

Physician Supply Key to Oklahoma's Health and Wealth

Recommendations for Physician Training, Recruitment, Retention Strategies

PURPOSE

The purpose of this brief is to describe the current physician landscape in Oklahoma and communicate policy recommendations identified by the Health Workforce Subcommittee of the Governor's Council for Workforce and Economic Development. The focus is on the development of effective strategies to strengthen the state's physician workforce.

INTRO

Across many sectors of the economy, the challenge of recruiting and retaining a strong workforce is critically important. Through the public-private sector partnership of the Governor's Council for Workforce and Economic Development, Oklahoma is coordinating efforts that will result in optimizing the workforce to meet the demands of industry, while improving the overall prosperity of the state.

The Health Workforce Subcommittee under the Governor's Council is comprised of 19 representatives across the spectrum of the state's healthcare sector. The Subcommittee has identified goals and strategies, specifically for the health workforce which also align with the overall economic development priorities of the governor: wealth generation, employment growth and improved labor force participation. Physician shortages and efforts to improve the supply were identified as one of the first priorities of the Governor's Health Workforce Subcommittee. Four important recommendations to improving physician supply are identified in this brief:

- 1) Stabilize and Improve Funding for Physician Education and Training**
- 2) Build Capacity for Health Workforce Data Collection**
- 3) Commit to Robust Recruitment and Retention Strategies**
- 4) Identify Key Economic Factors for Successful Practices**

PHYSICIAN SHORTAGE - OVERVIEW

Oklahoma ranks 45th in the nation for active physicians per 100,000 population, and 46th for active primary care physicians.(AAMC, Oklahoma Physician Workforce Profile, 2015)¹ The supply of physicians is a function of several dynamic characteristics in addition to the per population amount: geographic distribution, patient care hours and productivity, and the balance of new physician entrants and exits to the labor force are also highly relevant, especially in projecting shortages in the future. Before physicians can enter the labor market, they must complete medical training and licensure, spanning nearly a decade when undergraduate and postgraduate levels of education are considered. Patterns of "maldistribution" in physician supply across geographic areas are a second area of concern, in addition to overall supply. Fewer doctors practice in rural and other underserved areas, even after controlling for other factors. (HRSA 2016, Rural Health Information Hub 2017, OSU Center for Rural Health 2015)^{2,3,4} Finally, with approximately one-third of Oklahoma's physician workforce over the age of 60, the retirement of current physicians and the rate of new entrants to replenish the labor force will become critical issues for policymakers. (AAMC Oklahoma Physician Workforce Profile 2015)⁵

PHYSICIAN SHORTAGES AND THEIR EFFECT ON HEALTH

Oklahoma ranks below many peer states in terms of its ability to produce and recruit an adequate supply of physicians, while simultaneously performing poorly in many metrics of health outcomes. The Oklahoma State Department of Health's (OSDH) most recent "report card" rating the health of the overall population gives Oklahoma a "D" or "F" in 26 out of 36 key health indicators.⁶ Demand for health care services is heightened when the prevalence of chronic illnesses is higher. Statistical models, such as those used by AAMC and HRSA take into account the health status of populations when estimating the overall need for an adequate health workforce⁷.

In its comprehensive analysis of health systems, the Commonwealth Fund ranks Oklahoma as 49th out of 51, noting the state's high rates of avoidable hospital use and unhealthy lifestyles.⁸ Regular access to primary care, in the form of annual check-ups and screening plays an invaluable role in detecting "silent killers": conditions such as hypertension that can lead to increased risk of mortality. (Centers for Disease Control, 2016)⁹ Improvement in reducing rates of chronic disease and implementing statewide disease prevention approaches hinge upon strengthening the state's physician workforce. Peer-reviewed research indicates that increases in physician supply, particularly for primary care physicians are significantly associated with improved preventive health outcomes, particularly those related to avoidable hospitalizations and mortality. (Chang, C., 2017)¹⁰

PHYSICIAN SHORTAGES AND THEIR EFFECT ON WEALTH

Ensuring an adequate supply and distribution of trained physicians across the state has the dual benefit of supporting economic prosperity, as well as supporting improved health. Healthcare plays a locally-driven, integral role for the state's economy, contributing nearly 10% of the state's gross state product (GSP) in 2015. Subsectors which depend upon recruitment and retention of physicians, such as ambulatory health care services and hospitals supported nearly 140,000 jobs, or over 6% of estimated total employment in Oklahoma in 2015. (Bureau of Economic Analysis 2017)¹¹

Local wages and income generated by physicians support consumer spending, investment and other commercial activity, in a manner which has a "multiplier effect", as described in economic literature. (Bureau of Economic Analysis 2017)¹² The private sector firm IMS Health quantified approximately \$1.5-2 million in new local revenues, including approximately \$50,000 annual state tax revenues as a result of the recruitment of a new physician to an Oklahoma community. (IMS Health, 2014)¹³

Access to preventive care is an important factor in reducing the potential of illnesses to injure and disable workers and thus limit their participation in the workforce. Both OSDH and State Chamber of Commerce identify rising costs of healthcare and challenges in overall wellness as factors that may inhibit Oklahoma business growth and profitability.^{14,15}

Healthcare services are a complementary industry for the state's economy, due to their critical role in keeping workers productive and engaged in economic activity. However, shortages of physicians can create difficulties for health systems to fulfill this role and meet the demand for services in a community. The lack of key providers, including physician specialists, can negatively impact the financial outlook of a hospital. (Merritt Hawkins, 2017)¹⁶ Severe shortages of physicians across the state, if not addressed, is likely to be a factor contributing to health systems consequences ranging from prolonged vacancies to facility closure. Closure of

rural hospitals, in particular is an issue of concern for the health and economic livelihood of rural areas. (Holmes 2006)¹⁷

PHYSICIAN TRAINING OVERVIEW

Changing the trajectory of Oklahoma's performance in health outcomes and access to care requires collaborative, statewide strategies. Strategies to improve physician supply through strengthening graduate medical education (GME) are an important piece of addressing the problem. GME refers to the period of three to seven years of training following the completion medical school, which prepares for physicians for clinical practice in a chosen medical specialty. Residents can pursue additional fellowship training, to further specialize after residency in a "core" specialty area. Training is coordinated and funded by colleges of medicine and their affiliated teaching hospitals, who must meet standards issued from nonprofit accrediting bodies to receive public funding.

As of the 2016-2017 academic years, the state of Oklahoma had more than 110 GME programs, with nearly 1,200 participating residents and fellows across the spectrum of medical specialties. (OSDH 2017)¹⁸ The OU College of Medicine in OKC, OU Tulsa's School of Community Medicine and the Osteopathic Medical Education Consortium of Oklahoma (OMECCO) affiliated with the OSU Center for Health Sciences serve as sponsoring institutions which administer the majority of the state's postgraduate medical education programs.

GME FINANCING

The direct costs of GME include the cost of physician faculty teaching time, the cost of resident labor, as well as program administration costs such as recruitment, program overhead, accreditation, malpractice insurance, and numerous other educational costs. Indirect costs for training institutions include significant costs generated from the operational inefficiencies associated with having learners of varying level of skill in those teaching programs and institutions. Nationally, the estimated average cost for training a resident physician is between \$150,000 -180,000 annually. (RAND 2012)¹⁹ Variation in the cost of training depends on the type and complexity. A combination of state, federal and institutional funding streams support GME in Oklahoma, which are each highlighted below. The focus of this brief is primarily on state funding sources, which are most relevant to the purpose of the Health Workforce Subcommittee.

Federal Financing

Federal funding for GME only partially supports the overall training costs, with the federal Medicare program, and the shared federal-state Medicaid program comprising the major public expenditures related to GME. (Congressional Research Service 2016)²⁰

State Financing

Oklahoma invests a limited amount of state funds in GME through its state appropriations to higher education. A portion of the appropriated funding that is allocated to Colleges of Medicine can however be matched with federal dollars through a mechanism available to the Oklahoma Health Care Authority (OHCA), the state agency responsible for implementation of Medicaid, thus returning an enhanced amount of dollars to the colleges for medical training.

Additionally, OHCA partners with the Physician Manpower Training Commission (PMTTC), a state agency supporting the health care workforce, to leverage PMTC's state appropriations to cover a proportion of GME salaries and expenses for primary care residencies.

Institutional and Physician Practice Financing

Lastly, given limited federal dollars and reduced state appropriations for higher education, colleges of medicine and their affiliated teaching hospitals have increasingly had to develop ways to invest revenues generated from faculty physician and other patient care services to help offset the costs associated with training of residents and fellows. (RAND Corporation, 2013)²¹ This mechanism is highly limited however due to the fact that academic practices and their affiliated teaching hospitals shoulder a much higher burden of uncompensated clinical care when compared with other medical institutions state wide. (Oklahoma Watch, 2013)²² The consulting firm Avalere Health estimated teaching hospitals provided 56% of uncompensated care, despite only representing 26% of all hospitals in 2014. (AHA, 2015)²³

RECRUITMENT AND RETENTION OVERVIEW

Nationally, and at the state-level, recruitment of physicians occurs in a competitive environment, where compensation and lifestyle factors (quality of life, leisure, and professional development) are important influences on a physician's decision for where to remain in practice. Physician surveys indicate that practice and community "fit" are two of the most salient factors in recruitment: physicians are less likely to relocate to areas which do not match their expectations for professional opportunities, and for those of their spouses. (ASPR 2011)²⁴

High levels of student debt for medical education are becoming a top concern for recent and aspiring graduates of medical schools. AAMC's survey of medical schools found a nationwide median level of medical education debt of \$180,000 for graduating MD/DOs, which has steadily been rising over the past decade. (AAMC 'Medical Student Education, 2016)²⁵ Moreover, 44% of responding medical school graduates planned to enter some form of a loan forgiveness or repayment program. Beyond the cost of financing medical training, new physicians may also face significant costs and up-front investment if they seek to build their own practices.

States across the country including Oklahoma, invest public and private sector funds in various programs to recruit and retain physicians and other members of the health workforce. Financial incentives, such as scholarships and loan repayment are generally based on completion of a multi-year service obligation. (Pathman 2004)²⁶ An ongoing challenge with the evaluation of loan repayment and the subsequent retention of participants is to properly assess the unique factors that may influence retention. Factors such as the program requirements, participation criteria and methodology or definitions of "retention" may vary from state to state. Exit surveys and other processes to track the long-term retention of participants may not be fully implemented in various state programs.

However, available research evidence, such as meta-analyses of state and national studies on physician participation in loan repayment programs, have found increased percentages of retention for physicians who committed to a loan repayment obligation (UW Population Health Institute 2016)²⁷. Loan repayment obligations, such as those which require a contract or service term of two to four years, target specific areas experiencing physician shortages. They are therefore a mechanism for states to link loan repayment funding to the regions experiencing a greater shortage of providers. Evidence also supports implementing options for physicians to

'extend' their obligations, allowing physicians to be retained for a subsequent service term. Disincentives for 'breaking' a commitment to serve, such as penalties assessed on the principal loan repayment offered to the physician, are a companion method of influencing physician retention. (AAMC 'State and Federal Repayment' 2016)²⁸

The Oklahoma State Legislature established the Physician Manpower Training Commission (PMTTC) in 1975, with a core mission to enhance Oklahoma's health workforce through incentive programs designed to encourage physicians and other health professionals to serve in rural and underserved areas of the state. A 25 year study of PMTTC's physician retention conducted by the OSU Center for Rural Health in 2001 noted 82% of physicians participating in a PMTTC practice obligation remained in Oklahoma practice, with a rate of 67% of those in a rural area.²⁹ Throughout the history of PMTTC's operations, many of the 'best practices' associated with workforce incentive programs (obligation requirements, selection of rural and underserved areas, etc.) have been successfully implemented.

STRATEGIC RECOMMENDATIONS:

1) STABILIZE AND IMPROVE FUNDING FOR PHYSICIAN TRAINING

Public funding for training medical students and residents has been declining at a time when the need for doctors has been increasing. Oklahoma's federal 'matching' rate for Medicaid, as determined by CMS has declined for each year from SFY 2013 to the present, limiting the amount of funds to be leveraged to support medical education. (Kaiser Family Foundation, 2017)³⁰ A prominent benefit of continued state Medicaid funding for GME programs is to sustain a pipeline of future physicians with professional and personal investment in Oklahoma. Residency choice is an important factor in where physicians choose to eventually practice. Over 56% of family medicine residents remained in practice within 100 miles of where they completed their residency, in a 2013 national study published in *American Family Medicine*. (Fagan, 2013)³¹ Recent data from the Oklahoma Association of American Medical Colleges (AAMC), Oklahoma achieves encouraging results for physician retention: the state is performing in the top quartile (11th out of 50) in the percentage of physicians completing medical school and GME in-state who choose to remain for in-state clinical practice. (AAMC, 2015)³²

Oklahoma's GME institutions have also responded by creating a number of innovative training programs which implement evidence-based strategies for improving the likelihood that trainees will remain in the state upon program completion. (OSU Center for Health Sciences 2015, OU Medicine Magazine 2016)^{33,34} A substantial body of peer-reviewed evidence exists to support the effectiveness of early rural training tracks, such as those offered by OSU-CHS in developing early physician interest in rural practice settings. These tracks allow residents to gain professional networks and institutional familiarity within rural settings, facilitated by their medical school or training site. Similarly, residencies offering rural partnerships or elective opportunities such as those offered by OU and OSU's family medicine programs are examples of effective methods of encouraging rural practice. A review of multiple peer-reviewed studies conducted by the UW Population Health Institute concludes that providing residency and other training experiences to physicians in rural areas increases the likelihood of those physicians staying to practice in the future. (UW Population Health Institute 2016)³⁵

While innovative programs help supply by retaining a higher percentage of trainees already in the pipeline, they cannot fully overcome the effects of stagnant federal GME dollars and reduced state support. New funding strategies will be needed to help training institutions improve the supply of doctors in critical specialties where supply limits have both short term and lasting impact on Oklahoma's health system and health outcomes.

2) BUILD CAPACITY FOR DATA-DRIVEN HEALTH WORKFORCE RECOMMENDATIONS

Information on the supply and demand for physicians and other health professionals is critical to addressing shortages, because it allows for proactive planning in a rapidly-changing healthcare landscape. The state of Oklahoma should bring together resources, including agencies, private sector partners to make quality health workforce data more available.

One way the state has made progress towards bringing partners together is through the establishment of subcommittee for Health Workforce, under the overall Governor's Council for Workforce and Economic Development. State stakeholders and thought leaders developed this innovative idea, among a broad set of actionable strategies in 2014, as part of the creation of the Oklahoma Health Workforce Action Plan.³⁶ (OHWAP 2014) The National Governor's Association Center for Best Practices assisted the state in considering the benefits of aligning economic developments and health workforce planning, through in-depth facilitation and discussion. Case studies and expert opinion from the NGA endorses aligning multiple state priorities and partners for health workforce planning.³⁷ (National Governor's Association 2016)

Health workforce planning requires coordination of multiple partners, as each partner may have data on a relevant topic, but the information requires further linkage to draw accurate conclusions. For example, the Oklahoma State Department of Health houses a variety of data on overall population health, while the state's medical licensure boards maintain data on physician training, specialty and practice location. Private health systems, as well as agencies such as PMTC often have information on vacancies and departures of employed physicians. More effective and targeted analysis of physician shortages is possible through bringing together these and other ongoing data collection efforts, with the goal of improving the identification of the state's "critical shortage areas".

Areas of "critical shortage" for the state would likely include those regions or localities experiencing both high rates of disease and health needs, as well as prolonged physician shortages or vacancies. Critical shortage area identification is especially relevant in developing responsive strategies to impact physician supply for rural and underserved areas. Many existing frameworks for understanding needs for these areas, such as federal health professional shortage designations have limitations that have been recognized by state workforce partners.

Tools to share and recognize the areas in the state with critical needs would assist planners, policymakers and health system stakeholders in evaluating the extent to which progress is being made in addressing health workforce shortages. GME institutions and agencies such as PMTC could benefit from information that allows them to emphasize and prioritize programs matching physicians with the areas of greatest need for their future services. Shared goals for the overall health system, including reducing vacancies for providers and improving access to care would more easily be evaluated with better, more customized datasets.

States such as California and North Carolina have adopted these types of collaborative data strategies through their development of mechanisms such as online 'health workforce

clearinghouses'.³⁸ (California Office of Statewide Health Planning and Development, 2017) Clearinghouses provide services to standardize and regularly release health workforce data, which in turn can be used by state and private stakeholders to produce analytics and regular reports on overall health workforce supply. As a mechanism for producing workforce supply reports, a key strategy for other states was to ensure existing data collection systems, such as those already in place by licensure boards collected 'minimum data sets' of key information. Essential elements of data that can be collected by licensure boards include physician practice location, age, retirement status and specialty. Standardizing data collection among MD and DO boards, for instance, allowed for more consistent reporting of annual physician supply, in states such as North Carolina.

Committee members of the GME Workgroup have identified potential partners such as the AAMC Center for Workforce Studies that can train and partner with states in advancing their capabilities to analyze their health workforce shortages. The development of a formal proposal for recommended training in health workforce analytics has been discussed by members of the Health Workforce Subcommittee in recent meetings in 2017 and will become a primary focus of future discussions.

3) ROBUST RECRUITMENT AND RETENTION STRATEGIES

The Health Workforce Subcommittee has concluded that it is advantageous to leverage existing PMTC authority to improve state loan repayment programs so that Oklahoma can bolster efforts to recruit additional health professionals. Statutory authority for the agency as a whole and its specific Medical Loan Repayment and physician scholarship programs allows the agency to obligate and match funds for the purpose of recruiting and retaining health professionals.³⁹

The PMTC has been highly effective in developing new and innovative ways to identify state priorities and create tools that leverage public and private funding in collaborative ventures to recruit the providers the state needs in rural and underserved areas. One recent example is PMTC's Oklahoma Medical Loan Repayment which is designed to leverage public/community funds and Tobacco Settlement Endowment Trust (TSET) funds with federal matching dollars to offer a maximum of \$160,000 for primary care physicians who complete a four-year service obligation to a rural community. PMTC's existing authority to match state appropriated funds with those enhanced by the federal government allows the state to maximize its investment by drawing down additional dollars to expand the impact of health workforce recruitment programs. Sustaining and improving state funding for PMTC permits valuable additional loan repayment dollars, matched through communities and the OHCA FMAP to benefit the state.

4) IDENTIFY KEY ECONOMIC FACTORS FOR SUCCESSFUL PRACTICES THROUGH RESEARCH TO INFORM POLICY CHANGE

Prolonged shortages of physicians across the state, if not addressed, are likely to be a factor contributing to health systems consequences ranging from extended vacancies to facility closure. Closure of rural hospitals and medical practices is an issue of particular concern for the health and economic livelihood of rural areas. This relationship has been nicely demonstrated by the University of North Carolina's Rural Health Research Program which identified four financially distressed hospitals, all in rural areas ending inpatient or all clinical operations within the past five years.⁴⁰ Closure of these facilities impacted the sustainability of efforts to recruit

physicians in areas of high need, as those areas no longer had the necessary clinical supports and medical ecosystem to support newly relocated physicians.

While research on the economic benefits associated with physicians and health systems contributions exists, delving further into the specific economic and policy factors which enable these systems to thrive must be properly understood to monitor the impact of changes throughout the health system. Because Oklahoma's policy and economic environment is subject to a number of external and internal dynamics, including federal policy, health system and labor market trends, research specific to Oklahoma will be critical.

An innovative strategy, consistent with the economic alignment vision of the state's Health Workforce Subcommittee involves strengthening the state's resources for research in the economic considerations inherent in retaining an adequate health workforce. For example, quantifying the degree to which barriers hinder the success of rural practices can support targeted strategies to achieve greater retention. Rural practices often face challenges including lower volume, lower population density and challenges with technological infrastructure. All of these factors lead to reduced economic incentives for recruiting and maintaining employment for physicians in rural practices. The Health Workforce Subcommittee's recent discussions have contributed to insightful research proposals, such as the creation of a 'rural practice fragility' index which could help to measure the key factors that reduce the ability of a rural medical practice to succeed and retain physicians.⁴¹ The integration of the Health Workforce Subcommittee's efforts into the work of the Governor's Council for Workforce and Economic Development to assess and regularly monitor the unique workforce needs of local areas are also highly relevant to a greater understanding of health system and physician practice needs.

AUTHORS

John Zubialde, MD

Senior Associate Dean, OU College of Medicine.

Ted Haynes, MA

President, Blue Cross & Blue Shield of Oklahoma

Spencer Kusi, MPH

Research Specialist, Center for Health Innovation and Effectiveness, Oklahoma State Department of Health.

DATA SOURCES

¹ American Association of Medical Colleges. 2015 State Physician Workforce Databook: Oklahoma Physician Workforce Profile. <https://www.aamc.org/download/447218/data/oklahomaprofile.pdf>

[http://members.aamc.org/eweb/upload/2015StateDataBook%20\(revised\).pdf](http://members.aamc.org/eweb/upload/2015StateDataBook%20(revised).pdf)

² Health Resources and Services Administration. Fact Sheet: Distribution of U.S. Health Care Providers Residing in Rural and Urban Areas. <https://bhwh.hrsa.gov/sites/default/files/bhw/nchwa/nchwafactsheet.pdf>

³ Rural Health Information Hub. Rural Health Workforce. <https://www.ruralhealthinfo.org/topics/health-care-workforce>. February 21st, 2017. Accessed May 25, 2017.

⁴ OSU Center for Rural Health. OSIM State Health System Innovation Plan – Appendices Prepared for the Oklahoma State Department of Health. <http://osim.health.ok.gov>

⁵ 2015 State Physician Workforce Databook.

⁶ Oklahoma State Department of Health. State Report Card, p. 7. State of the State's Health

<https://ok.gov/health2/documents/SOSH%202014.pdf>

⁷ IHS Insight. 2017 Update: The Complexities of Physicians Supply and Demand: Projections from 2015 to 2030. Final Report.

⁸ The Commonwealth Fund. 2017 State Health System Scorecard.

<http://datacenter.commonwealthfund.org/scorecard/state/38/oklahoma/>

⁹ Centers for Disease Control. Sodium Reduction and Hypertension: Controlling the "Silent Killer". June 2016.

http://www.cdc.gov/globalhealth/healthprotection/ncd/pdf/factsheets/ncd_sodium_reduction_hypertension_01-2016.pdf

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- ¹⁰ Chang, C., O'Malley, A. J., & Goodman, D. C. (2017). Association between Temporal Changes in Primary Care Workforce and Patient Outcomes. *Health Services Research*, 52(2), 634-655.
- ¹¹ U.S. Bureau of Economic Analysis, 2015 Total Full-Time and Part-Time Employment by NAICS Industry. <https://www.bea.gov/iTable/iTable.cfm?reqid=70&step=1&isuri=1&acrdn=2#reqid=70&step=1&isuri=1> (accessed July 2017)
- ¹² U.S. Bureau of Economic Analysis, Regional Input-Output Modeling System (RIMS II). <https://www.bea.gov/regional/rims/index.cfm>
- ¹³ IMS Health. The National Economic Impact of Physicians: National Report, prepared for the American Medical Association. March 2014.
- ¹⁴ State Chamber of Oklahoma Research Foundation ACE Book 2016: Accountability for A Competitive Economy.. <https://www.okstatechamber.com/sites/www.okstatechamber.com/files/ACEBook-2016.pdf>
- ¹⁵ Oklahoma Employers Health and Wellness Survey https://www.ok.gov/health/Organization/Office_of_Communications/News_Releases/2014_News_Releases/Oklahoma_Employers_Health_and_Wellness_Survey.html
- ¹⁶ Merrit Hawkins. 2017 Review of Physician and Advanced Practitioner Recruiting Incentives. An Overview of the Salaries Bonuses, and Other Incentives Customarily Used to Recruit Physicians, PAs and Nurse Practitioners.
- ¹⁷ Holmes, George M., et. Al. The Effect of Rural Hospital Closures on Community and Economic Health. *Health Services Research*.
- ¹⁸ OSDH Analysis of 2016-2017 data from the Accreditation Council for Graduate Medical Education (ACGME) and the American Osteopathic Association (AOA).
- ¹⁹ RAND Corporation. Does It Cost More to Train Residents or to Replace Them: A Look at the Costs and Benefits of Operating Graduate Medical Education Programs, 2013.
- ²⁰ Congressional Research Service. Federal Support for Graduate Medical Education: An Overview. <https://fas.org/sqp/crs/misc/R44376.pdf>
- ²¹ RAND Corporation.
- ²² Oklahoma Watch. Is Your Local Hospital Making or Losing Money?. <http://oklahomawatch.org/2013/10/25/is-your-local-hospital-making-or-losing-money/> Accessed June 2017.
- ²³ AHA Trendwatch: Teaching Hospitals: Preparing Tomorrow's Physicians Today. June 2015.
- ²⁴ Schutte, Lori. What You Don't Know Can Cost You: Building a Business Case for Recruitment and Retention Best Practices. Association of Staff Physician Recruiters, <http://www.aspr.org/?696>
- ²⁵ American Association of Medical Colleges Medical Student Education: Debt, Costs, and Loan Repayment Fact Card. October 2016. https://members.aamc.org/eweb/upload/2016_Debt_Fact_Card.pdf
- ²⁶ Pathman, DE, et. Al. Outcomes of States' Scholarship, Loan Repayment, and Related Programs for Physicians. *Med Care*. 2004; 42: 560-568.
- ²⁷ University of Wisconsin Population Health Institute, What Works for Health – Higher Education Financial Incentives for Health Professionals Serving Underserved Areas. <http://whatworksforhealth.wisc.edu/program.php?t1=22&t2=16&t3=111&id=28>
- ²⁸ American Association of Medical Colleges. State and Federal Loan Repayment, Scholarships. https://services.aamc.org/fed_loan_pub/index.cfm
- ²⁹ Lapolla, Michael. Twenty-Five Years; Oklahoma Physician Manpower Training Commission – A Health Policy Report. OSU Center for Health Sciences. October 2001.
- ³⁰ Kaiser Family Foundation (FMF) – Oklahoma. <http://www.kff.org/medicaid/state-indicator/federal-matching-rate-and-multiplier>
- ³¹ Fagan, E. Migration After Family Medicine Residency: 56% of Graduates Practice Within 100 Miles of Training. *Am Fam Physician*. 2013;88(10) <http://www.graham-center.org/rgc/publications-reports/publications/one-pagers/migration-after-residency-2013.html>
- ³² 2015 State Physician Workforce Databook.
- ³³ Rural Medical Track Brochure, OSU Center for Health Sciences. <http://www.healthsciences.okstate.edu/com/admissions/docs/Rural%20Medical%20Track%20Brochure.pdf>
- ³⁴ OU Medicine Magazine. Relations Key in Rural Medicine Residency, Fall/Winter 2016. <https://hippocrates.ouhsc.edu/comweb/oumedicine/2016Fall/>
- ³⁵ What Works for Health – Rural Training in Medical Education <http://whatworksforhealth.wisc.edu/program.php?t1=22&t2=16&t3=111&id=362>
- ³⁶ Oklahoma Health Workforce Action Plan (OHWAP): Building a Transformed Health Workforce: Moving From Planning to Implementation. <https://www.ok.gov/health2/documents/Health%20Workforce%20Policy%20Academy%20Action%20Plan%20Final%2010-20no%20comments.pdf>
- ³⁷ NGA. Advancing Sustainable Improvements in Population Health: Integration Population Health into Statewide System Transformation. <https://www.nga.org/files/live/sites/NGA/files/pdf/2017/1703HealthPopulationRoadmap.pdf>
- ³⁸ California Office of Statewide Health Planning and Development. Health Workforce Clearinghouse. <http://oshpd.ca.gov/HWDD/Clearinghouse.html>

³⁹ 70 O.S. § 625.2, 63 O.S. §1-2721 as summarized on the Physician Manpower Training Commission website. <http://pmtc.ok.gov/statutes-and-rules> Accessed September 2017.

⁴⁰ Sheps Center for Rural Health Research. Rural Hospital Closures: January 2010-Present.

<http://www.shepscenter.unc.edu/programs-projects/rural-health/rural-hospital-closures/>

⁴¹ Nagykaldi Z, Zubialde J, Mold JW. Developing a Primary Care Practice Fragility Index. Poster Presentation, Annual North American Primary Care Research Group (NAPCRG) Meeting, June 23, 2017. Bethesda, MD.