UNIVERSITY OF NEW ENGLAND

INNOVATION FOR A HEALTHIER PLANET

Senate Committee on Health, Education, Labor and Pensions (HELP)

Hearing Title: Examining Health Care Workforce Shortages: Where do we go from Here?

Thursday, Feb.16, 2023, 10:00 AM
Rm. 430, Dirksen Senate Office Building

James D. Herbert, Ph.D.
President
University of New England

Thank you, Chairman Sanders, Ranking Member Cassidy, and other members of the committee for the opportunity to speak with you today. It's an honor to share some thoughts on strategies for addressing our nation's healthcare workforce crisis.

My name is James Herbert, and I am the president of the University of New England (UNE). UNE is Maine's largest private university, with campuses in Biddeford and Portland Maine and in Tangier Morocco. We are a comprehensive university that houses Maine's only medical school and only physician assistant program, and northern New England's only dental school. We're the largest provider of healthcare professionals to the state of Maine,[1] and we take great pride in being a private university with a public mission.

As you probably know, Maine's population is the oldest in the nation[2] and is tied with Vermont as being the most rural[3] state. Our healthcare workers are also among the oldest in the country, with many practitioners approaching, or even practicing beyond, retirement age.[4] The challenges

---

[1] UNE offers programs in 14 health professions, including osteopathic medicine, dental medicine, pharmacy, physician assistant, nursing, nurse anesthesia, dental hygiene, occupational therapy, physical therapy, social work, nutrition, athletic training, applied exercise science, and public health.

[2]Maine has the highest median age in the U.S.: 44.7 years relative to the national average of 38.8 (US Census Bureau, 2022). At 21.3% Maine also has the highest percentage of citizens over 65 in the U.S. (US Census Bureau, 2019b).

[3]US Census Bureau, 2019b

[4]At 39.3%, Maine ranks first in the nation for the percentage of active physicians who are age 60 or older (AAMC, 2021). In 9 of16 Maine counties, 50% or more of physicians are 55 or older (Skillman & Stover, 2018). Over 50%

we face are in some sense harbingers of what the rest of the country will increasingly confront as our nation ages and as urbanization creates pockets underserved populations in our cities as well as in our vast remote rural areas.

I won't detail the growing shortage of healthcare professionals across our country, as I'm sure you already appreciate the scope of the problem. Rather, I will offer ***six specific strategies*** that I believe can go a long way to addressing the crisis (these are summarized briefly in Appendix A). I will also offer some examples of how we at UNE are attempting to implement each of these strategies. This is not to imply that we've figured out all the best solutions, but rather to provide some specific examples of how higher education can partner productively with the government, business, and nonprofit sectors to move the needle in important ways on this critical problem.

First, and most obviously, ***we must increase the number of doctors, nurses, and other healthcare professionals we educate*** to address our growing population, aging workforce, and many underserved communities. But educating more professionals is not as straightforward as it may seem; we at universities face a number of barriers in doing so. I will briefly touch on the three most important of these challenges.

By far the most important impediment to training more healthcare providers is the availability of clinical training experiences in hospitals and clinics, which has been well documented by the Department of Health and Human Services Health Resources and Services Administration (HRSA).[5] As financial margins have tightened and clinician workloads have increased over the past three decades, healthcare facilities and practicing clinicians have fewer resources and less time to devote to training students.[6] *The single most important thing we can do to increase the number of healthcare providers is to support and expand partnerships between universities and community healthcare settings to develop additional residencies, clerkships, practica, and other training opportunities*. In medicine in particular, the Center for Medicare and Medicaid Services'

---

of Maine's registered nurses are 50 or older (Maine Nursing Action Coalition, Center for Health Affairs NEONI, 2017).

[5] U.S. Congress: Advisory Committee on Interdisciplinary, Community-Based Linkages. (2018).

[6] Benbassat, 2020; Cox & Desai, 2019; Hanna, 2019; Hatfield et al., 2022; Graziano et al., 2018; Konrad et al., 2010; Krehnbrink et al, 2020; de Villiers et al., 2018; Rodriguez, 2013

(CMS) payment system for graduate medical education (GME; i.e., physician residencies) favors academic medical centers, places caps on successful rural residency programs making expansion difficult, and penalizes community hospitals that may have previously partnered with other institutions. In other words, CMS policy is antiquated and makes it very difficult to grow more residency placements.[7]

At UNE, one way we have expanded clinical training opportunities is by working with partners in rural and underserved primary care sites and Federally Qualified Health Centers. One advantage of such placements is that students learn how to deliver compassionate care to Maine's most vulnerable residents, many of whom are uninsured and also navigate chronic physical and mental health conditions. The precepting clinicians in these settings are dedicated to treating underserved patients, sometimes with limited access to specialized professional support.[8] These settings afford students exposure to a broad range of conditions and allow them to perform and assist with a wide variety of procedures.

Clinical training opportunities are not the only infrastructure limitation to producing more healthcare professionals. Cost, both to educational institutions and to students themselves, is also a factor. Standing up new educational facilities, or expanding existing ones, involves considerable start-up costs. One-time governmental support is often needed to supplement institutional investments and philanthropy.[9]

Tuition for many programs is high and can be an impediment for many students, especially those from poor, working class, or even middle-class backgrounds. Contrary to certain narratives, this

[7] CMS policies for GME have established caps on most existing residency programs and although CMS created a somewhat circuitous pathway for rural hospitals to expand beyond their cap, the criteria of the review committees of the Accreditation Council on Graduate Medical Education (ACGME) create significant obstacles to accredited expansion and the creation of new rural residency programs.

[8] Hempel et al., 2015; Lee et al., 2016.

[9] An example of an effective public-private partnership is UNE's establishment of our College of Dental Medicine. Recognizing the region's significant unmet oral healthcare needs and the fact that there was no dental school in all of northern New England, in 2013 we partnered with both federal and state governments, regional industry, non-profits, and philanthropists to establish a dental school. Senator Collins was critical in helping to secure federal support for that project. And the people of Maine passed a $3.5 million bond to support not only creation of the school itself, but also community dental clinics around the state to help them increase their capacity to provide dental care and to take our students on rotation. The school was created with an explicit focus on addressing underserved populations.

is not because greedy universities are trying to get rich on the backs of students.[10] Rather, the costs to educate students have risen considerably. For example, the cost of training third- and fourth-year medical students has increased five-fold since 2017. Scholarship and loan repayment programs can make healthcare education accessible to those who would otherwise find it out of reach. The National Health Service Corps is one example of such a program; however, it is inadequate to meet current needs in many ways. Only a limited number of professions are covered, the competition is high with many applicants being turned down, the scholarship or loan reimbursement amounts are inadequate, and the kinds of eligible sites (FQHCs, tribal clinics, etc.) are too limited.

A third barrier to training more healthcare professionals is the difficulty hiring and retaining qualified faculty members, who can typically earn more in direct care clinical settings and yet require a higher level of training and credentialing than those working clinically.[11] Support such as that displayed by Senators Sanders, Collins, and others for strategic loan repayment programs targeting those assuming faculty positions in health professions is critical to ensuring the future of the healthcare workforce. Loan repayment programs improve access to graduate/doctoral education by encouraging qualified individuals to advance their education and subsequently become employed as faculty.[12] Title VIII programs, such as the Nursing Workforce Development Programs, are an example of an important step in addressing this issue.
In addition, in some cases practicing clinicians can be recruited to serve as faculty instructors in their existing workplaces. For example, we have developed a new accelerated nursing program,

[10] An exception being certain predatory foreign medical schools, particularly in the Caribbean, that cater to American students who cannot gain entry into domestic medical schools and which charge exorbitant tuition.
[11] Christmas et al., 2010; Feldman et al., 2015; Girod et al., 2017; Nauseen et al., 2018
[12] The case of dentistry is illustrative of the problem. The number of dental school graduates entering an academic career immediately following graduation is quite low. For the Class of 2022 graduates responding to the American Dental Education Association Senior Survey, 0.7% (13 of the 1,757 respondents) indicated they plan to work as a faculty/staff member at a dental school after graduation (Istrate et al., 2022). An additional consideration is that most dental schools provide little exposure to academic careers. At UNE's College of Dental Medicine (CDM), dental students may participate as teaching assistants, tutors, peer mentors in the simulation and patient care clinic, or conduct research with faculty to be exposed to elements of an academic career. To date, out of six graduating classes, five alumni have returned to teach as part-time adjunct faculty in the CDM, one is an adjunct faculty in UNE's dental hygiene program, one recently joined the CDM as a full-time faculty member, and eight serve as preceptor faculty at CDM clinical affiliation sites where fourth-year students complete community-based externship rotations.

in which existing employees of Maine's largest healthcare system are trained on site by a combination of our own faculty and hospital clinicians.

Despite these challenges, at UNE we continuously seek to increase the number of health profession students we educate. For example, we have increased the size of our nursing program 300% over the last decade, and we have a grant under review with the US DOL to further bolster our nursing training. We are currently in the process of increasing the class size of our medical students from 165 to 200 per year, our dental students from 64 to 72 per year, and our graduate registered dietician program from 80 to 100 per year. And with these increases we remain focused on quality training, as evidenced by the fact that our students routinely score above the state and national means on clinical board exams, and our medical students have among the highest residency match rates in the nation.

The second strategy for addressing the nation's healthcare workforce involves ***intentionally recruiting and training more students who look like the communities we need to serve***. It is well established that individuals from underrepresented groups are more likely to seek out practitioners who share their identities and backgrounds.[13] Studies have found that minority patients who are treated by race/ethnic-concordant clinicians are more likely to use needed health services and are less likely to delay seeking care.[14]

In Maine, we have a growing immigrant population, especially from Central and Eastern Africa, and not surprisingly, this community experiences significant healthcare discrepancies relative to the broader population.[15] To address this issue, not only has UNE increased recruitment efforts targeting students of color across the entire university, we recently expanded our "Advanced Standing" programs in dentistry and pharmacy, which are designed to accelerate the time it takes for foreign-trained immigrant professionals to achieve a U.S. degree and become eligible for licensure. We have also developed partnerships with local community colleges to matriculate

[13] LaVeist et al., 2003; Shen et al., 2018; Takeshita et al., 2020
[14] Handtke et al., 2019; LaVeist & Nuru-Jeter, 2002; Saha et al., 2000;
[15] Drewniak et al., 2017

students from our immigrant communities into certain healthcare programs (e.g., dental hygiene).[16]

Third, it's not enough merely to train more healthcare professionals, ***we must address their maldistribution within our society. That is, we must encourage healthcare providers to practice in underserved areas, including rural, tribal, and medically underserved urban communities***. Like Maine, most states have vast rural areas with highly distributed populations, and these communities have far less access to healthcare.[17] The U.S. government has invested in programs, administered through the Health Resources and Services Administration, that provide financial support in the form of loan repayment to graduates who serve in disadvantaged areas. These programs are absolutely critical, and we thank Congressional leadership for their ongoing support. However, they are insufficient. For example, in the case of physicians, the loan repayment subsidies do not compensate enough for the typical salary gap between rich urban and suburban communities and underserved urban and rural areas.[18]

The paucity of physicians and other healthcare providers practicing in rural areas is particularly acute, fueled in part by the decline of students from rural backgrounds pursuing healthcare education.[19] At UNE, we have successfully used a three-prong strategy to encourage our graduates to practice in rural areas. We intentionally recruit students from rural areas, both from Maine and around the country. Students from small towns and other nonurban areas are more likely to return to such communities after graduation.[20] Regardless of where they come from, we place students in clinical training sites in underserved rural areas as part of their education to

---

[16] National Academies of Sciences, Engineering and Medicine, 2021.

[17]The US Department of Health and Human Services has designated nearly 248 geographic areas in Maine as health professional shortage areas for primary care, dental health, and mental health, as of December 31, 2022 (Maine Center for Disease Control & Prevention, 2023). Maine also has 51 medically underserved areas/populations, defined as areas having too few primary care providers, high infant mortality, high poverty, and/or a high elderly population. Nearly all of Maine's medically underserved areas are in Maine's Congressional District Two, the second most rural congressional district in the country (US DHHS, 2019).

[18] In addition to scholarship and loan repayment programs, revisions to Medicaid reimbursement schedules are needed to meet the needs of rural populations and to incentivize clinicians to practice in these areas. Rural populations tend to be more reliant on Medicaid to pay for healthcare. In the case of dentistry, for example, coverage and reimbursement rates vary by state. The low reimbursement rates and cumbersome preauthorization and claims processes deter many practitioners from accepting Medicaid insurance.

[19] Shipman, S. (2019)

[20] American Academy of Family Physicians, 2016; Hu et al., 2022; Lee et al., 2021; University of Wisconsin, 2020;

give them a taste of rural practice and lifestyle. Each year, many graduates exposed to these crucial settings during rotations return for employment, inspired by the commitment to quality patient care they witnessed, as well as their love of small-town life.[21] For example, between 2013 and 2019 up to 53% of our medical students who completed a rotation in a rural community hospital in Maine returned to those areas to practice regardless of where they did their residency or where they were originally from. Our experience is consistent with research demonstrating a direct relationship between exposure to rural settings in physician residency training and subsequent work in rural communities.[22]

Finally, in concert with state and philanthropic partners, we have developed loan repayment and scholarship programs to incentivize practice in rural settings. These efforts have paid off; over the past decade we have made dramatic inroads in addressing the needs of rural communities. For example, 40% of UNE medical school graduates who practice in Maine do so in health profession shortage areas (HPSAs) designated by the U.S. government, positively impacting the HPSA designation of five counties.[23] And in our dental school's first six graduating classes (2017 – 2022), we educated 377 dentists, 27% of whom are currently practicing in Maine. Of those practicing in Maine, 57% are practicing in a Dental Health Professional Shortage Area (HPSA), 47% are enrolled as MaineCare providers or are in a practice that accepts MaineCare, and 17% practice in a FQHC or non-profit clinic.[24] Nearly one in five is employed in a Federally Qualified Health Center, a non-profit community clinic, or the Veteran's Administration, and four in ten are practicing in Maine's most disadvantaged areas.[25]

---

[21] UNE's dental school clinical model is an excellent example of success in this regard. UNE places students in up to two 12-week clinical rotations in settings throughout northern New England, working in collaboration with a network of FQHCs, non-profit clinics, and private dental offices. Students provide billable services while receiving supervision from the preceptor and most importantly, learning about the community they serve. We are grateful for the U.S. Department of Health and Human Services' on-going funding to Maine's network of health centers providing access to many of our marginalized residents, while also offering much-needed clinical placements to students.

[22] Russell et al., 2022.

[23] NCAHD's Enhanced State Licensure Data, 2016; The Robert Graham Center, 2012.

[24] Department of Professional and Financial Regulations, Maine Board of Dental Practice: Provider directory; Maine Care Services, Provider directory; Health Resources & Services Administration, Find shortage areas; National Plan Provider and Provider Enumeration System, NPPES NPI registry.

[25] This is particularly noteworthy given that Maine has the second fewest (just ahead of New Hampshire) dental providers participating in Medicaid or CHIP in the entire country, according to the American Dental Association's Health Policy Institute (2019).

The fourth strategy for addressing the healthcare workforce crisis involves technology. Specifically, ***we must leverage the power of technology to reach underserved communities***. The COVID-19 pandemic introduced many Americans for the first time to the value of telehealth, as we all learned to access healthcare providers via videoconferencing.[26] Telehealth and digital medicine have enormous potential to transform healthcare delivery, particularly in underserved areas.[27] In addition to patients accessing their providers through secure videoconferencing platforms, primary care providers in remote locations can themselves access specialist colleagues in urban tertiary care hospitals and university health centers for expert consultation. And emerging digital medicine and artificial intelligence technologies will increasingly allow clinicians to monitor patient symptoms and even deliver certain treatments remotely over the internet. These technologies can also enhance the education of students in health profession programs but also the reach and effectiveness of continuing medical education programs. At UNE, we are integrating robust telehealth training for all of our health profession students in close partnership with our various training sites.

Fifth, ***changes to state level regulations that allow health professionals to practice at the top of their scope could help address health care workforce shortages***. "Scope of practice" defines what services or procedures a particular type of health professional is trained for and is legally permitted to provide. Across the US, many states have scope of practice laws that prevent some health professionals from providing certain services even though they are trained and prepared to do so. Temporary changes to increase flexibility of such regulatory practices were made in many states around the country during the pandemic to help address the pandemic related workforce crisis. Continuing such flexibility should be seriously considered. The focus when it comes to developing scope of practice regulation should be on what level of regulation results in the best outcomes in terms of health and safety of the population, not on managing guild-driven turf wars between professions at the "edges" of their scope of practice. Overlap and redundancy between professions is a good thing, especially during times of workforce shortages.

[26]Wosik et al., 2020
[27] Kichloo et al., 2020

Sixth and finally, ***we must fundamentally change the prevailing educational model in two ways***. First, accrediting bodies need to allow training programs to be more creative and flexible -- without sacrificing educational quality of course -- to develop novel training models. This would include so-called "career laddering" opportunities that do not completely remove the individual from the workforce while they are pursuing an advanced degree, such as a physician assistant or nurse practitioner becoming a physician, a dental hygienist becoming a dentist, or a certified nursing assistant becoming a registered nurse. In addition, accrediting bodies should accept more high-quality clinical simulation hours in place of hours physically spent at clinical sites, thereby reducing the burden on clinical sites.

The second educational reform involves breaking down the traditional siloes that characterize healthcare training and practice. Anyone who has recently been a patient in a hospital, or who has cared for a hospitalized loved one, understands how siloed the practice of healthcare tends to be. Far too often, healthcare professionals are all practicing their respective crafts with scant communication and coordination among themselves. This siloed practice is a result, at least in part, of the traditional discipline-centered model of educating healthcare professionals. In 2001, the Institute of Medicine issued a groundbreaking report, *Crossing the Quality Chasm: A New Health System for the 21st Century*, which laid out the case for dramatic, systemic changes to health care organization and delivery. In response, stakeholders from academia, health systems, and government convened to determine how best to address the Institute's recommendations. In 2012, these efforts led to the development of a new educational model in which students from diverse disciplines are explicitly trained to work together, across traditional boundaries, in multi-disciplinary teams. Known as "interprofessional education"[28] or "IPE" for short, this training model prepares students with team-based competencies, attitudes, and skills that complement distinctive disciplinary knowledge. Interprofessional health care teams offer more than any one discipline can achieve alone, and this is especially critical as patients' health conditions are becoming increasingly complex.[29] Growing evidence suggests that interprofessional

[28] Interprofessional Education occurs when two or more professions learn about, from, and with each other to improve collaboration and the quality of patient care.
[29] Mayo & Williams-Woolley, 2016

collaborative practice[30] improves clinical outcomes,[31] reduces medical errors,[32] increases patient satisfaction,[33] and decreases provider burnout.[34]

The IPE training model, especially when paired with digital health technologies, can be instrumental in meeting the needs of underserved communities.[35] The combination of IPE and telehealth allows doctors, mid-level clinicians, and other primary care practitioners to effectively expand their scope of practice, while also extending specialist care to those for whom it is otherwise out of reach.

At UNE, we have been pioneers in IPE over the past decade for all our healthcare programs. We are currently constructing a new health sciences training facility on our Portland campus, which will serve as the new home of our medical school. By co-locating all of our health profession programs on a single site, we will be able enhance our training of students in this collaborative, team-based model.

In conclusion, successfully addressing America's healthcare workforce crisis will require not merely acting on each of these six strategies in isolation, but seamlessly integrating them. Although strategic investment of resources will be required, much of the work we confront reflects cultural changes that will require strong leadership, a willingness to innovate, and coordinated partnership between academia, government, industry, and the nonprofit sector.

---

[30] According to the World Health Organization, interprofessional collaborative practice happens when multiple health workers from different professional backgrounds work together with patients, families, care givers, and communities to deliver the highest quality of care (World Health Organization, 2010)

[31] Lutfiyya et al., 2019

[32] Anderson & Lakhan, 2016; Hardisty et al., 2014; Irajpour et al, 2019; Lygre et al., 2017; Wilson et al., 2016

[33] Will et al, 2019

[34] Cain et al., 2017; Dow et al., 2019

[35] One particular area of healthcare that exemplifies the value of this kind of collaborative approach is geriatrics. Diseases of aging often encompass a broad scope of conditions and disciplines: heart disease and diabetes treated by primary care practitioners; mobility issues by physical and occupational therapists; isolation by social workers; oral health by dentists and hygienists, and so on. At UNE, we weave training in geriatrics throughout all of our health profession programs. Thanks to legislation sponsored by Senator Collins and supported by Maine's Junior Senator Angus King, and working closely the University of Maine and multiple statewide partners, UNE is one of 48 organizations nationally to have received funding through HRSA's Geriatrics Workforce Education Program, which aims to create a more age-friendly health system by transforming primary care practices and engaging and empowering older adults.

I am grateful for the committee's time and attention, and appreciate your efforts to address our nation's healthcare workforce crisis. Thank you.

References

American Academy of Family Physicians. (2016). *Rural practice, keeping physicians in (position paper)*. https://www.aafp.org/about/policies/all/rural-practice-keeping-physicians.html

American Dental Association. (2021). *Supply of dentists in the US: 2001-2021*. https://www.ada.org/resources/research/health-policy-institute/dentist-workforce

Anderson, E., & Lakhani, N. (2016). Interprofessional learning on polypharmacy. *The Clinical Teacher, 13*(4), 291–297. https://doi.org/10.1111/tct.12485

Association of American Medical Colleges. (2019). *Maine physician workforce profile*. https://www.aamc.org/media/37931/download

Benbassat, J. (2020). Managing time-constrained doctor-patient encounters: A proposal for a teaching program by a former doctor and present patient. *Journal of Primary Care and General Practice, 3*(1), 1-3. https://www.alliedacademies.org/articles/managing-timeconstrained-doctorpatient-encounters-a-proposal-for-ateaching-program-by-a-former-doctor-and-present-patien.pdf

Cain, C. L., Taborda-Whitt, C., Frazer, M., Schellinger, S., White, K. M., Kaasovic, J. Nelson, B., & Chant, A. (2017). A mixed methods study of emotional exhaustion: Energizing and depleting work within an innovative healthcare team. *Journal of Interprofessional Care, 31*(6), 714-724. https://doi.org/10.1080/13561820.2017.1356809

Center for Health Affairs NEONI. (2017). *Maine Nursing Forecaster*. https://usm.maine.edu/sites/default/files/nursing/Maine%20Nursing%20Forecaster%20Public%20Access%20Information.pdf

Christmas, C., Durso, S. C., Kravet, S. J., & Wright, S. M. (2010). Advantages and challenges of working as a clinician in an academic department of medicine: academic clinicians' perspectives. *Journal of Graduate Medical Education, 2*(3), 478-484. https://doi.org/10.4300/JGME-D-10-00100.1

Cox, W. J., & Desai, G. J. (2019). The crisis of clinical education for physicians in training. *Missouri Medicine, 116(5),* 389-391.

de Villiers, M., Conradie, H., & van Schalkwyk, S. (2018). Teaching medical students in a new rural longitudinal clerkship: Opportunities and constraints. *Annals of Global Health, 84(1),* 58–65. https://doi.org/10.29024/aogh.17

Department of Professional and Financial Regulations. (n.d.) *Maine Board of Dental Practice: Provider directory.* https://www.maine.gov/dental/licensure/license-verification.html

Dow, A. W., Baernholdt, M., Santenhttps, S. A., Baker, K., & Sessle, C. N. (2019). Practitioner wellbeing as an interprofessional imperative. *Journal of Interprofessional Care.33(6),* 603-607. https://doi.org/10.1080/13561820.2019.1673705

Drewniak, D., Krones, T., Wild, V. (2017). Do attitudes and behavior of health care professionals exacerbate health care disparities among immigrant and ethnic minority groups? An integrative literature review. *International Journal of Nursing Studies, 70*, 89-98. https://doi.org/10.1016/j.ijnurstu.2017.02.015

Feldman, H. R., Greenberg, M. J., Jaffe-Ruiz, M., Kaufman, S. R., & Cignarale, S. (2015). Hitting the nursing faculty shortage head on: Strategies to recruit, retain, and develop nursing faculty. *Journal of Professional Nursing, 31*(3), 170-178. https://doi.org/10.1016/j.profnurs.2015.01.007

Girod, S. C., Fassiotto, M., Menorca, R., Etzkowitz, H., & Wren, S. M. (2017). Reasons for faculty departures from an academic medical center: a survey and comparison across faculty lines. *BMC Medical Education, 17*(1), 8-17. https://doi.org/10.1186/s12909-016-0830-y

Graziano, S. C., McKenzie, M. L., Abbott, J. F., Buery-Joyner, S. D., Craig, L. B., Dalrymple, J. L., Forstein, D. A., Hampton, B. S., Page-Ramsey, S. M., Pradhan, A., Wolf, A., & Hopkins, L. (2018). Barriers and strategies to engaging our community-based preceptors. *Teaching and Learning in Medicine, 30*(4), 444-450. https://doi.org/10.1080/10401334.2018.1444994

Handtke, O., Schilgen, B., & Mösko, M. (2019). Culturally competent healthcare–A scoping review of strategies implemented in healthcare organizations and a model of culturally competent healthcare provision. *PloS one 14* (7). https://doi.org/10.1371/journal.pone.0219971

Hanna, M. (2019). The patient vs. the clock: time constraints are damaging progress in medicine. *In-Training*. https://in-training.org/the-patient-vs-the-clock-time-constraints-are-damaging-progress-in-medicine-18623

Hardisty, J., Scott, L., Chandler, S., Pearson, P., & Powell, S. (2014). Interprofessional learning for medication safety. *The Clinical Teacher, 11*(4), 290-296. https://doi.org/10.1111/tct.13430

Hatfield, J., Neal, G., Isbell, T., & Dickey, D. (2022). The effect of a medical student on community preceptor productivity. *Medical Education 56* (7), 747-753. https://doi.org/10.1111/medu.14733

Health Resources & Services Administration. (n.d.). *Find shortage areas.* https://data.hrsa.gov/tools/shortage-area/by-address

Hempel, S., Gibbons, M. M., Ulloa, J. G., Macqueen, I. T., Miake-Lye, I. M., Beroes, J. M., & Shekelle, P. (2017). Rural healthcare workforce: a systematic review. Department of Veterans Affairs (US). https://www-ncbi-nlm-nih-gov.une.idm.oclc.org/books/NBK409505/

Hu, X., Dill, M.J., & Conrad, S.S. (2022). What moves physicians to work in rural areas? An in-depth examination of physician practice location decisions. *Economic Development Quarterly, 36* (3) 245-260. https://doi.org/10.1177/08912424211046600

Irajpour, A., Farzi, S., Saghaei, M., & Ravaghi, H. (2019). Effect of interprofessional education of medication safety program on the medication error of physicians and nurses in the intensive care

units. *Journal of Education and Health Promotion*, *8*(1). https://doi.org/10.4103/jehp.jehp_200_19

Istrate, E.C., Cooper, B.C., & West, K.P. (2022, Sept.). Dentists of tomorrow 2022: An analysis of the results from the ADEA 2022 survey of U.S. dental school seniors. *American Dental Education Association (ADEA) Education Research Series*, 4. https://www.adea.org/Seniors2022/

Kichloo, A., Albosta, M., Dettloff, K., Wani, F., El-Amir, Z., Singh, J., & Chugh, S. (2020). Telemedicine, the current COVID-19 pandemic and the future: A narrative review and perspectives moving forward in the USA. *Family Medicine and Community Health, 8*(3). https://doi.org/10.1136/fmch-2020-000530

Konrad, T. R., Link, C. L., Shackelton, R. J., Marceau, L. D., von Dem Knesebeck, O., Siegrist, J., & McKinlay, J. B. (2010). It's about time: physicians' perceptions of time constraints in primary care medical practice in three national healthcare systems. *Medical Care*, *48*(2), 95 -100. https://doi.org/10.1097/MLR.0b013e3181c12e6a

Krehnbrink, M., Patel, K., Byerley, J., Tarantino, H., Peyser, B., Payne, L., Foley, K., & Latessa, R. (2020). Physician preceptor satisfaction and productivity across curricula: A comparison between longitudinal integrated clerkships and traditional block rotations. *Teaching and Learning in Medicine, 32(2)*, 176–183. https://doi.org/10.1080/10401334.2019.1687304

LaVeist, T. A., & Nuru-Jeter, A. (2002). Is doctor-patient race concordance associated with greater satisfaction with care? *Journal of Health and Social Behavior*, *43*(3), 296-306. https://www-jstor-org.une.idm.oclc.org/stable/3090205

LaVeist, T. A., Nuru-Jeter, A., Jones, K. E. (2003). The association of doctor-patient race concordance with health services utilization. *Journal of Public Health Policy, 24*(3-4*)*, 312-323. https://doi.org/10.2307/3343378

Lee, M., Newton, H., Smith, T., Crawford, M., Kepley, H., Regenstein, M., Chen, C. (2016). The benefits of physician training programs for rural communities: Lessons learned from the teaching health center graduate medical education program. *Journal of Health Care for the Poor and Underserved 27*(4), 83-90. https://doi.org/10.1353/hpu.2016.0184

Lee, J. K., McCutcheon, L. R. M., Fazel, M. T., Cooley, J. H., & Slack, M. K. (2021). Assessment of interprofessional collaborative practices and outcomes in adults with diabetes and hypertension in primary care. *JAMA Network Open, 4*(2). https://doi.org/10.1001/jamanetworkopen.2020.36725

Lygre, H., Kjome, R., Choi, H., & Stewart, A. L. (2017). Dental providers and pharmacists: A call for enhanced interprofessional collaboration. *International Dental Journal, 67(6)*, 329–331. https://doi.org/10.1111/idj.12304

Lutfiyya, M. N., Chang, L. F., McGrath, C., Dana, C., & Lipsky, M. S. (2019). The state of the science of interprofessional collaborative practice: A scoping review of the patient health-related

outcomes based literature published between 2010 and 2018. *PloS one, 14(6),* e0218578. https://doi.org/10.1371/journal.pone.0218578

Maine Care Services. (n.d.) Provider directory. https://mainecare.maine.gov/mhpviewer.aspx?FID=PDIR

Maine Center for Disease Control & Prevention (2023). Health professional shortage areas (HPSAs) and medically underserved areas/populations (MUA/Ps). https://www.maine.gov/dhhs/mecdc/public-health-systems/rhpc/hpsa.shtml

Maine Senior Guide (2019). https://maineseniorguide.com/

Mayo, A. T. & Williams-Woolley, A. (2016). Teamwork in health care: Maximizing collective intelligence via inclusive collaboration and open communication. *AMA Journal of Ethics, 18(9),* 933-940. https://doi.org/10.1001/journalofethic?.2016.18.9.ta2-1609

McAndrew, M., Brunson, W. D., & Kamboj, K. (2011). A survey of US dental school programs that help students consider academic careers. *Critical Issues in Dental Education, 75(11)*, 1458-1464. https://doi.org/10.1002/j.0022-0337.2011.75.11.tb05203.x

National Academies of Sciences, Engineering and Medicine. (2021). *The Future of Nursing 2020-2030: Charting a Path to Achieve Health Equity*. The National Academies Press. https://doi.org/10.17226/25982.

Nausheen, F., Agarwal, M. M., Estrada, J. J., & Atapattu, D. N. (2018). A survey of retaining faculty at a new medical school: opportunities, challenges and solutions. *BMC medical education*, *18*(1), 1-8. https://doi.org/10.1186/s12909-018-1330-z

National Center for the Analysis of Health Care Data. (2016). *Enhanced state licensure data*. https://www.ncahd.org/esl-data/

National Plan Provider and Provider Enumeration System. (n.d.). NPPES NPI registry. https://npiregistry.cms.hhs.gov/search

The Robert Graham Center (2012). *Projecting US primary care physician workforce needs (2010-2025).* http://www.annfammed.org/content/10/6/503.full.pdf

Rodriguez, S. M. (2013). The impact of limited clinical sites on prelicensure nursing education programs: Current issues and recommendations for the future. *Sophia, the St. Catherine University Repository.* https://sophia.stkate.edu/ma_nursing/73

Russell, D. J., Wilkinson, E., Petterson, S., Chen, C., & Bazemore, A. (2022). Family Medicine Residencies: How Rural Training Exposure in GME Is Associated with Subsequent Rural Practice. *Journal of Graduate Medical Education*, *14* (4), 441-450. https://doi.org/10.4300/JGME-D-21-01143.1

Saha, S., Taggart, S. H., Komaromy, M., & Bindman, A. B. (2000). Do patients choose physicians of their own race? To provide the kind of care consumers want, medical schools might be able to justify using race as an admissions criterion. *Health affairs*, *19*(4), 76-83. https://doi.org/10.1377/hlthaff.19.4.76

Shen, M. J., Peterson, E. B., Costas-Muñiz, R., Hernandez, M. H., Jewell, S. T., Matsoukas, K., & Bylund, C. L. (2018). The effects of race and racial concordance on patient-physician communication: A systematic review of the literature. *Journal of Racial and Ethnic Health Disparities*, *5*(1), 117–140. https://doi.org/10.1007/s40615-017-0350-4

Shipman, S. A., Wendling, A., Jones, K. C., Kovar-Gough, I., Orlowski, J. M., & Phillips, J. (2019). The decline in rural medical students: A growing gap in geographic diversity threatens the rural physician workforce. Health Affairs, 38(12). https://doi.org/10.1377/hlthaff.2019.00924

Skillman, S. M., & Stover, B. (2014). Maine's physician, nurse practitioner and physician assistant workforce in 2014. *Seattle, WA: WWAMI Center for Health Workforce Studies, University of Washington*. https://www.familymedicine.uw.edu/chws/wp-content/uploads/sites/5/2018/08/maines_physicians_nps_and_pas_2018.pdf

State Board of Maine Dental Practice. (2019). https://www.maine.gov/dental/

Takeshita, J., Wang, S., Loren, A.W., Mitra, N., Shults, J., Shin, D.B., & Sawinski, D.L. (2020). Association of racial/ethnic and gender concordance between patients and physicians with patient experience ratings. *JAMA network open 3*, (11). https://doi.org/10.1001/jamanetworkopen.2020.24583

University of Wisconsin. (2020). Neighborhood Atlas. https://www.neighborhoodatlas.medicine.wisc.edu

U.S. Census Bureau. (2019a). *Maine.* https://data.census.gov/cedsci/profile?g=0400000US23

Health Resources and Services Administration. *HU.S. DHHS HPSAs and MUAs in Maine*. Retrieved June, 2019 from https://bhw.hrsa.gov/workforce-shortage-areas/shortage-designation.

U.S. Census Bureau. (2019b) *American Fact Finder*. https://www.census.gov/programs-surveys/acs/data.html

U.S. Congress: Advisory Committee on Interdisciplinary, Community-Based Linkages. (2018). *Enhancing Community-Based Clinical Training Sites: Challenges and Opportunities*.

Will, K. K., Johnson, M. L., & Lamb, G. (2019). Team-based care and patient satisfaction in the hospital setting: a systematic review. *Journal of Patient-Centered Research and Reviews*, *6*(2), 158. https://doi.org/10.17294/2330-0698.1695

Wilson, A. J., Palmer, L., Levett-Jones, T., Gilligan, C., & Outram, S. (2016). Interprofessional collaborative practice for medication safety: Nursing, pharmacy, and medical graduates'

experiences and perspectives. *Journal of Interprofessional Care, 30*(5), 649–654. https://doi.org/10.1080/13561820.2016.1191450

World Health Organization. (2010). *Framework for action on interprofessional education and collaborative practice* (No. WHO/HRH/HPN/10.3). https://www.who.int/publications/i/item/framework-for-action-on-interprofessional-education-collaborative-practice

Wosik, J., Fudim, M., Cameron, B., Gellad, Z. F., Cho, A., Phinney, D., & Tcheng, J. (2020). Telehealth transformation: COVID-19 and the rise of virtual care. *Journal of the American Medical Informatics Association.*

Appendix A

Table 1

Summary of Recommendations

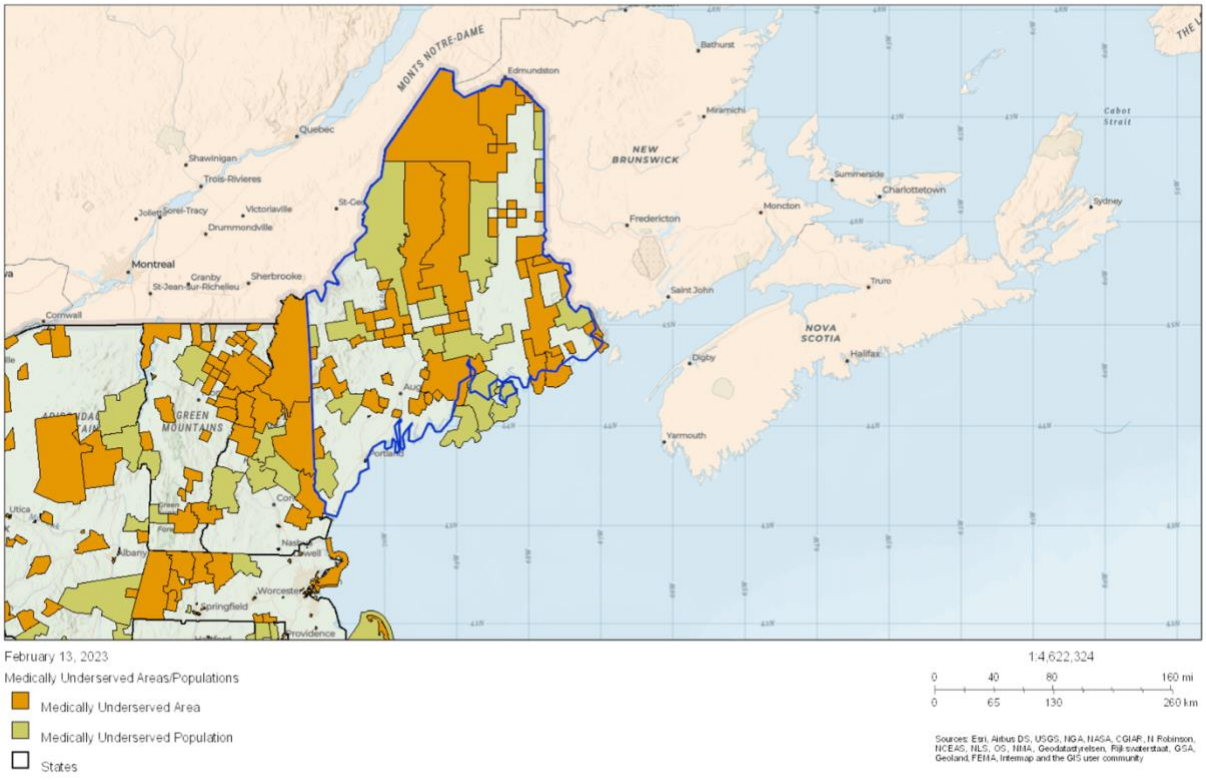
Increase the number of healthcare professionals	Increase the number of doctors, nurses, dentists, and other healthcare professionals we educate by: 1) expanding partnerships between universities and community healthcare settings to develop additional training opportunities; 2) revise antiquated CMS policies for funding GME; 3) providing targeted one-time investments in expanding healthcare training infrastructure; and 4) strategic scholarship and loan-repayment programs, including those supporting clinical educators to increase faculty
Representation	Intentionally recruit and train more students who look like the communities they serve
Maldistribution of providers	Use a variety of tools to encourage healthcare providers to practice in underserved areas, including rural, tribal, and medically underserved urban communities
Technology	Leverage the power of technology, including telehealth and digital medicine, to reach underserved communities
Scope of practice	Modify state level regulations to allow health professionals to practice at the top of their scope
Flexibility of educational models	Encourage accrediting bodies to allow training programs to be more creative and flexible (without sacrificing educational quality) to develop novel training models including “career laddering” opportunities that do not completely remove the individual from the workforce while they are pursuing an advanced degree
Interprofessional Education	Promote Interprofessional Education (IPE) training models to break down traditional healthcare training and practice siloes

Appendix B

National Center for the Analysis of Healthcare Data
Health Professional Shortage Areas: Maine Maps

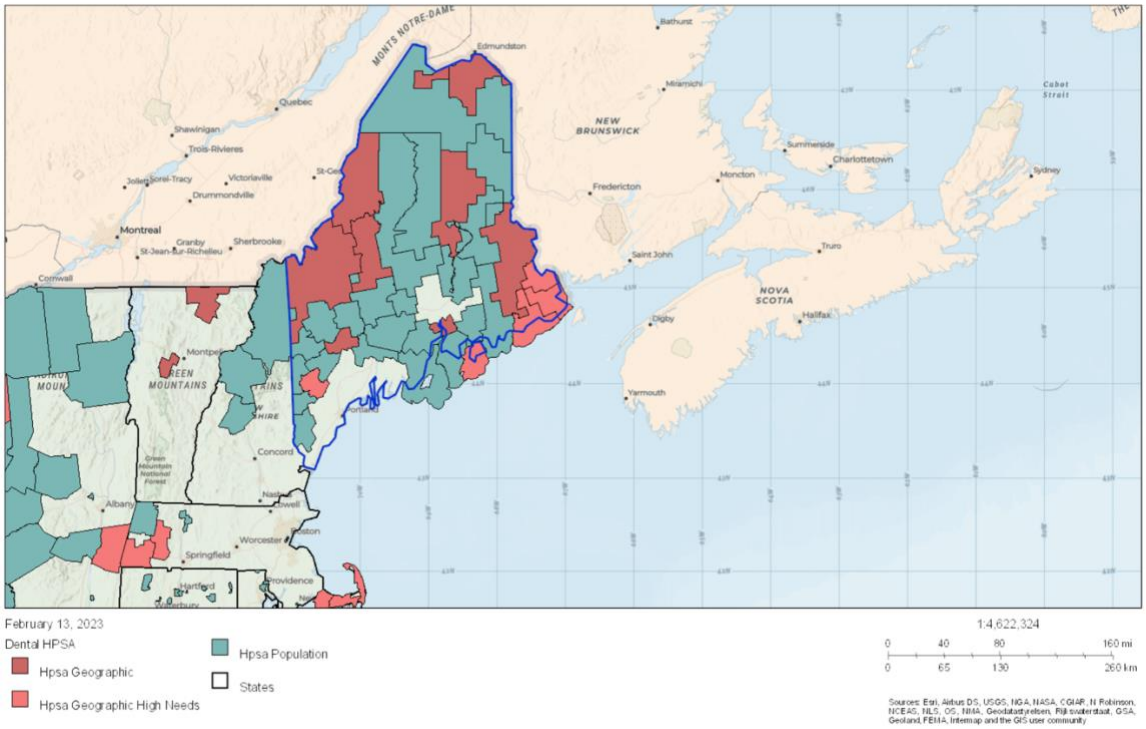
Source: National Center for the Analysis of Healthcare Data (2023, Feb 13). *Mapping portal development.* https://www.ncahd.org/portal-development/

Map 1
Medically Underserved Areas (2023)



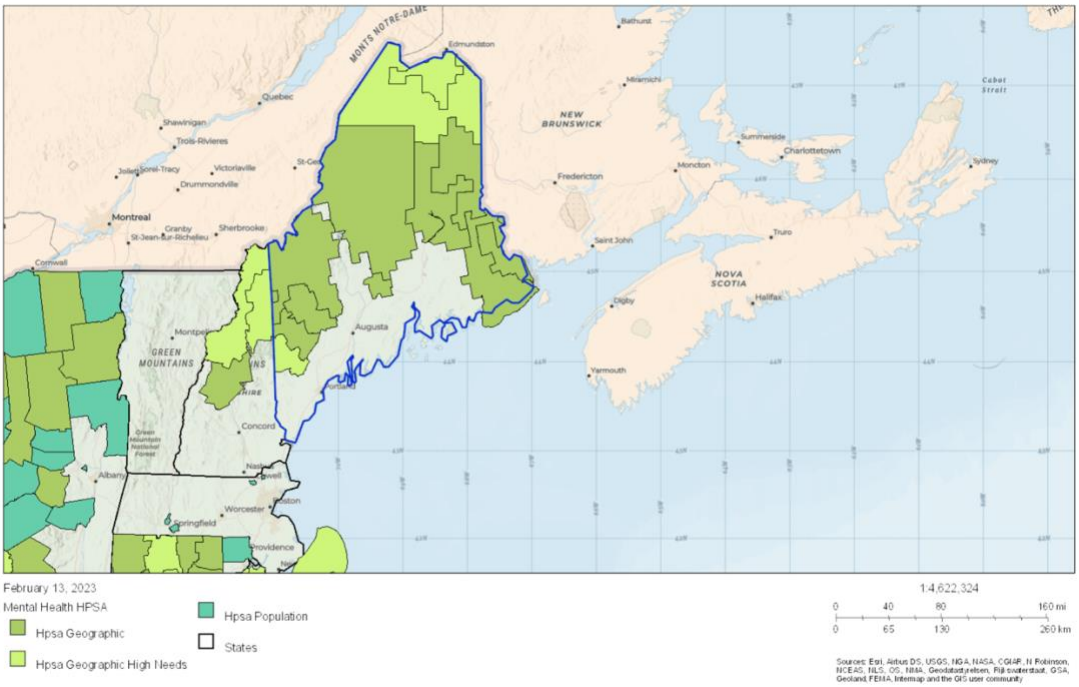
Map 2

Dental: Health Professional Shortage Area (2023)



Map 3

Mental Health: Health Professional Shortage Area (2023)



Map 4

Primary Care: Health Professional Shortage Area (2023)