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Expectations Exceeded: The Success of a Regional Medical Campus in Producing Rural Physicians

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Abstract

The University of Kansas School of Medicine (KUSM) established a small rural regional medical campus (RMC) in Salina, Kansas in 2011 to address the rural physician workforce shortage in Kansas. Fourteen classes (114 students) have matriculated at this RMC since 2011, and ten classes (81 students) have graduated. A retrospective, longitudinal cohort study of the hometowns of the 114 matriculants, postgraduate training of 81graduates, and eventual practice locations of 47 graduates that have completed postgraduate training was done. Ninety-two (81.4%) of the matriculants were from rural communities, and 47.4% of matriculants received Kansas Medical Student (KMS) loans to help defray medical school costs. Fifty-five of 81 graduates (67.9%) entered primary care residencies (48.1% in family medicine, 7.4% in pediatrics, and 12.3% in internal medicine). Forty-seven Salina RMC graduates have completed postgraduate training and are now in practice; 39 (83.0%) are practicing in Kansas, 36 (76.6%) are serving rural Kansas, and thirty (63.8%) are practicing primary care in rural Kansas. The Salina RMC has been extremely successful in attracting rural students, graduating students who select primary care residencies, and witnessing graduates return to rural Kansas to practice. This study supports the findings of other investigators: students with rural backgrounds, training in a rural environment, and postgraduate training in family medicine were associated with eventually choosing rural practice. The KMS loan program requiring graduates to eventually serve in an underserved county in Kansas for loan forgiveness was undoubtedly another major factor contributing to rural Kansas practice. The KUSM RMC program in Salina may be worthy of replication by other medical schools attempting to increase the rural physician workforce.

Conflicts of interests: None

Ethical approval: This study was approved by the Kansas University Medical Center IRB (#0010470)

Introduction

Access to medical care can be a critical issue for the 46 million rural residents of the United States and 43% of the world's population residing in rural areas.[1,2] This problem has been attributable to a decreased physician workforce in rural regions.[3] Increasing the number of primary care physicians that choose to practice in rural areas is an objective shared by many states in the U.S. and by other nations. The issues of rural workforce shortages and potential solutions to the problem have been the subject of numerous studies.[4-17] A variety of factors have been associated with increasing the supply and retention of rural primary care physicians. Rabinowitz and colleagues at Jefferson Medical College in Philadelphia, Pennsylvania have been among the leaders developing rural medical school programs to increase the supply of rural primary care physicians.[4,7,11,17] Matriculating students at Jefferson Medical College reported three factors associated with choosing a career in rural practice: growing up in a rural community, planning rural practice, and planning family medicine.[11] In a policy paper published in The Bulletin of World Health Organizations in 2010, Strasser and Neusy identified similar factors associated with rural practice: rural

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background, educational experiences in rural settings, and targeted postgraduate training for rural practice.[9] The authors also spotlighted the efforts of Northern Ontario School of Medicine, a rural, community-based medical school, to recruit students from local underserved rural areas who will eventually serve the northern Ontario region. In follow-up studies, two-thirds of family medicine residency graduates from northern Ontario were practicing in the northern Ontario region or similar rural areas.[18]

Multiple investigators in the U.S. and Canada have highlighted these determinants. In a study from British Columbia, Canada, Lovato and coworkers found that choosing to practice family medicine in a rural area was associated with a rural background and training at a regional medical campus.[16] Wendling and colleagues at the Michigan State University College of Human Medicine analyzed thirty years of data from their Rural Physician Program and found that by targeting rurally interested students, students with a primary care focus, and providing substantial medical school training within a rural region increased the number of students choosing rural physician careers.[14] Crump and coworkers at the University of Louisville School of Medicine reiterated the findings of others: factors associated with an increase in rural physician workforce included rural upbringing, family medicine residency, and a rural medical school campus.[13] Interestingly, in a separate article Crump and coauthors warned against "urban disruption" of rural students admitted to an urban campus; rurally-inclined students matriculating on an urban medical school campus may decide that big city practice is preferable to a rural career.[6] In summary, the factors that appear most important in predicting an eventual career in rural primary care include: (1) an individual student's rural background, (2) medical school training in a rural environment, and (3) family medicine residency.

The lack of an optimal physician workforce in rural Kansas has been well documented.[19] Of the 105 counties in Kansas, 97 have medically underserved areas or populations defined as "too few primary care providers, high infant mortality, high poverty and/or high elderly population."[20] The Kansas physician workforce situation reflects the physician maldistribution seen nationally: 20% of the population lives in rural areas, while only 10% of all physicians practice in those areas.[3]

In 2011 the University of Kansas School of Medicine (KUSM) established a regional medical campus (RMC) in Salina, an urbanized regional community of 46,889 residents (2020 U.S. Census) in the predominately rural region of north central Kansas. The Salina campus (KUSM-Salina) complemented the main campus in metropolitan Kansas City, Kansas (KUSM-KC) and the established urban RMC in Wichita, Kansas (KUSM-Wichita). KUSM-Salina was created in an attempt address the shortage of physicians in rural Kansas by training medical students in a rural community, hoping that many would choose to stay and practice in rural communities. Accepting eight students each year, the University of Kansas School of Medicine-Salina (KUSM-Salina) campus is among the smallest full four-year allopathic medical school campuses in North America. Students receive many of their foundational science lectures through live videoconferencing from the main campus and work one-on-one with local physicians during their clinical years. The inception and educational delivery program of this RMC have been previously reported.[21]

The aspirational goal of KUSM-Salina was to attract students from rural areas, train them in a rural community, introduce them to the rewards and challenges of rural practice, and hope that at least 50% of them would elect to enter primary care residency programs and return to Kansas, especially rural Kansas, to practice. Additionally, it was hoped that many of the students who elected a medical discipline other than traditional primary care (family medicine, general internal medicine and pediatrics) would choose to practice in rural Kansas. This is a report of first fourteen years of effort by KUSM to address the rural workforce problem in Kansas. Results are compared with other medical school programs designed to increase the rural physician workforce. It updates a previous report regarding KUSM-Salina RMC's early success in training physicians for Kansas, especially rural Kansas.[22]

Method

This was a retrospective, longitudinal cohort study. KUSM-Salina medical student hometown data was collected by the campus dean's office upon student

matriculation. Hometown populations were determined as of the 2020 Census or later. The U. S. Census Bureau defines an urbanized area as 50,000 people or more; any area that is not urban is rural.[23]

The residency training matches of all KUSM-Salina graduates for the years 2015 through 2024 was provided to the campus dean's office by the National Resident Matching Program (NRMP). Residency match data for all KUSM graduates for the years 2015-2024 was obtained from the Office of Student Affairs on the main campus in Kansas City, Kansas. Residency match data for U.S. allopathic medical school seniors for the years 2015-2024 was obtained from yearly published NRMP reports.[24-33] Practice location for each KUSM-Salina graduate who completed residency training, and in some cases additional fellowship training, was determined by personal communication with the physician and/or through an internet search.

Data was analyzed using descriptive statistics.

This study was approved by the Kansas University Medical Center IRB (Study # 0010470).

Results

Since opening in 2011, 114 students have matriculated on the KUSM-Salina campus (13 classes of eight and one class of ten). One student withdrew from medical school after the first year. Of the 114 KUSM-Salina matriculants from 2011 to 2024, 106 (93.0%) were from Kansas and 92 (81.4%) were raised in rural communities with a population no greater than Salina (46,889 residents). Fifty-four (47.4%) of the first 114 matriculants received Kansas Medical Student (KMS) loans, which paid for tuition and provided students with a monthly living stipend. Students who received KMS loan support and subsequently completed a residency in family medicine, internal medicine, pediatrics, emergency medicine, or psychiatry (recently added to list of qualifying residencies) and then practiced in one of 101 designated medically underserved counties in Kansas for four years had their total loan amount forgiven.[34] Students who did not comply with these requirements were required to repay the loan plus substantial interest. It should be noted that internal medicine and pediatric subspecialists do not qualify for loan forgiveness, even if they practice in medically underserved counties in Kansas.

As of 2024, there have been eighty-one KUSM-Salina graduates. Fifty-five graduates (67.9%) have entered primary care residencies (family medicine, internal medicine, medicine primary, or pediatrics) (**Table 1**). The remaining twenty-six graduates matched in various other residency programs: five in orthopedic surgery, five in general surgery, four in OB-GYN, four in emergency medicine, two in pathology, two in radiology, one in psychiatry, and one in ENT. The authors realize that many internal medicine residents and some pediatric residents may enter subspecialty fellowships after residency and should not be considered primary care physicians. Nevertheless, primary care internists and pediatricians should not be discounted. NRMP match data for the KUSM-KC and KUSM-Wichita campuses for the same years are noted on **Table 2**, and match data for all U.S. allopathic graduates for 2015-2024 is noted in **Table 3**.The KUSM-Salina primary care residency match rate of nearly 68% compares to 43.0% (830 of 1932 graduates) for the combined Kansas City and Wichita campuses and 40.3% (72,195 of 178,964 graduates) for United States allopathic students for the same ten-year period.

CLASS	Family Medicine	Pediatrics	Internal Medicine	All Other Matches	TOTAL
2015	3	2	1	2	8
2016	3	1	1	3	8
2017	4	0	1*	0	5
2018	6	0	2	2	10
2019	3	0	2	3	8
2020	8	0	0	0	8
2021	3	1	2	2	8
2022	0	0	0	8	8
2023	4	1	0	3	8
2024	5	1	1	3	10
TOTAL (%)	39 (48.1)	6 (7.4)	10 (12.3)	26 (32.1)	81

Table 1. NRMP match data for KUSM-Salina 2015-2024. *Internal medicine primary.

Class	Family Medicine	Pediatrics + Med/Peds	Internal Medicine, Categorical	Internal Medicine, Primary	All Other Matches	TOTAL
2015	28	17	26	0	106	177
2016	32	16	32	1	112	193
2017	27	22	30	1	113	193
2018	44	20	33	0	101	198
2019	28	13	33	0	123	197
2020	32	25	32	0	108	197
2021	41	16	35	0	110	202
2022	33	20	39	0	101	193
2023	28	14	42	0	110	194
2024	24	12	36	0	116	188
TOTAL	317	175	338	2	1100	1932
(%)	(16.4)	(9.1)	(17.4)	(0.001)	(56.9)	

Table 2. NRMP match data for KUSM-KC and KUSM-Wichita 2015-2024 graduates

Year	Family Medicine	Pediatrics	Med/Peds	Internal Medicine, categorical	Internal Medicine, primary	All Other Matches	TOTAL
2015	1,405	1,889	319	3,317	206	9,796	16,932
2016	1,467	1,829	329	3,291	210	9,931	17,057
2017	1,513	1,849	291	3,245	224	10,358	17,480
2018	1,628	1,746	306	3,195	229	10,636	17,740
2019	1,601	1,715	315	3,366	239	10,527	17,763
2020	1,543	1,731	316	3,496	247	10,775	18,108
2021	1,606	1,749	313	3,523	251	10,993	18,435
2022	1,541	1,661	332	3,491	248	11,213	18,486
2023	1,484	1,635	397	3,592	246	11,234	18,498
2024	1,521	1,464	339	3,595	240	11,306	18,465
Total (%)	15,309 (8.6)	17,268 (9.6)	3,167 (1.8)	34,111 (19.1)	2,340 (1.3)	106,769 (59.7)	178,964

Table 3. NRMP residency matches for PGY1 positions for 2015-2024 (U.S. seniors, allopathic medical school graduates)[23-32]

Thirty-nine (48.1%) KUSM-Salina graduates from 2015-2024 matched in family medicine, six (7.4%) in pediatrics, and ten (12.3%) in internal medicine. The Kansas City and Wichita campuses matched 16.4% of graduates in family medicine, 9.1% in pediatrics or med/peds, and 17.5% in categorical internal medicine or primary medicine during this ten-year period. Nationally, 8.6% of U.S. allopathic graduates entered family medicine residencies, 11.4% matched in pediatrics or med/peds residencies, and 20.3% matched in categorical internal medicine or medicine primary residencies for the years 2015-2024.

Forty-seven KUSM-Salina graduates have completed postgraduate training in the discipline of their choice as of June 30, 2024; thirty-nine (83.0%) are practicing in Kansas, thirty-six (76.6%) are practicing in rural Kansas, and thirty (63.8%) are practicing primary care in rural Kansas (twenty-six in family medicine, two in general internal medicine, two in pediatrics). Additionally, two orthopedic surgeons, one urologist, one emergency medicine physician, one OB-GYN, and one pathologist, all of whom graduated from KUSM-Salina, returned to rural Kansas to practice.

Thirty-four of the thirty-six KUSM-Salina graduates (94.4%) now practicing in rural Kanas were raised in rural communities. Two graduates are engaged in primary care practice in rural areas in other states; these two graduates also grew up in rural communities.

Twenty-three of the twenty-four KUSM-Salina graduates who received KMS loans and have completed postgraduate training are now fulfilling their obligation for loan forgiveness by practicing primary care in rural Kansas. The lone graduate not fulfilling the obligation to practice primary care in an underserved area of Kansas is practicing pulmonary/critical care medicine at an academic medical center in another state. It is too early to tell whether any KUSM-Salina graduate will abandon their rural practice once their KMS loan service obligation has been completed.

Discussion

The KUSM-Salina campus has been attractive for students raised in rural communities and has been successful in training physicians who eventually practice in rural communities in Kansas. To date, 76.5% of the Salina rural RMC graduates have returned to rural Kansas to practice and 64% of the KUSM-Salina graduates are primary care physicians in rural Kansas, exceeding the original goal of 50%.

In a review of 1,391 University of Louisville Medical School graduates from 2001 to 2010, Crump and coworkers found that 55% of their rural campus graduates practiced in rural locations, while only 9% of graduates from the main campus practiced in rural locations.[12] Rabinowitz and colleagues noted that graduates of Thomas Jefferson University's Rural Physician Shortage Area Program were 8.5-9.9 times more likely to enter rural family medicine than their peers.[17] Unfortunately, a complete data set detailing practice locations for KUSM-KC and KUSM-Wichita graduates was not available for comparison with KUSM-Salina results.

KUSM-Salina's results also support the conclusions of multiple authors that rural programs increase the chances that a student will choose a family medicine residency.[10,17,35,36] Nearly 50% of KUSM-Salina graduates chose family medicine residencies

compared to 16.4% for the other two KUSM campuses and 8.6%, nationally.

The Salina campus leadership and faculty did not mandate, coerce or cajole medical students to choose a primary care specialty or practice in Kansas. KUSM-Salina's goal was to train a student capable of entering the medical specialty of their choice and stimulate an interest to practice in a rural environment. It is noteworthy that six KUSM-Salina graduates trained in non-primary care specialties have returned to rural Kansas to practice, where their services are needed.

Paying for a medical education is daunting for many students. The average total cost of medical school has been reported to be $235,827.[37] Financial assistance to help defray the cost of a medical education is important for many students. In a systemic review of the literature regarding practice location, Goodfellow et al found that financial incentives, as well as special training programs, were effective in promoting primary care physicians to practice in underserved areas.[15] KUSM-Salina student participation in the KMS loan program undoubtedly was a major factor contributing to choosing a career in rural primary care in Kansas. KUSM-Salina students who received significant financial aid (a forgivable loan) during medical school through this program overwhelmingly abided by the requirement for loan forgiveness to serve in an underserved county in Kansas for the same number of years they received support.

Conclusions

This study provided additional evidence that rural upbringing, rural training, and family medicine residency are critical factors associated with a student's eventual choice to practice primary care in a rural location. Additionally, the financial consequences (loan repayment with substantial added interest) that occur, if recipients of KMS loans choose not to practice primary care in rural Kansas, cannot be ignored as a major factor contributing to a physician's initial choice to abide by their contractual obligation to practice in a medically underserved county in Kansas.

The conclusions of this study are limited by the low numbers of graduates and the inability to directly compare eventual practice locations of graduates of the three KUSM campuses. Nevertheless, KUSM-Salina has been successful in producing primary care physicians for rural Kansas. The economic and medical impact on the communities where the graduates choose to practice can be significant. The addition of one physician to a rural Kansas community can make a big difference. A longer follow-up study will be needed to determine whether the initial success of KUSM-Salina in producing physicians for rural Kansas will translate to long-term success. Will a significant number of rural physicians eventually choose to abandon rural practice?

Expectations that at least 50% of KUSM-Salina graduates eventually practice primary care in rural Kansas have been exceeded. It was also gratifying that students completing postgraduate training in other specialties have elected to return to rural Kansas to practice. States that suffer from serious physician shortages in rural areas may find that the rural RMC approach KUSM has adopted to address this problem is worthy of replication. Establishing a rural RMC, admitting students raised in rural areas, providing educational opportunities which allow students to experience the rewards and challenges of rural medicine, encouraging students to examine primary care residencies, and providing financial incentives for those who choose a career in rural primary care are all worthy of consideration.

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References

1. Dobis EA, Krumel TP, Cromartie J, Conley KL, Sanders A, Ortiz R. Rural America at a Glance, 2021 Edition. USDA, Economic Research Service. (https://www.ers.usda.gov/webdocs/publications/102576/eib-230.pdf.)
2. World Bank Group. Rural Population (% of total). (https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS.)
3. US Government Accountability Office. Physician Workforce: Locations and Types of

Graduate Training Were Largely Unchanged, and Federal Efforts May Not Be Sufficient to Meet Needs. GAO-17-411. US Government Accountability Office; 2017.
4. Rabinowitz HK, Diamond JJ, Markham FW, Paynter NP. Critical factors for designing programs to increase the supply and retention of rural primary care physicians. JAMA 2001;286(9):1041-1048.
5. Laven G, Wilkinson D. Rural doctors and rural backgrounds: how strong is the evidence? A systemic review. Aust J Rural Health 2003;11:277-284.
6. Crump WJ, Barnett D, Fricker S. A sense of place: rural training at a regional medical school campus. J Rural Health 2004;20(1):80-84.
7. Rabinowitz HK, Diamond JJ, Markham FW, Wortman JR. Medical school programs to increase the rural physician supply: a systemic review and projected impact of widespread replication. Acad Med 2008;83(3):235-243.
8. Rourke J. Increasing the number of rural physicians. CMAJ 2008;178(3):322-325.
9. Strasser R, Neusy A. Context counts: training health workers in and for rural and remote areas. Bull World Health Organ 2010;88:777-782.
10. Zink T, Center B, Finstad D, et al. Efforts to graduate more primary care physicians who will practice in rural areas: examining outcomes from the University of Minnesota-Duluth and Rural Physician Associate Program. Acad Med 2010;85(4):599-604.
11. 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):493-604. DOI: 10.1097/ACM.0b013e3182488c06.
12. Crump WJ, Fricker RS, Ziegler C, Wiegman DL, Rowland ML. Rural track training based at a small regional campus: equivalency of training, residency choice, and practice location of graduates. Acad Med 2013;88(8):1122-1128. DOI: 10.1097/ACM.0b013e31829a3df0.
13. Crump WJ, Fricker RS, Ziegler CH, Wiegman DL. Increasing the rural physician workforce: a potential role for small rural medical school campuses. J Rural Health 2016;32:254-259.
14. Wendling AI, 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):113-119. DOI: 10.1097/ACM.0000000000000885.
15. Goodfellow A, Ulloa JG, Dowling PT, et al. Predictors of primary care physician practice location in underserved urban and rural areas in the United States: a systemic literature review. Acad Med 2016;91(9): 1313-1321. DOI: 10.1097/ACM.0000000000001203.
16. Lovato CY, Hsu HCH, Bates J, Casiro O, Towle A, Snadden D. The regional medical campus model and rural family medicine practice in British Columbia: a retrospective longitudinal cohort study. CMAJ Open 2019. DOI:10.9778/cmajo.20180205.
17. Rabinowitz HK, Molley RJ, Markham FW, Love GA. Lessons learned as Thomas Jefferson University's Rural Physician Shortage Area Program (PSAP) approaches the half-century mark. Acad Med 2022;97(9):1264-1267.
18. Heng D, Pong RW, Chan BT, et al. Graduates of northern Ontario family medicine residency programs practice where they train. Can J Rural Med 2007;12:146-152. PMID: 17662174.
19. Greiner KA, Paolo A, Kennedy M, et al. Kansas physician workforce report. The University of Kansas Medical Center and the Kansas Department of Health and Environment Office of Local and Rural Health. Kansas Workforce Advisory Board, Topeka and Kansas City, KS; March 12, 2007.
20. Health Resources and Services Administration. Find Shortage Areas: MUA/P by State and County. (http://muafind.hrsa.gov/index.aspx.)
21. Cathcart-Rake W, Robinson M, Owings S, Kennedy M, Paolo A, Chumley H. The birth of a rural medical school—the University of Kansas School of Medicine-Salina experience. Med Sci Educ 2012;22(4):256-258.
22. Cathcart-Rake W. Producing physicians for rural Kansas; the early success of the University of Kansas School of Medicine-Salina regional medical campus. J Regional Med

Campuses 2020;3(1). DOI: https://doi.org/10.24926/jrmc.v3i1.2314.
23. Ratcliffe M, Burd C, Holder K, Fields A. Defining Rural at the U.S. Census Bureau; American Community Survey and Geography Brief. Issued December 2016. (https://www2.census.gov/geo/pdfs/reference/ua/Defining_Rural.pdf.)
24. National Resident Matching Program. Results and Data; 2015 Main Residency Match; April 2015. (www.nrmp.org.)
25. National Resident Matching Program. Results and Data; 2016 Main Residency Match; April 2016. (www.nrmp.org.)
26. National Resident Matching Program. Results and Data; 2017 Main Residency Match; April 2017. (www.nrmp.org.)
27. National Resident Matching Program. Results and Data; 2018 Main Residency Match; April 2018. (www.nrmp.org.)
28. National Resident Matching Program. Results and Data; 2019 Main Residency Match; April 2019. (www.nrmp.org.)
29. National Resident Matching Program. Results and Data; 2020 Main Residency Match; May 2020. (www.nrmp.org.)
30. National Resident Matching Program. Results and Data; 2021 Main Residency Match; May 2021. (www.nrmp.org.)
31. National Resident Matching Program. Results and Data; 2022 Main Residency Match; May 2022. (www.nrmp.org.)
32. National Resident Matching Program. Results and Data; 2023 Main Residency Match; May 2023. (www.nrmp.org.)
33. National Resident Matching Program. Results and Data; 2024 Main Residency Match; June 2024. (www.nrmp.org.)
34. University of Kansas Medical Center. The Kansas Medical School Student Loan—Primary Care Program. October 2018. (https://www.kumc.edu/documents/sfa/KMSL-Primary Care Information Sheet.pdf.)
35. Liaw W, Cheifetz C, Luangkhot S, Sheridan M, Bazemore A, Phillips RL. Match rates into family medicine among regional medical campus graduates, 2007-2009. JABFM 2012;25(6):894-907
36. Bates J, Grand'Maison P, Banner SR, Lovato CY, Eva KW. Exploring the contributions of combined model medical education campuses to the physician workforce. Acad Med 2021;96(3):409-415. DOI: 10.1097/ACM.0000000000003560.
37. Hansen, Melanie. Average cost of medical school. EducationData.org. January 16, 2024. (https//educationdata.org/average-cost-of-medical-school.)