

Legislative Commission on the Interdisciplinary Primary Care Workforce

September 24, 2020 2:00-4:00pm – Zoom Conference

Call in information:

Join Zoom Meeting

<https://nh-dhhs.zoom.us/j/93854387300?pwd=Mk5sL20vVVRjMWU5VFICTEptOWR0QT09>

Meeting ID: 938 5438 7300

Passcode: 080068

By phone: 1-646-558-8656

Dial *6 to mute or unmute if you connect by phone

Agenda

- 2:00 - 2:10 **Read Emergency Order #12 Checklist and Take Roll Call Attendance**
- 2:10 – 2:20 **Meeting schedule for next year/H1B Rural Workforce Grant**
– Alisa Druzba
- 2:20 - 3:10 **Rural Medical Student Matriculation** - Scott Shipman, MD, MPH, Director of Clinical Innovations and Director of Primary Care Affairs at the Association of American Medical Colleges (AAMC)
- 3:10 – 3:40 **Hospital Systems Update** – Paula Minnehan, Senior Vice President, State Government Relations, New Hampshire Hospital Association
- 3:40 - 3:55 **Legislative Update** – Rep. Polly Campion
- 3:55 - 4:00 **Adjourn**

Next meeting: Thursday October 22, 2:00-4:00pm

State of New Hampshire
COMMISSION ON PRIMARY CARE WORKFORCE ISSUES

DATE: September 24, 2020

TIME: 2:00 – 4:00pm

LOCATION: Zoom Conferencing

Meeting Notes

TO: Members of the Commission and Guests

FROM: Danielle Weiss

MEETING DATE: September 24, 2020

Members of the Commission:

Rep. Polly Champion, NH House of Representatives

Mary Bidgood-Wilson, ARNP – Chair

Alisa Druzba, Administrator, Rural Health and Primary Care Section – Vice-Chair

Stephanie Pagliuca, Director, Bi-State Primary Care Association

Don Kolisch, MD, Geisel Medical School

Jeanne Ryer, NH Citizens Health Initiative

Scott Shipman, MD, Director, Primary Care Affairs and Workforce Analysis, AAMC

Bill Gunn, NH Mental Health Coalition

Tom Manion, CEO, New London Hospital

Pamela Dinapoli, NH Nurses Association

Dianne Castrucci, NH Alcohol and Drug Abuse Counselors Association

Laurie Harding, Upper Valley Community Nursing Project

Guests:

Danielle Weiss, Health Professions Data Center Manager, Rural Health and Primary Care

Paula Smith, SNH AHEC

Paula Minnehan, NH Hospital Association

Geoff Vercauteren, Director of Workforce Development, Catholic Medical Center

Catrina Watson, NH Medical Society

Peter Mason, Geisel School of Medicine, IDN region 1

Phil Heywood, Executive Director, Northeast Osteopathic Medical Education Network, UNE

Priscilla Marsicovetere, Franklin Pierce PA Program

Lindy Keller, Behavioral Health

Katrina DeShaney, PA, teaching at Franklin Pierce

Meeting Discussion:

2:00 - 2:10 **Welcome and Introductions/Read EM #12 Checklist and Take Roll Call** – Mary Bidgood-Wilson, ARNP – Chair

2:10 – 2:20 **Meeting schedule for next year/H1B Rural Workforce Grant** – Alisa Druzba, Rural Health & Primary Care, NH DHHS

- We meet on 4th Thursday of every month, from 2-4pm
 - o We will take July off instead of August
 - Many have missed July in past
 - In August, we will look at the legislative timeline

- H1B Rural Workforce Grant – DOL
 - o Overview: <https://www.ruralhealthinfo.org/funding/5054>
 - o Alisa hosted an information session call as the NH SORH Director
 - o H1B is a visa status focused on bringing in workforce we don't have enough of, medium to highly skilled
 - o NH SORH will assist with definition of rural, HPSAs, other layers of application and points to get
 - o Possible applicants – PCA, health systems, non-profits, points awarded if have done that type of work
 - Bi-state is exploring

2:20 - 3:10 **Rural Medical Student Matriculation** - Scott Shipman, MD, MPH, Director of Clinical Innovations and Director of Primary Care Affairs at the Association of American Medical Colleges (AAMC)

Refer to article and presentation attachments, “The Decline in Rural Medical Students.”

3:10 – 3:40 **Hospital Systems Update** – Paula Minnehan, Senior Vice President, State Government Relations, New Hampshire Hospital Association

- A substantial shift to telemedicine
 - o Trying to adjust and meet needs of providers and patients
 - How much is patient driven v system?
 - Provider driven to an extent because providers need physical touch in some of the exams
 - Some patients wish for in-person too so it's mixed

3:40 - 3:55 **Legislative Update** – Rep. Polly Campion

Refer to the presentation “2020 Legislative Update.”

3:55 - 4:00 **Adjourn**

Next meeting: Thursday October 22, 2:00-4:00pm

The Decline In Rural Medical Students: A Growing Gap In Geographic Diversity Threatens The Rural Physician Workforce

Scott A. Shipman, MD, MPH

Andrea Wendling, MD

Karen C. Jones, MApStat

Iris Kovar-Gough, MA, MLIS

Janis M. Orlowski, MD

Julie Phillips, MD

HealthAffairs

Published: December 2019

Background

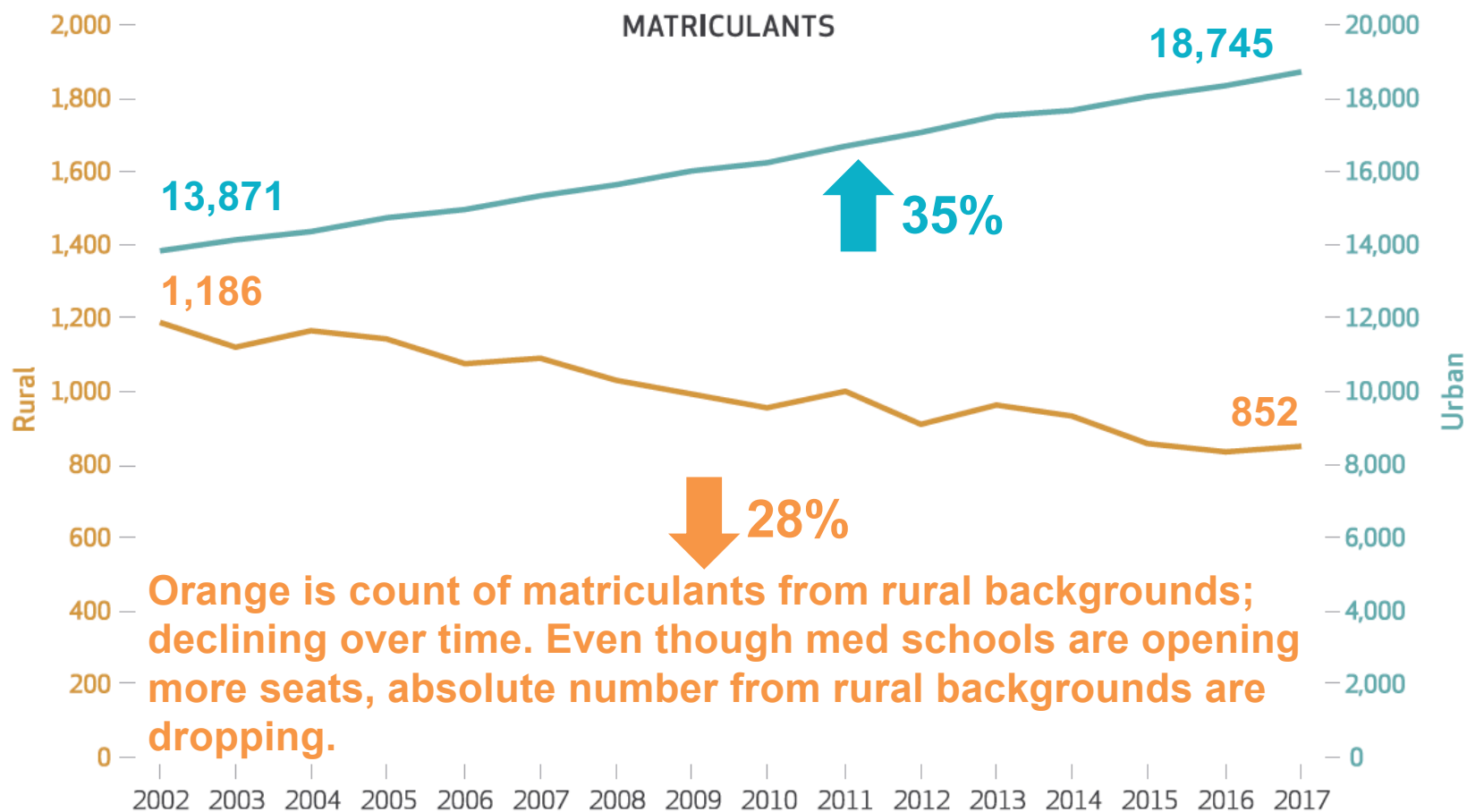
- **Rural physician shortages are a longstanding problem, with significant implications for access to care for rural communities and maldistribution**
- **Rural background is the strongest predictor of interest in rural practice and subsequent practice in a rural setting**
- **Medical schools have expanded enrollment by >30% since 2002**
- **Will this expansion provide an answer to longstanding workforce needs?
This is what the article is trying to answer; in short, no.**

Key methods

- Examined trends in rural and urban applicants and matriculants to all US MD-granting medical schools from 2002-2017
- Rural background defined using county of birth or high school graduation, based on Rural-Urban Continuum Codes (Rural codes 6 – 9)
- Explored the independent effect of rural background on likelihood of admission to medical school, for underrepresented racial/ ethnic minorities in medicine (URM) and non-URM applicants

EXHIBIT 3

Matriculants to medical school for academic years beginning 2002-17, by rural or urban background



SOURCE Authors' analysis of data from the American Medical College Application Service for 2002-03 through 2017-18. **NOTE** Rural or urban background could not be ascertained for 2.2 percent of the matriculants included in the study.

EXHIBIT 4

Likelihood ratios for acceptance to medical school for academic years beginning 2002–17, by selected variables

Variable	Likelihood ratio	95% CI
Sex (ref: male)		
Female	1.17	(1.17, 1.18)
MCAT score (ref: quintile 1 [lowest])		
Quintile 2	2.98	(2.93, 3.03)
Quintile 3	4.85	(4.78, 4.93)
Quintile 4	6.33	(6.23, 6.43)
Quintile 5 (highest)	7.32	(7.20, 7.44)
Grade point average (GPA) (ref: median or below)		
Above median	1.69	(1.68, 1.70)
Urban/rural and URM/non-URM (ref: urban non-URM)		
Rural non-URM	1.13	(1.11, 1.14)
Rural URM	1.79	(1.72, 1.86)
Urban URM	1.70	(1.69, 1.72)
Highest parental education (ref: less than bachelor's degree)		
Bachelor's degree	0.97	(0.96, 0.98)
More than bachelor's degree but less than doctorate	1.07	(1.06, 1.08)
Doctorate or higher	1.07	(1.06, 1.08)

Regression analysis, controlled for factors we see: gender, MCAT score, GPA, and parental education

non-URM = non-underrepresented racial minority

Analysis found favoring rural and ethnic backgrounds

Why the decrease in rural med students?

- **18% decrease in number of rural applicants** (while urban applicants increased by 59%)
- Rural applicants appear to be **less competitive for admission**, given medical school admissions' priorities (% of rural applicants admitted dropped during study period)

Net drop is greater than 18%

Less competitive; what they're looking for in rural applicants disadvantages rural applicants compared to others even though being rural gives points

Conclusions

To overcome the ‘geographic diversity gap,’ need to **QUADRUPLE** the number of medical students from rural backgrounds

Minority rural populations are growing & have disproportionate chronic disease burden, yet **only 1 in 200** entering medical students are rural students from an underrepresented minority group

Need policies to **strengthen rural pipeline** into medicine, or be prepared to target a worsening rural workforce shortage through other means

2020 Legislative Update

Rep. Polly Champion



Timeline

- Session Disrupted – March 13, 2020
 - Majority of House bills had been heard; no Senate bills had “crossed over”
 - Remote Senate hearings over summer for omnibus bills
 - House and Senate convened in June for concurrence on bills from other body
 - House and Senate convened September 16 - to vote on Governor Sununu’s vetoes
-

What bills became law?

Thirty-nine bills signed into law

Interdisciplinary Primary Care Workforce

- Commission on the Interdisciplinary Primary Care Workforce (HB 1249 - Originally SB 567)
 - Updated name
 - Extended life – 2024
 - Updated duties – telehealth, workforce retention

Prescription Drug Legislation

- Prescription drug access and affordability – HB 1280
 - Importation of drugs from Canada (SB 685)
 - Reduce and cap cost of insulin (HB 1280)
 - Drug affordability board (SB 687)
 - Insurance coverage for epi-pens (HB 1281)
 - Timely prior authorization (SB 691)
 - Requires notice of introduction of new high-cost drugs (HB 703)

Telehealth (HB 1623)

- Ensures reimbursement parity, expands site of service, and enables all providers to provide services through telehealth for Medicaid and commercial health coverage.
- Enables access to medication assisted treatment (MAT) in specific settings by means of telehealth services.
- Amends the Physicians and Surgeons Practice Act to expand the definition of telemedicine.
- Amends the relevant practice acts to expand the definition of telemedicine, which is increasingly important during this pandemic.
- Enables the use of telehealth services to deliver Medicaid reimbursed services to schools.

Healthcare Omnibus (HB 1639)

- Requires DHHS to amend the income standard used for eligibility for the "in and out" medical assistance policy.
- Requires DHHS to develop a state health assessment and a state health improvement plan and establishes the state health assessment and state health improvement plan advisory council to assist the commissioner with the plan.
- Requires that boards regulating practitioners prescribing, administering, and dispensing controlled substances adopt rules for management of chronic pain.
- Requires insurance coverage for long-term antibiotic therapy for tick-borne illness.
- Clarifies the licensure of physician assistants and provides for biennial renewal of physician assistant licenses.
- Establishes the New Hampshire drug overdose fatality review commission.
- Establishes an opioid abatement trust fund..
- Authorizes pharmacists to administer a COVID-19 vaccine if one is available.

- Requires the superintendent of a county correctional facility to provide a prisoner with medication-assisted treatment for substance use disorders where medically appropriate.
- Clarifies the patients' bill of rights.
- Prohibits a physician, surgeon, nurse, physician assistant, APRN, or student undertaking a course of professional instruction from performing certain examinations on an anesthetized or unconscious patient without consent unless such examination meets certain specific criteria.

Miscellaneous

- Funded Health Professionals Program (HB 1520)
- Broadband Access (HB 1111)
 - allows municipalities to determine locations within the municipality unserved by a broadband provider
 - provides for the establishment of communication districts.
- Funded Nashua Safe Stations (HB 1230)
- Tick-borne Illness Commission Established (HB 490)
- Omnibus Education Bill (HB 1558)
 - Requires “Return to learning” policy for head injury

Long-term Care (HB 578)

- Established committee to study safety of residents and employees
- Eliminated cost caps for community based care relative to nursing home care
- Requires HHS to adopt rules for reimbursement of costs of training LNAs

Healthcare Bills Vetoed 2020

- Dental coverage for Medicaid recipients, came out of 2019 commission (HB 250)
- Independent review of nursing homes and long term care needs (HB 1246)
- Transparency in Reporting Healthcare Associated Infections (HB 1246)
- Enabling vulnerable adults to seek a protective order (HB 1660)

Vetoed

Twenty-two bills vetoed in 2020

Vetoed

- Paid Family Leave
- Minimum Wage Increase
- Increased access to mental health care and SUD treatment (SB 5)
- Firearm safety legislation (ERPO)
- Dental benefit for Medicaid beneficiaries
- Protective order for vulnerable adults



VOTE

By Scott A. Shipman, Andrea Wendling, Karen C. Jones, Iris Kovar-Gough, Janis M. Orlowski, and Julie Phillips

DOI: 10.1377/hlthaff.2019.00924
HEALTH AFFAIRS 38,
NO. 12 (2019): 2011–2018
©2019 Project HOPE—
The People-to-People Health
Foundation, Inc.

The Decline In Rural Medical Students: A Growing Gap In Geographic Diversity Threatens The Rural Physician Workforce

ABSTRACT Growing up in a rural setting is a strong predictor of future rural practice for physicians. This study reports on the fifteen-year decline in the number of rural medical students, culminating in rural students' representing less than 5 percent of all incoming medical students in 2017. Furthermore, students from underrepresented racial/ethnic minority groups in medicine (URM) with rural backgrounds made up less than 0.5 percent of new medical students in 2017. Both URM and non-URM students with rural backgrounds are substantially and increasingly underrepresented in medical school. If the number of rural students entering medical school were to become proportional to the share of rural residents in the US population, the number would have to quadruple. To date, medical schools' efforts to recognize and value a rural background have been insufficient to stem the decline in the number of rural medical students. Policy makers and other stakeholders should recognize the exacerbated risk to rural access created by this trend. Efforts to reinforce the rural pipeline into medicine warrant further investment and ongoing evaluation.

As of the 2010 census nearly sixty million people lived in rural communities in the US, and almost one in five people in the US were rural residents.¹ Although popular media often highlight compelling narratives of a specific region or rural community in decline and seek to make broad generalizations about rural depopulation, the overall size of the US rural population has been stable for several decades.

Rural populations have higher rates of many chronic illnesses and have not enjoyed the same gains in life expectancy that urban populations have in recent decades.^{2,3} People living in rural communities are less likely to receive recommended preventive services than their urban counterparts are.⁴ Compared to urban hospitals, rural hospitals have higher rates of maternal

morbidity⁵ and infant mortality.⁶ Recent losses of obstetric services have also disproportionately affected rural counties that have high percentages of minority women of reproductive age.⁷

More than 15 percent of rural residents are members of racial/ethnic minority groups, and this percentage is increasing.^{8,9} Research has demonstrated that members of rural minority groups—particularly black, Hispanic, and American Indian/Alaska Native populations—face higher chronic disease burdens and worse access to care than non-Hispanic white rural residents.¹⁰

Physician shortages in rural settings, which are magnified by the disproportionate health care needs of rural communities, have been a widespread and perennial challenge. Only 11 percent of the physician workforce practices in rural communities,¹¹ and as of 2019 over 62 percent of all federally designated primary care Health Pro-

Scott A. Shipman (sshipman@aamc.org) is director of primary care initiatives and clinical innovations at the Association of American Medical Colleges (AAMC), in Washington, D.C.

Andrea Wendling is director of rural health in the Department of Family Medicine, Michigan State University, in Boyne City.

Karen C. Jones, now retired, was a research analyst in the Workforce Studies unit, AAMC, when this work was performed.

Iris Kovar-Gough is a research librarian at the Michigan State University College of Human Medicine, in East Lansing.

Janis M. Orlowski is chief health care officer at the AAMC.

Julie Phillips is assistant dean for student career and professional development in the Office of Student Affairs and Services, Michigan State University; and an associate professor at the Sparrow-Michigan State University Family Medicine Residency Program, in Lansing.

professional Shortage Areas were in rural areas.¹² This gap in access to physician care is likely to be an important contributor to increased rural morbidity and mortality.

The recent significant growth in the number of new US medical schools and the increase in size of existing ones presents an opportunity to train a workforce better suited to meeting the needs of rural communities. Unfortunately, that growth has been accompanied by a decrease in the percentage of students who report an interest in practicing in small towns and rural communities.¹³ This decline in interest in rural practice may be because medical education, most of which is based in metropolitan areas, disproportionately exposes future physicians to medical practice in urban and suburban settings. It may also be driven by a paucity of incoming students who have experienced a rural lifestyle, including being familiar with the distinct cultural aspects of small-town life. This is important because multiple studies have demonstrated that students from rural backgrounds are much more likely to decide to practice in rural settings.^{14–20}

Research has similarly shown that physicians from racial/ethnic minority groups that are traditionally underrepresented in medicine (URM) are more likely to practice in underserved communities and provide care to minority populations.^{21,22} Important research and coordinated efforts have focused attention on strengthening the pipeline of URM students and on the importance of racial/ethnic diversity in medical school and the physician workforce.^{23–25}

Despite widespread recognition of the need for more rural physicians, we are aware of no longitudinal national studies that have examined the proportion of rural students who apply, are admitted, and matriculate to medical school. Given the importance of ensuring equitable access to care for rural populations, we sought to better understand these trends over time for MD-granting schools in the US.

Study Data And Methods

DATA SOURCES AND ANALYTIC APPROACH We obtained data on applicants and matriculants from the American Medical College Application Service for the period 2002–03 through 2017–18 (hereafter, academic years are referenced by the first year, so the two year ranges above are presented as 2002 and 2017). Only people who were born in the US or were permanent residents who graduated from high school in the US were included in our sample. Because of data limitations, people from any of the US territories could not have a rural status assigned to them, except those who were born or graduated from high

school in a county in one of the fifty states or in the District of Columbia.

This study was approved by the American Institute of Research Institutional Review Board.

We used the 2013 Rural-Urban Continuum Codes²⁶ of each applicant's birth and high school graduation counties to identify rural background. Applicants were considered to be from a rural background if either their birth or high school graduation county had a code of 6 (meaning that the county had an urban population of 2,500–19,999 and was adjacent to a metropolitan area) through 9 (meaning that the county was completely rural or had an urban population of fewer than 2,500 people and was not adjacent to a metropolitan area). All others were considered to be from an urban background. Applicants who applied in multiple years were counted in each year, and the data include the outcome for each year (accepted or not accepted)—with the exception that only one accepted record was included for those who deferred admission.

We examined the trend in numbers of applicants and matriculants from rural and urban backgrounds and compared rural and urban counterparts on key demographic and academic factors, including age, sex, URM status, Medical College Admission Test (MCAT) score quintile, grade point average (GPA), and highest parental education.

We used the MCAT score quintile rather than the actual score because of changes in MCAT scoring over the study period. The Association of American Medical Colleges administers the MCAT. The version used from 1991 to January 2015 (MCAT91) was revised, and a new version was implemented after January 2015 (MCAT15). These versions are scored differently and on different scales. Thus, for all applicants who took the MCAT91, we calculated score quintiles and assigned them to a quintile group, and we applied the same method to assign applicants who took the MCAT15 to a quintile group. This approach allowed us to combine data from individuals throughout the study period. For each person in a given year, we assigned a quintile based on the most recent MCAT score.

We then used a logistic regression model to examine the likelihood of acceptance to any medical school for rural and urban applicants, controlling for age, sex, MCAT quintile, GPA, URM status, highest parental education, and application year (additional information on the details of the regression model is available from the authors on request). For applicants who were accepted, we also employed a logistic regression model to evaluate the likelihood of matriculating for rural and urban students, controlling for the same demographic and academic characteris-

tics. Poisson regression was used to obtain the relative risk estimates for each of these models.

LIMITATIONS The study had important limitations that should be acknowledged. First, rural identity and experience can be assessed in a variety of ways and are unlikely to be fully captured by the traditional measures used in medical school applications and in this study.²⁷ A more in-depth, qualitative assessment of rural background might have yielded different results, but using such an assessment would be impractical in a longitudinal national study such as this one. We anticipate that the trends identified in this study would be likely to be correlated over time with other measures of rural background.

Second, we were unable to consider in our regression analyses all applicant characteristics that might have influenced acceptance to medical school.

Third, the study focused on students at MD-granting medical schools who had rural backgrounds, using metrics consistent with those

available to medical school admission committees. Doctor of osteopathy students, students at international medical schools, and non-physician clinicians were beyond the scope of this analysis, though each of these groups contributes meaningfully to the rural workforce. Like MD-granting schools, osteopathic medical schools and training programs for physician assistants and nurse practitioners have grown dramatically in number as well as in aggregate size of graduating classes. Future research should explore the degree to which the trends reported here are generalizable across these different clinician groups.

Study Results

There were 618,856 applicant records and 281,845 matriculants who satisfied our inclusion criteria. Compared to urban applicants, rural applicants were more likely to be men and were slightly older (exhibit 1). While rural appli-

EXHIBIT 1

Applicants and matriculants to US MD-granting medical schools for academic years beginning 2002-17, by rural or urban background

	Applicants				Matriculants			
	Rural		Urban		Rural		Urban	
	No.	%	No.	%	No.	%	No.	%
Sex								
Female	16,786	46.0	273,190	48.0	7,229	44.9	125,262	48.3
Male	19,679	54.0	295,397	52.0	8,877	55.1	134,003	51.7
Underrepresented in medicine ^a								
Yes	3,866	10.7	91,751	16.6	1,433	9.0	38,185	15.1
No	32,303	89.3	462,447	83.4	14,556	91.0	215,406	84.9
MCAT score (quintile)								
1 (lowest)	10,501	29.1	119,479	21.3	1,307	8.3	12,481	4.9
2	8,287	23.0	102,369	18.3	3,269	20.7	30,612	12.1
3	8,429	23.4	134,361	24.0	4,808	30.4	65,790	26.0
4	5,496	15.2	113,841	20.3	3,806	24.0	73,613	29.1
5 (highest)	3,380	9.4	90,117	16.1	2,641	16.7	70,335	27.8
Grade point average								
Median or below	16,489	45.3	291,681	51.4	4,290	26.7	84,182	32.5
Above median	19,902	54.7	275,747	48.6	11,799	73.3	174,745	67.5
Highest parental education								
Less than bachelor's degree	9,307	26.4	102,174	18.6	3,503	22.3	35,588	14.1
Bachelor's degree	9,869	28.0	134,529	24.4	4,404	28.1	56,158	22.2
More than bachelor's degree but less than doctorate	8,376	23.8	146,783	26.7	4,011	25.6	70,607	27.9
Doctorate or higher	7,642	21.7	167,298	30.4	3,757	24.0	90,403	35.8
Mean age, years (SD)	24.8 (3.8)	— ^b	24.4 (3.3)	— ^b	24.2 (3.0)	— ^b	23.9 (2.7)	— ^b

SOURCE Authors' analysis of data from the American Medical College Application Service for 2002-03 through 2017-18. **NOTES** To identify rural background consistently, the sample was limited to people born in or permanent residents of the US who graduated from high school in the US. Applicants who applied in multiple years were counted in each year, and the data include the outcome for each year (accepted or not accepted)—with the exception that only one accepted record was included for people who deferred admission. Total counts may vary across some variables because of occasional missing data within student applications. MCAT is Medical College Admission Test. SD is standard deviation. ^aBlack, Hispanic, American Indian/Alaska Native, or Pacific Islander. ^bNot applicable.

cants had higher GPAs, their MCAT scores were lower than those of their urban peers, and, on average, they came from households with lower parental educational attainment, as measured by postsecondary and professional degrees. There was no noticeable change in the relative performance of rural and nonrural applicants on the MCAT or in terms of cumulative GPA over time (data available from the authors). Only 10.7 percent of rural applicants were from groups considered to be underrepresented in medicine.

The number of applicants from a rural background declined 18 percent during the study period, from 2,479 in 2002 to 2,032 in 2017 (exhibit 2). During this same period the number of urban applicants increased by 59 percent, from 27,023 to 42,894.

The number of matriculants from a rural background also declined during this period, from 1,186 in 2002 to 852 in 2017 (exhibit 3)—a decrease of 28 percent. Concurrently, the number of urban matriculants increased by 35 percent, from 13,871 to 18,745. Students from rural backgrounds made up only 4.3 percent of the total incoming medical student body in both 2016 and 2017—a smaller share than that in any previous years in the study period.

Among urban matriculants, both non-URM and URM groups increased in number over the study period, by 3,008 students, to 14,756

(a 25 percent increase), and by 1,541 students, to 3,436 (an 81 percent increase), respectively.

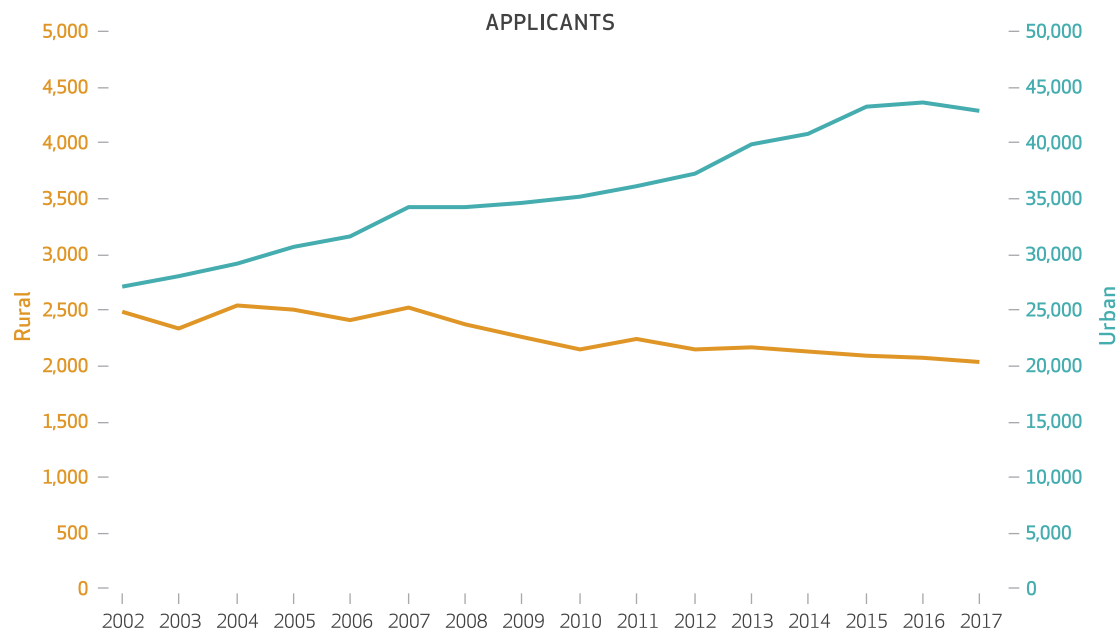
In contrast, there was a decline among rural non-URM matriculants, from 1,090 in 2002 to 748 in 2017 (a 31 percent decrease). In the same period, rural URM matriculants experienced limited growth overall (an 11.5 percent increase), though only 97 students in this category entered medical school in 2017. In that academic year 1 in 8 incoming rural students was from a URM group. Rural URM students accounted for just 1 in 200 incoming medical students overall.

Regression analyses examined the likelihood of acceptance for rural URM, rural non-URM, and urban URM students, compared to urban non-URM applicants (the most prevalent group). Results showed that rural URM, urban URM, and rural non-URM applicants had an increased likelihood of acceptance to medical school: 79 percent, 70 percent, and 13 percent higher, respectively (exhibit 4).

We used the same covariates in a regression model to estimate the likelihood of matriculation for rural accepted applicants, compared to their urban counterparts. Given the very high probability of matriculating for any admitted student (over 98 percent), there was no difference between rural and urban applicants in terms of the probability of matriculation once they were accepted.

EXHIBIT 2

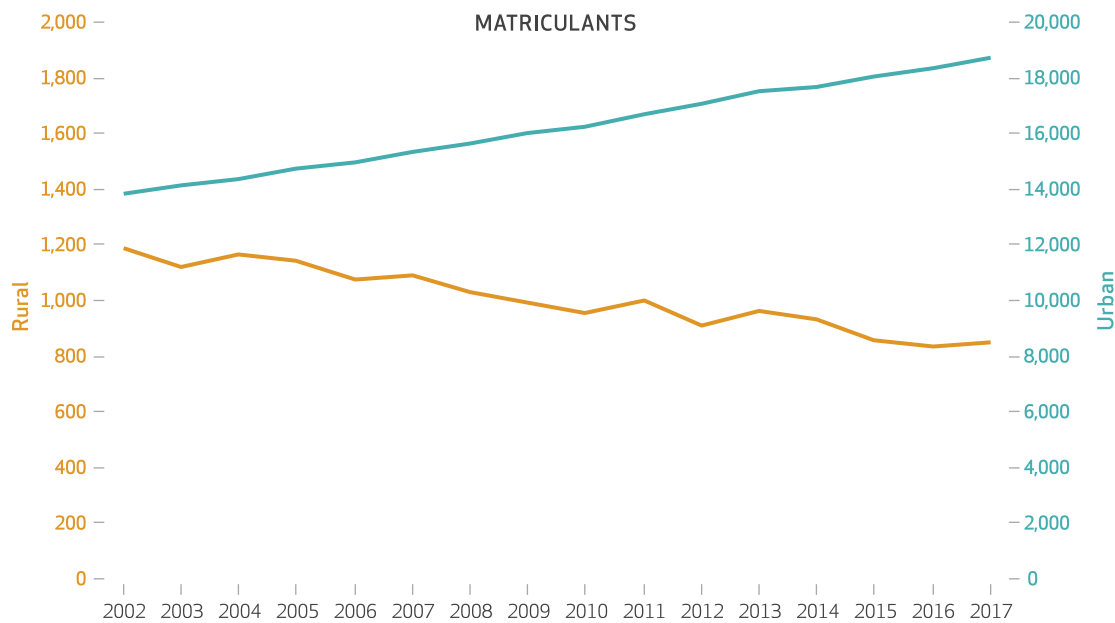
Applicants to medical school for academic years beginning 2002–17, by rural or urban background



SOURCE Authors' analysis of data from the American Medical College Application Service, for 2002–03 through 2017–18. **NOTE** Rural or urban background could not be ascertained for 2.2 percent of the applicants included in the study.

EXHIBIT 3

Matriculants to medical school for academic years beginning 2002-17, by rural or urban background



SOURCE Authors' analysis of data from the American Medical College Application Service for 2002-03 through 2017-18. **NOTE** Rural or urban background could not be ascertained for 2.2 percent of the matriculants included in the study.

Discussion

Physician workforce shortages in rural and remote areas of the US are persistent and growing. The shortage of rural physicians contributes to

rural-urban health disparities, including a widening disparity in life expectancy.^{2,3} To date, health care workforce policy solutions have been inadequate to meet the challenge. Given that a

EXHIBIT 4

Likelihood ratios for acceptance to medical school for academic years beginning 2002-17, by selected variables

Variable	Likelihood ratio	95% CI
Sex (ref: male)		
Female	1.17	(1.17, 1.18)
MCAT score (ref: quintile 1 [lowest])		
Quintile 2	2.98	(2.93, 3.03)
Quintile 3	4.85	(4.78, 4.93)
Quintile 4	6.33	(6.23, 6.43)
Quintile 5 (highest)	7.32	(7.20, 7.44)
Grade point average (GPA) (ref: median or below)		
Above median	1.69	(1.68, 1.70)
Urban/rural and URM/non-URM (ref: urban non-URM)		
Rural non-URM	1.13	(1.11, 1.14)
Rural URM	1.79	(1.72, 1.86)
Urban URM	1.70	(1.69, 1.72)
Highest parental education (ref: less than bachelor's degree)		
Bachelor's degree	0.97	(0.96, 0.98)
More than bachelor's degree but less than doctorate	1.02	(1.01, 1.02)
Doctorate or higher	1.07	(1.06, 1.08)

SOURCE Authors' analysis of data from the American Medical College Application Service for 2002-03 through 2017-18. **NOTES** The exhibit shows the risk ratios and associated confidence intervals obtained from a Poisson regression with a robust error variance estimate (N = 563,871). Analyses controlled for age, sex, Medical College Admission Test (MCAT) score, GPA, parental education, and application year. CI is confidence interval. URM is underrepresented racial/ethnic minority group in medicine.

rural background is a strong predictor of practicing in a rural community, policies and programs that support the rural pipeline into medicine may warrant prioritization. Understanding recent trends in rural student application, admission, and matriculation is an important precursor to considering policies and later evaluating them to determine which are the most effective.

The declining pool of rural applicants suggests that more needs to be done to help rural children and young adults identify a pathway to becoming a physician. Support for premedical pipeline programs for people from rural backgrounds may help bridge gaps in achievement and readiness for medical school, helping rural students overcome educational disparities that prevent them from seeking careers in medicine.²⁸ For example, pipeline programs can make high school students aware of medical career opportunities and help them prepare college applications. At the college level, these programs can offer MCAT preparation courses, medical school application assistance, financial aid education, and opportunities to shadow physicians.^{29–32} As a group, rural students' parents have lower levels of educational attainment, and they may be less likely to have the means to independently provide these opportunities and resources to their children.³³

In many states Area Health Education Centers have been an important source of programming for the health care pipeline. However, the centers receive highly variable support at the state level, and federal funding is continually in jeopardy. Providing secure and robust funding for the centers—along with requirements for evidence-based programming that both meaningfully exposes rural youth to relatable mentors and provides longitudinal support to promote confidence and competitiveness for the pursuit of a career in medicine—could be an effective way to build on existing infrastructure. Research would be needed to ensure that these funds led to desired outcomes.

This study suggests that on the whole, medical schools' admission processes recognize and value applicant diversity, including rural background and underrepresented racial/ethnic groups. Transparency about recent trends may aid medical schools' future efforts. Over a period in which there has been incremental progress in representation of URM students in medical school (although significant additional progress is needed), there has been a 28 percent decrease in the number of matriculants from rural backgrounds. This decline has occurred even in the context of substantial medical school expansion. Many new medical schools appear to focus on

While overall gains have been made in terms of minority students entering medicine, they have largely excluded rural minorities.

traditionally underrepresented students, including traditional URM groups and those from households with lower socioeconomic status.¹³ Having new and established schools consider rural background as an important component of a diverse student body and tracking the schools' effectiveness in increasing diversity in this area could have a significant impact on the dearth of rural students, thereby supporting the future adequacy of the rural workforce.³⁴

The fact that the matriculant pool has dropped more extensively than the applicant pool over time suggests that there is a growing mismatch between the qualifications of rural applicants and medical schools' admissions priorities. The somewhat higher likelihood that non-URM applicants with rural backgrounds will be accepted, compared to their urban peers—after other factors that are independently influential in gaining admission are controlled for—is not enough to offset this discrepancy. There has not been a noticeable change in rural applicants' qualifications, compared to those of urban applicants: Rural applicants perform less well on the MCAT, although their GPAs are higher (data available from the authors). However, a number of other factors that influence admission decisions were not included in our analyses. For instance, studies have shown that rural applicants tend to perform worse than urban applicants on multiple mini-interviews.³⁵ Other experiential factors valued by medical schools, such as research experience, may also be less prevalent among rural applicants. These factors require further study and potential interventions to ensure that rural applicants are competitive. Also valuable would be more widespread adoption of holistic admissions practices that value a broad set of life and leadership experiences among applicants when assembling a student body that reflects a diverse set of skills and backgrounds.^{36,37}

Describing the composition of rural communities using national aggregate data masks significant heterogeneity in the racial/ethnic makeup across different rural regions of the country. This study highlighted the deeper disparities that exist at the intersection of rural and underrepresented racial/ethnic groups in medicine. In particular, while overall gains have been made in terms of minority students entering medicine, those gains have largely excluded rural minorities.

Efforts to increase the number of medical students from rural backgrounds can be augmented by additional efforts during training. For instance, rural medical school programs that are housed in rural communities have demonstrated success in attracting rural applicants and graduating students who eventually practice in rural communities.²⁰ These models allow students to learn in rural health care systems, helping students build skills necessary for rural practice. By placing medical school campuses in rural communities, these institutions also provide academic role models in medicine to high school and college students in these communities.

Creating rural campuses in proximity to high-need rural populations is limited by cost and complexity. Exposure to rural life and rural practice can occur more readily, if not as comprehensively, through clinical rotations in rural settings, especially longitudinal integrated clerkships.^{38,39} Offering rural training experiences and other opportunities to interact with rural physicians should be a priority for medical

schools that care about the problem of insufficient rural capacity in their region or across the nation.

Conclusion

From a workforce pipeline perspective, this study has made it clear that students from a rural background are an increasingly underrepresented group in medical school. Four times the number of rural medical students would be required for these students to be proportional to rural representation in the overall US population. Given that trends over time have been in the opposite direction, we believe that efforts to enhance the rural pipeline warrant consideration.

Policy makers and other stakeholders should recognize the growing risk created by the decline in medical students with rural backgrounds, particularly in the absence of robust options to enhance the rural workforce. Rural background is strongly associated with service to rural and underserved populations, as well as entry into primary care.^{19,20} These represent two of the most persistent areas of unmet health care workforce needs in the United States. Thus, rural background should be included in any consideration of adequate medical student diversity, along with a recognition that both URM and non-URM rural students are increasingly underrepresented relative to the nation's population. While solutions will require sustained, multifaceted efforts, increased awareness and ongoing measurement of this disparity are crucial first steps. ■

NOTES

- 1 Census Bureau, Geography Program. 2010 census urban and rural classification and urban area criteria [Internet]. Washington (DC): Census Bureau; 2010. Table, Urban, urbanized area, urban cluster, and rural population, 2010 and 2000; [cited 2019 Oct 31]. Available from: <https://www.census.gov/programs-surveys/geography/guidance/geo-areas/urban-rural/2010-urban-rural.html>
- 2 Dwyer-Lindgren L, Bertozzi-Villa A, Stubbs RW, Morozoff C, Mackenbach JP, van Lenthe FJ, et al. Inequalities in life expectancy among US counties, 1980 to 2014: temporal trends and key drivers. *JAMA Intern Med.* 2017;177(7):1003–11.
- 3 Singh GK, Siahpush M. Widening rural-urban disparities in life expectancy, U.S., 1969–2009. *Am J Prev Med.* 2014;46(2):e19–29.
- 4 Casey MM, Thiede Call K, Klingner JM. Are rural residents less likely to obtain recommended preventive healthcare services? *Am J Prev Med.* 2001;21(3):182–8.
- 5 Kozhimannil KB, Thao V, Hung P, Tilden E, Caughey AB, Snowden JM. Association between hospital birth volume and maternal morbidity among low-risk pregnancies in rural, urban, and teaching hospitals in the United States. *Am J Perinatol.* 2016;33(6):590–9.
- 6 Ely DM, Driscoll AK, Mathews TJ. Infant mortality rates in rural and urban areas in the United States, 2014 [Internet]. Hyattsville (MD): National Center for Health Statistics; 2017 Sep [cited 2019 Oct 16]. (NCHS Data Brief No. 285). Available from: <https://www.cdc.gov/nchs/data/databriefs/db285.pdf>
- 7 Hung P, Henning-Smith CE, Casey MM, Kozhimannil KB. Access to obstetric services in rural counties still declining, with 9 percent losing services, 2004–14. *Health Aff (Millwood).* 2017;36(9):1663–71.
- 8 Housing Assistance Council. Race and ethnicity in rural America [Internet]. Washington (DC): The Council; 2012 Apr [cited 2019 Oct 16]. (Rural Research Brief). Available from: http://www.ruralhome.org/storage/research_notes/rnr-race-and-ethnicity-web.pdf
- 9 According to an analysis by Kathleen Weessies, geosciences librarian at the Michigan State University Libraries, in East Lansing, using American FactFinder. Census Bureau. 2010 census, summary file 1 [Internet]. Washington (DC): Census Bureau; [page last reviewed 2014 Jan 31]. Table GCT-P3, Race and Hispanic or Latino: 2010—United States—urban/rural and inside/outside metropolitan and micropolitan area; [cited 2019 Oct 31]. Available from: https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_SF1_GCTP3.US26&prodType=table
- 10 James CV, Moonesinghe R, Wilson-Frederick SM, Hall JE, Penman-Aguilar A, Bouye K. Racial/ethnic health disparities among rural adults—United States, 2012–2015. *MMWR Surveill Summ.* 2017;

- 66(23):1-9.
- 11 Fordyce MA, Chen FM, Doescher MP, Hart LG. 2005 physician supply and distribution in rural areas of the United States [Internet]. Seattle (WA): University of Washington Rural Health Research Center; 2007 Nov [cited 2019 Oct 16]. (Final Report No. 116). Available from: <https://depts.washington.edu/uwrhrc/uploads/RHRC%20FR116%20Fordyce.pdf>
 - 12 Health Resources and Services Administration. Designated Health Professional Shortage Areas statistics, fourth quarter of fiscal year 2019, designated HPSA quarterly summary [Internet]. Rockville (MD): HRSA, Bureau of Health Workforce; 2019 Sep. Table 2. Health professional shortage areas: rural/non-rural classification as of December 31, 2018; [cited 2019 Oct 31]. Available for download from: <https://data.hrsa.gov/Default/GenerateHPSAQuarterlyReport>
 - 13 Shipman SA, Jones KC, Erikson CE, Sandberg SF. Exploring the workforce implications of a decade of medical school expansion: variations in medical school growth and changes in student characteristics and career plans. *Acad Med.* 2013; 88(12):1904-12.
 - 14 Hughes S, Zweifler J, Schafer S, Smith MA, Athwal S, Blossom HJ. High school census tract information predicts practice in rural and minority communities. *J Rural Health.* 2005;21(3):228-32.
 - 15 Johnson GE, Wright FC, Foster K. The impact of rural outreach programs on medical students' future rural intentions and working locations: a systematic review. *BMC Med Educ.* 2018;18(1):196.
 - 16 MacQueen IT, Maggard-Gibbons M, Capra G, Raaen L, Ulloa JG, Shekelle PG, et al. Recruiting rural healthcare providers today: a systematic review of training program success and determinants of geographic choices. *J Gen Intern Med.* 2018;33(2):191-9.
 - 17 Owen JA, Conaway MR, Bailey BA, Hayden GF. Predicting rural practice using different definitions to classify medical school applicants as having a rural upbringing. *J Rural Health.* 2007;23(2):133-40.
 - 18 Pretorius RW, Lichter MI, Okazaki G, Sellick JA Jr. Where do they come from and where do they go: implications of geographic origins of medical students. *Acad Med.* 2010; 85(10 Suppl):S17-20.
 - 19 Rabinowitz HK, Diamond JJ, Markham FW, Santana AJ. The relationship between entering medical students' backgrounds and career plans and their rural practice outcomes three decades later. *Acad Med.* 2012;87(4):493-7.
 - 20 Wendling AL, Phillips J, Short W, Fahey C, Mavis B. Thirty years training rural physicians: outcomes from the Michigan State University College of Human Medicine rural physician program. *Acad Med.* 2016;91(1):113-9.
 - 21 Xierali IM, Nivet MA, Fair MA. Analyzing physician workforce racial and ethnic composition associations: physician specialties (part I) [Internet]. Washington (DC): Association of American Medical Colleges; 2014 Aug [cited 2019 Oct 16]. (Analysis in Brief Vol. 14, No. 8). Available from: <https://www.aamc.org/system/files/reports/1/aug2014aibpart1.pdf>
 - 22 Xierali IM, Nivet MA. The racial and ethnic composition and distribution of primary care physicians. *J Health Care Poor Underserved.* 2018;29(1): 556-70.
 - 23 Association of American Medical Colleges. Diversity and inclusion [Internet]. Washington (DC): AAMC; c 2019 [cited 2019 Oct 16]. Available from: <https://www.aamc.org/initiatives/diversity/>
 - 24 Cohen JJ, Gabriel BA, Terrell C. The case for diversity in the health care workforce. *Health Aff (Millwood).* 2002;21(5):90-102.
 - 25 Gardner O. Pipeline programs and system reform: a path to improving health equity [Internet]. Washington (DC): Association of American Medical Colleges; 2018 Jul 5 [cited 2019 Oct 16]. Available from: <https://www.aamc.org/news-insights/pipeline-programs-and-system-reform-path-improving-health-equity>
 - 26 Economic Research Service. Rural-Urban Continuum Codes [Internet]. Washington (DC): Department of Agriculture; [last updated 2019 Aug 20; cited 2019 Oct 16]. Available from: <https://www.ers.usda.gov/data-products/rural-urban-continuum-codes/>
 - 27 Wendling AL, Shipman SA, Jones K, Kovar-Gough I, Phillips J. Defining rural: the predictive value of medical school applicants' rural characteristics on intent to practice in a rural community. *Acad Med.* 2019 Jul 30. [Epub ahead of print].
 - 28 Smith SG, Nsiah-Kumi PA, Jones PR, Pamies RJ. Pipeline programs in the health professions, part I: preserving diversity and reducing health disparities. *J Natl Med Assoc.* 2009; 101(9):836-40, 845-51.
 - 29 Crump WJ, Fricker RS, Flick KF, Gerwe-Wickham K, Greenwell K, Willen KL. A rural pathways program for high school students: reinforcing a sense of place. *Fam Med.* 2014; 46(9):713-7.
 - 30 Rackley BP, Wheat JR, Moore CE, Garner RG, Harrell BW. The Southern Rural Access Program and Alabama's Rural Health Leaders Pipeline: a partnership to develop needed minority health care professionals. *J Rural Health.* 2003; 19(5, Suppl):354-60.
 - 31 Wheat JR, Brandon JE, Leeper JD, Jackson JR, Boulware DW. Rural Health Leaders Pipeline, 1990-2005: case study of a second-generation rural medical education program. *J Agromedicine.* 2007;12(4):51-61.
 - 32 Wheat JR, Leeper JD, Murphy S, Brandon JE, Jackson JR. Educating physicians for rural America: validating successes and identifying remaining challenges with the Rural Medical Scholars Program. *J Rural Health.* 2018;34(Suppl 1):s65-74.
 - 33 Torpey E. Measuring the value of education [Internet]. Washington (DC): Bureau of Labor Statistics; 2018 Apr [cited 2019 Oct 17]. Available from: https://www.bls.gov/careeroutlook/2018/data-on-display/education-pays.htm?view_full
 - 34 Rabinowitz HK, Diamond JJ, Markham FW, Wortman JR. Medical school programs to increase the rural physician supply: a systematic review and projected impact of widespread replication. *Acad Med.* 2008;83(3):235-43.
 - 35 Raghavan M, Martin BD, Burnett M, Aoki F, Christensen H, Mackalski B, et al. Multiple mini-interview scores of medical school applicants with and without rural attributes. *Rural Remote Health.* 2013;13(2):2362.
 - 36 Association of American Medical Colleges. Advancing Holistic Review Initiative [Internet]. Washington (DC): AAMC; 2014 Sep [cited 2019 Oct 17]. Available from: <https://www.aamc.org/download/358384/data/holisticreviewbrochure.pdf>
 - 37 Schmude ML. Holistic review: fad or future of medical school admissions? Harvard Macy Community Blog [blog on the Internet]. 2017 Oct 24 [cited 2019 Oct 17]. Available from: <https://www.harvardmacy.org/index.php/hmi/holistic-review-fad-or-future-of-medical-school-admissions>
 - 38 Zink T, Center B, Finstad D, Boulger JG, Repesh LA, Westra R, et al. Efforts to graduate more primary care physicians and physicians who will practice in rural areas: examining outcomes from the University of Minnesota-Duluth and the Rural Physician Associate Program. *Acad Med.* 2010;85(4):599-604.
 - 39 Walters L, Greenhill J, Richards J, Ward H, Campbell N, Ash J, et al. Outcomes of longitudinal integrated clinical placements for students, clinicians, and society. *Med Educ.* 2012;46(11):1028-41.