NC	Percent of 2020 Graduates with an Initial Residency Choice of Primary Care, Psychiatry, or General Surgery in NC
Campbell	153	0	153	33	22%	96	63%	22	14%
Family Medicine						26	17%	7	5%
Internal Medicine						34	22%	8	5%
Pediatrics						17	11%	3	2%
IM/ Peds						1	1%	0	0%
OBGYN						4	3%	0	0%
Psychiatry						8	5%	3	2%
General Surgery						6	4%	1	1%
Duke	112	0	112	32	29%	59	53%	18	16%
Family Medicine						4	4%	2	2%
Internal Medicine						27	24%	10	9%
Pediatrics						7	6%	1	1%
IM/ Peds						3	3%	2	2%
OBGYN						7	6%	2	2%
Psychiatry						6	5%	0	0%
General Surgery						5	4%	1	1%
ECU	73	1	72	28	39%	54	75%	22	31%
Family Medicine						9	13%	4	6%
Internal Medicine						12	17%	3	4%
Pediatrics						18	25%	9	13%
IM/ Peds						0	0%	0	0%
OBGYN						4	6%	4	6%
Psychiatry*						5	7%	2	3%
General Surgery						6	8%	0	0%
UNC-CH	170	1	169	66	39%	110	65%	43	25%
Family Medicine						16	9%	10	6%
Internal Medicine						38	22%	14	8%
Pediatrics						17	10%	8	5%
IM/ Peds						7	4%	3	2%
OBGYN						9	5%	1	1%
Psychiatry						9	5%	2	1%
General Surgery						14	8%	5	3%

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Wake Forest	114	0	114	35	31%	68	60%	15	13%
Family Medicine						7	6%	2	2%
Internal Medicine						21	18%	4	4%
Pediatrics						9	8%	2	2%
IM/ Peds						2	2%	0	0%
OBGYN						7	6%	1	1%
Psychiatry						12	11%	5	4%
General Surgery						10	9%	1	1%
Total	622	2	620	194	31%	387	62%	120	19%
Family Medicine						62	10%	25	4%
Internal Medicine						132	21%	39	6%
Pediatrics						68	11%	23	4%
IM/ Peds						13	2%	5	1%
OBGYN						31	5%	8	1%
Psychiatry						40	6%	12	2%
General Surgery						41	7%	8	1%

Sources: Nicole Allen, Associate Director of Student Affairs, Bowman Gray Center for Medical Education, Wake Forest University; Gaye Tennison, Associate Registrar, Brody School of Medicine, East Carolina University; Sheba Hall, Staff Assistant, Office of Student Affairs, Duke University School of Medicine; Tydal Jackson, Graduate Medical Education Coordinator, Campbell University Jerry M. Wallace School of Osteopathic Medicine; Elizabeth Steadman, Director, Office of Medical Education Student Affairs, University of North Carolina School of Medicine.

* Includes one student matched to a "triple certification" specialty in pediatrics/psychiatry/child psychiatry

Notes

Limitations: The information used in this analysis to determine a medical graduate's initial specialty choice for residency and to determine retention in primary care comes from different sources. When calculating retention in primary care five years after graduation, data from the AAMC are used to determine initial choice of residency. AAMC does not differentiate between internal medicine and medicine-preliminary, so the data may appear to be inflated for initial residency choice of primary care. Two data sources are used to determine current practice or training area. For physicians practicing in North Carolina, NC Medical Board (NCMB) data are used to determine the physician's current self-reported primary area of practice. For physicians practicing outside of North Carolina, AAMC data are used to determine current practice or training area.

Beginning with the class of 2014, Sheps no longer received AMA Masterfile data matched to AAMC GMETrack data as in prior years. This change was the result of a renegotiated data use agreement between AMA and AAMC that took effect in 2020. Without the AMA Masterfile data, it is not possible to track workforce outcomes for NC medical school graduates in practice or training outside of NC. In addition, Sheps no longer has access to variables from the AMA Masterfile indicating whether a physician is dead or has left active practice, and is unable to triangulate data when the AMA Masterfile indicates that a physician has an NC license but the NC licensure file does not include the physician, as sometimes happens due to a change in last name.

Beginning with the class of 2006 all MDs graduating in a year, regardless of month, are counted with that year's graduates.

Primary Care Tables: Primary care coding was revised in 2014 to reflect more accurate aggregation of AMA minor codes to AMA major codes. Primary care residency specialties are defined by legislation passed by the NC General Assembly in 1993 (Senate Bill 27/ House Bill 729) and include family medicine, general internal medicine, general pediatric medicine, internal medicine-pediatrics, and obstetrics and gynecology. Specialties included under the definitions of current practice specialties for primary care, psychiatry, and general surgery were revised in 2014 and reviewed by practicing clinicians for accuracy.

"Primary Care" is defined for both initial specialty of residency training (identified using AAMC data and denoted by the use of one asterisk) and for current practice or training area (identified using either NCMB data for physicians in NC and AAMC data for physicians practicing out of state and denoted by the use of two asterisks). More specialties are included under the definition of "primary care" for current practice or training area than for specialty of residency training because physicians may specialize within their primary care area of practice following training. For example, a physician who entered residency training in "pediatrics," and following completion of training reported a current practice area of "adolescent medicine" would be counted as a primary care physician.

General Surgery Tables: For tables calculating retention in general surgery five years after graduation, it is important to note that surgical residencies are currently a minimum of five years, and students who select an initial specialty of general surgery often transition to more specialized surgical training.

State-Supported Students at Duke and Wake Forest Medical Schools: Prior analysis tracked outcomes just for the subgroup of students that received the state IMEO funds (roughly 35% of the Wake Forest Students and 20% of the Duke students). Students were identified using data from NCSEAA. The IMEO grant program was repealed in 2009 legislation (see Senate Bill 202) and tracking for those students is no longer a component of this analysis.