

# The Proportion of Rural Applicants to the UNC-Chapel Hill School of Medicine is Close to Parity with the Proportion of College-Educated Young Adults in Rural NC

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## Research article

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## Abstract

## Background

Over the past 40 years, North Carolina's physician supply grew faster than the total population, but the maldistribution of physicians between urban and rural areas increased. In rural counties, access-to-care and health disparities remain concerning.

## Method

Descriptive analyses were conducted to compare the number and percentage of rural and urban students from North Carolina (NC) who applied, interviewed, and were accepted to the University of North Carolina's School of Medicine. The likely pool of rural applicants was based on the number of college-educated 18-34-year-olds by county.

## Results

Roughly 10.9% of NC's population of college-educated 18-34-year-olds live in rural counties. Between 2017–2019, 9.3% (n = 225) of UNC SOM applicants were from a rural county.

## Conclusion

An increase of just 14 additional rural applicants annually would bring the proportion of rural UNC SOM applicants in alignment with the potential applicant pool in rural NC counties. Addressing NC's rural physician workforce needs will require multiple strategies that affect different parts of the medical education and health care systems, including boosting college completion rates in rural areas.

## Background

Compared to those in urban areas, rural populations have poorer health outcomes and higher mortality rates (Probst et al., 2019). These health disparities stem from a variety of sources, including lack of health insurance coverage, health behavior and risk factors, lower socioeconomic status and physician shortages in rural areas (Gong et al., 2019; Randolph and Holmes, 2018). Over the past four decades, North Carolina's physician supply has grown faster than the population, but the maldistribution of physicians between urban and rural areas has increased over time (Holmes, 2018; Sheps Health Workforce NC, n.d.). In 1979, urban counties had about 6.1 more physicians per 10,000 population compared to rural counties. By 2018, this gap had more than doubled to 13.1 more physicians per capita.

According to Bourdieu's theory of habitus (1977), individual's educational paths and potential access are constrained by his/her habitus (Hughes, 2018). Habitus is defined as a set of dispositions including

family background, rural vs. urban upbringing, and financial status (Bourdieu, 1977). In one study, Bourdieu and Passeron (1990) argued an inequality of higher education access exists, specifically noting children of farmers were less likely to pursue higher education than children of professionals. Therefore, Bourdieu's theory highlights challenges facing rural students accessing higher education in general.

Unfortunately, rural students are underrepresented in medical school nationwide and their numbers are declining (Shipman et al., 2019). Since growing up in a rural area is a strong predictor of future rural practice (Brooks et al., 2002; Goodfellow et al., 2016; Hughes et al., 2005; Owen et al., 2007; Parlier et al., 2018; Rabinowitz et al., 2012), recruiting rural medical school applicants is an important strategy to boost the rural physician workforce. Underrepresentation of rural medical school students are caused by either a shortage of rural applicants (Anderson et al., 2009; Hutten-Czapski et al., 2005) or a difference in their admission rates. Prior national studies suggest that rural applicants are equally likely or more likely (Longo et al., 2005; Shipman et al., 2019) to be admitted to medical school relative to urban applicants.

As one of the state's two publicly funded medical schools, the University of North Carolina at Chapel Hill's School of Medicine (UNC SOM), plays a key role in producing a physician workforce that meets the state's health care needs. This study examines our efforts to recruit rural medical school applicants. In particular it examines the questions of whether we are attracting sufficient applicants from rural backgrounds and whether there are differences in admission rates.

## Methods

### Sample

All in-state applicants for the 2017, 2018, and 2019 admission cycles were included in the analyses (n = 2791). There were 350 applications (112 in each of 2017 and 2018, and 126 in 2019) excluded because they were either incomplete or withdrawn. Both first-time and re-applicants were included in the sample. Applicants are permitted to reapply three times following their initial application (Saguil and Kellerman, 2014).

### Data and Methods

This descriptive analysis used application data from the School of Medicine at the University of North Carolina-Chapel Hill.

The UNC SOM admissions data contain variables collected by the Association of American Medical Schools' (AAMC's) American Medical College Application Service® (AMCAS®), the centralized application service used by most allopathic medical schools in the United States.

In addition to AMCAS application data, we used annual certified population estimates from the State Demographer's Office at the NC Office of State Budget and Management. Rural status was assigned based on the applicant's permanent address and was defined using the August 2017 Federal Office of Management and Budget (OMB) Standards for Delineating Metropolitan, Micropolitan, and non-Core

Based Statistical Areas. Metropolitan counties were considered “urban” and all other counties were considered “rural.” Using this definition, NC had 54 rural counties during the study period.

We used data from the American Community Survey to define a pool of potential applicants based on the number of college-educated 18-34-year-olds in each county. While there is no age limit for applicants, the majority (98.0%,  $n = 2734/2791$ ) of all UNC SOM applicants during the study period were between the ages of 18 and 34. Limiting the population by age allowed us to better estimate the potential applicant pool.

Descriptive statistics and bivariate analyses were conducted in Stata version 14. This study was approved by the UNC-Chapel Hill Office of the University Registrar, which is required to approve access to student records for research purposes. The study was reviewed by the UNC-Chapel Hill Office of Human Research Ethics and received an Internal Review Board exemption under the secondary data exemption category.

## Results

Although (21.7%,  $n = 2.2$  million) of North Carolinians live in rural areas, the proportion of potential medical school applicants in rural areas is smaller, largely limited to college-educated 18-34-year-olds in each county. Figure 1 shows that roughly 10.9% of NC’s population of college-educated 18-34-year-olds live in rural NC counties (US Census Bureau, 2018).

Table 1 shows data on UNC medical school applicant characteristics by urban versus rural home address. Roughly half of the rural (50%,  $n = 130$ ) and urban applicants (50%,  $n = 1,268$ ) were interviewed, and roughly one in five applicants from each group (21%,  $n = 54$ ; 20%,  $n = 498$ ) were offered admission. The proportion of admitted applicants from rural NC (9.8%,  $n = 54/552$ ) was similar to the proportion of all applicants from rural NC (9.2%,  $n = 257/2,791$ ), and was close to the proportion of the total population of potential applicants in rural NC (10.9%,  $n = 57/127524,104/10,300,000$ ). Had an additional 6 applicants applied each year, the proportion of rural applicants would have aligned with the potential rural applicant pool ( $257 + 18 = 275$  or 9.8% of 2791).

Table 1

Characteristics of Rural vs. Urban UNC School of Medicine Applicants from North Carolina Who Applied, Received an Interview, and Were Offered Admission, 2017–2019 Application Cycles

	Applied		Interviewed				Admitted					
	Rural		Urban		Rural		Urban		Rural		Urban	
	#	%	#	%	#	%	#	%	#	%	#	%
Total	257		2534		130		1268		54		498	
<i>Application Cycle</i>												
2017	92	36%	796	31%	44	34%	416	33%	18	33%	127	26%
2018	84	33%	872	34%	42	32%	421	33%	14	26%	179	36%
2019	81	32%	866	34%	44	34%	431	34%	22	41%	192	39%
Rural Birth County	78	30%	96	4%	45	35%	49	4%	22	41%	19	4%
Source: Sheps Center for Health Services Research with applicant data from the School of Medicine at the University of North Carolina-Chapel Hill for the 2016–2017, 2017–2018, and 2018–2019 admissions cycles.												

The rural and urban in-state applicant pools had similar proportions of women (51%, n = 131; 51%, n = 1,282) and reapplicants (30%, n = 77; 30%, n = 764). A greater proportion of rural applicants reported a rural birth county 30% (n = 78), than did urban applicants 4% (n = 96). Compared to rural applicants, a larger proportion of urban applicants were in the highest quintile of Medical College Admission Test (MCAT) scores (12%, n = 30 vs. 17%, n = 426). Conversely, a higher proportion of rural applicants had science and math grade point average above the median (54%, n = 139, vs. 49%, n = 1,234).

## Discussion

Our findings indicate UNC SOM applicants from rural backgrounds is proportional to potential applicant pool living in the state's rural counties and are admitted in proportion to their peers from non-rural backgrounds. Students from rural backgrounds applying to UNC SOM (9.2%) is close to parity with the potential applicant pool in rural counties; 10.9% of NC's population of college educated 18-34-year-olds, the potential medical school applicant pool, live in a rural county.

The proportional representation likely represents the success of outreach programs that UNC SOM has pursued over the past decade. A recent study noted the importance of pipeline programs by rural students as helpful in breaking their habitus (Hughes, 2018). UNC SOM established an Office of Rural Initiatives (UNC School of Medicine, n.d.) that supports students during medical school and provides innovative pathway programs into medical school. The Office of Rural Initiatives conducts county-wide outreach programs in rural counties across the state to with high school students. The Office has also worked to

expand the spots in UNC's Science Enrichment Preparation (S.E.P.) Program and the Medical Education Development (MED) Program for students from rural NC, in order to expand the number of rural students in pipeline programs.

The proportion of admitted applicants from rural NC (9.8%) was similar to the proportion of all applicants from rural NC (9.3%). This proportional representation reflects the deliberate attempts by the admission's office to reach out to rural applications. It also represents the admission committee's shift to a more holistic approach to admissions.

The answer to the questions posed in this paper has important implication for other institutions. We have added to the body of evidence that confirms the results of prior studies that rural applicants are equally likely or more likely to be admitted (Longo et al., 2005; Shipman et al., 2019) but emphasizes the need for more effective pathway programs that encourage more applicants from rural backgrounds. It is a measure of success that students from rural backgrounds are admitted at rates comparable to their peers from urban backgrounds. Additionally, the proportion of applicants from rural backgrounds aligns with the potential rural applicant pool is a measure of success. However, it is insufficient to care for the more than one in five North Carolinians living in a rural county. Like many of our peer institutions we must think of further innovative ways to increase the pool of physicians serving rural communities. Shipman and colleagues (2019) noted that "four times the number of rural medical students would be required for these students to be representative to rural representation in the overall US population" (p. 2017).

Additional efforts are needed to expand the pool of rural medical school applicants, including increasing the number of college-educated young people in rural communities. Enhancing pathway programs in schools and colleges is needed to overcome educational and socioeconomic challenges faced by some students in rural areas. The state has such programs in the NC Area Health Education Centers (AHEC) Scholars program. Building innovative partnerships, including conditional acceptance program with community colleges that serve these communities, is one solution that appears promising (Saguil and Kellerman, 2014).

But as Anderson et al (2009) point out, students often become interested in health careers at age 15 or younger, and parents and grandparents, teachers, and close associates stimulated their aspirations, with teachers being the most influential. The theory of habitus explains why some may never pursue this interest (Bourdieu, 1977). However, pipeline programs that reach back into high schools may influence students' habitus (Glaesser and Cooper, 2014). The UNC SOM is building these pipelines. For example, the Family Medicine Summer Academy is a three-day immersive experience for high school students from rural and underserved areas of the state. The students receive an all-expense paid experience at UNC-Chapel Hill, participating in hands-on workshops, and receiving lectures about the path to medical school. They are then linked with a mentor who meets with them quarterly to provide guidance. Payment reforms that allow sustainable practices in rural areas are likely another vital component to building the workforce to narrow health disparities in rural areas.

We must also consider recruiting urban students to build the rural physician workforce. Relying only on students from rural backgrounds may be insufficient to meet the significant workforce needs in rural communities. UNC training medical students in high functioning rural teaching practices can role model the joy and rewards of working in rural communities for students not from rural backgrounds. Longitudinally integrated curricula seem to be particularly effective (Quinn et al., 2011). Immersion programs, such as the Kenan Rural Program, help students envision careers in rural settings. Similarly, UNC SOM's Fully Integrated Readiness for Service (FIRST) program offers students mentorship support during medical school. FIRST students complete medical school in three years and match to a primary care residency program in North Carolina. Medical students who go on to residency training in the state have a much higher probability of remaining in practice after graduation (Bacon et al., 2016).

## Limitations

Home address county data may not accurately capture the rural identity of UNC SOM applicants. High school county is a better predictor of rural affinity than birth county or home address county, but was not available in the data (Brooks et al., 2002; Wendling et al., 2019). Rural county was defined using Federal OMB county-based statistical area classifications, but a more expansive definition of rural might have affected study results. Rurality is a continuum (Bennett et al., 2019), and the "rural" definition used in this analysis may be more restrictive than the one used by the admissions committee. UNC SOM has several rural-focused medical education initiatives and has noted in multiple public fora that the school seeks applicants with "a rural heart" (Gala et al., 2018; Hudson, 2016; Reeder, 2015), suggesting that there is also a qualitative notion of rurality being considered by the committee that we were unable to assess in the dataset used for this study.

Another limitation is that this study investigates a single institution. Although we described pipeline programs designed for our state, other medical schools have incorporated immersion programs and other pipeline programs to address these concerns.

## Conclusion

It is important for schools to examine their recruitment and admissions processes to ensure that admitted students reflect the realistic applicant pool in rural communities. At UNC SOM we have done this and uncovered no obvious weaknesses but have realized that doing this alone is likely not sufficient. At UNC SOM we are working actively to enlarge the "potential applicant pool" through innovative pathway programs reaching back to high school as well as curricular innovations to attract students who are not from rural backgrounds. These same lessons can be applied to enlarging the workforce for other marginalized and underrepresented communities.

## Abbreviations

AAMC

American Association of Medical Colleges  
AHEC  
Area Health Education Centers  
AMCAS  
American Medical College Application Service  
FIRST  
Fully Integrated Readiness for Service  
MED  
Medical Education Development  
MCAT  
Medical College Admission Test  
NC  
North Carolina  
OMB  
Office of Management and Budget  
UNC SOM  
University of North Carolina School of Medicine

## Declarations

**Ethics approval and consent to participate:** Exempted by Institutional Review Board

**Consent to publish:** All authors consent to publish

**Availability of data and materials:** The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

The authors do not have any financial or non-financial competing interests

**Authors' Contributions:** All authors contributed in substantial ways in the design, analysis, writing, and editing of this manuscript

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## Figures

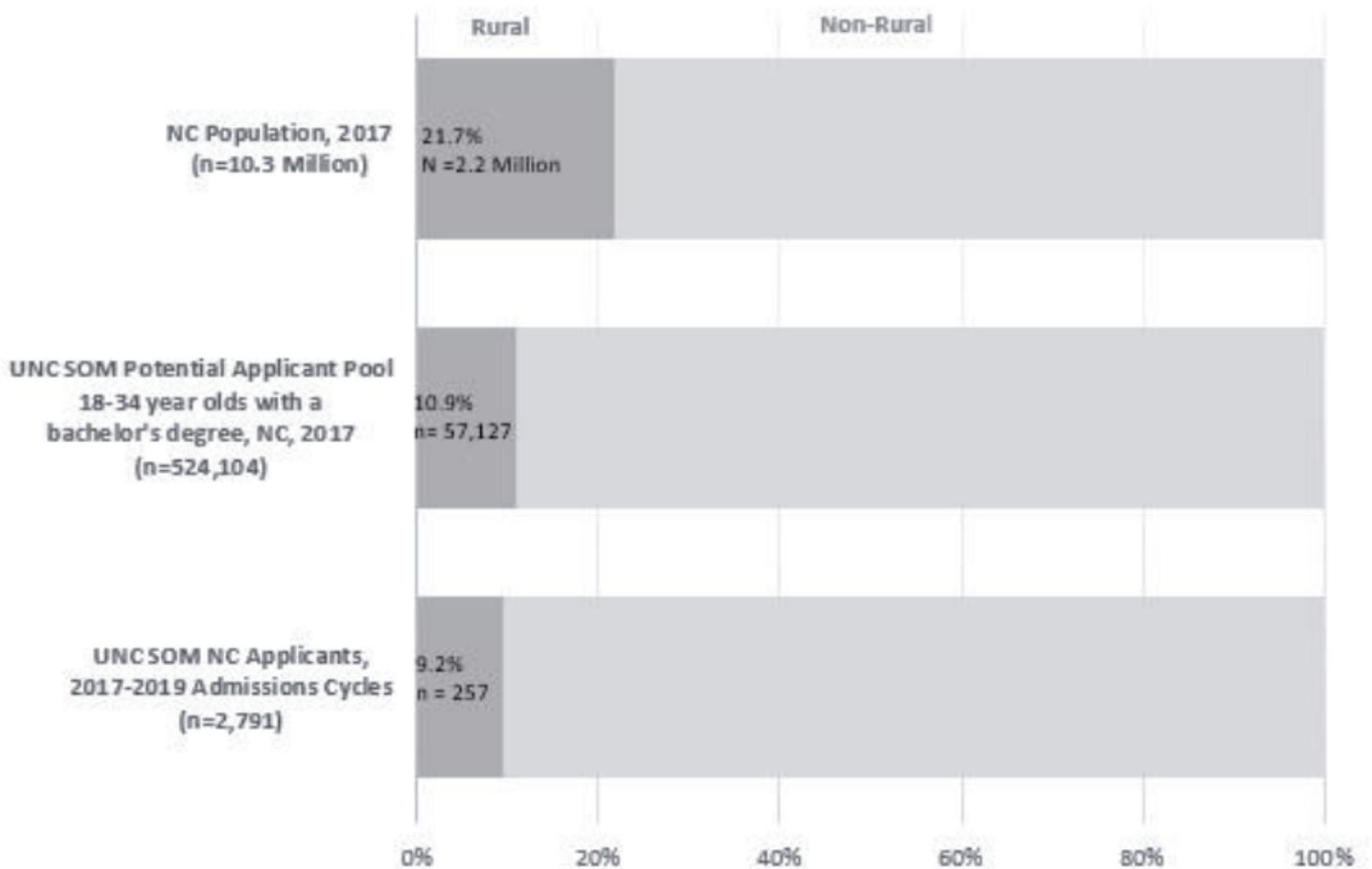


Figure 1

Rurality of NC's Population, Potential UNC SOM Applicant Pool, and UNC SOM Applicants Source: Sheps Center for Health Services Research with applicant data from the School of Medicine at the University of North Carolina-Chapel Hill for the 2016-2017, 2017-2018, and 2018-2019 admissions cycles. July 2017 Certified Current Population Estimates from the NC Office of State Budget and Management. Data on educational attainment by county is from the U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates.