

Trinity College

Trinity College Digital Repository

Masters Theses

Student Scholarship

Spring 2018

Physician Shortage or Allocation Problem? A Comprehensive Analysis of The Primary Care Physician Shortage Rurally In the United States

Mazin E. Khalil

Trinity College, Mazin.Khalil.2015@trincoll.edu

Follow this and additional works at: <https://digitalrepository.trincoll.edu/grad>



Part of the [Public Policy Commons](#), and the [Social Policy Commons](#)

Recommended Citation

Khalil, Mazin E., "Physician Shortage or Allocation Problem? A Comprehensive Analysis of The Primary Care Physician Shortage Rurally In the United States" (2018). *Masters Theses*. 28.

<https://digitalrepository.trincoll.edu/grad/28>

This Thesis is brought to you for free and open access by the Student Scholarship at Trinity College Digital Repository. It has been accepted for inclusion in Masters Theses by an authorized administrator of Trinity College Digital Repository.

Trinity College
HARTFORD CONNECTICUT

TRINITY COLLEGE

Master's Thesis

Physician Shortage or Allocation Problem? A Comprehensive Analysis of The
Primary Care Physician Shortage Rurally In the United States

submitted by

Mazin Khalil, 2018

In Fulfillment of Requirements for
the Degree of Master of Arts

Advisor: Prof. Maurice Wade

Spring 2018

Table of Contents

ACKNOWLEDGEMENTS	3
INTRODUCTION.....	4
TERMINOLOGY	10
SHORTAGE PROBLEM.....	17
ISSUES WITH ANALYZING SHORTAGE.....	26
THE AFFORDABLE CARE ACT AND ITS ROLE IN THE SHORTAGE	29
ALLOCATION PROBLEM.....	32
ANALYZING THE ALLOCATION THEORY PROBLEM	35
SOLUTIONS	37
INCREASED SUPPLY OF PHYSICIANS	40
LOAN-DEBT FORGIVENESS AND SCHOLARSHIPS	43
INCREASING PHYSICIAN PRODUCTIVITY	45
INTRODUCTION TO PHYSICIAN-EXTENDERS	46
COSTS	48
THE ROLE OF PHYSICIAN-EXTENDERS IN THE PHYSICIAN SHORTAGE.....	50
CHINA	54
AUSTRALIA	61
RECOMMENDATIONS.....	68
CONCLUSION	72
REFERENCES.....	73

Acknowledgements

I want to take this time to out to thank everyone who has been supportive of me throughout these past two years. That support means the world to me. In thanking everyone, I would like to first state Praise Be to Allah for allowing me to complete this project and make it through these two years. I would like to offer my thanks to the late night library Thesis Crew consisting of Malin Evertsz-Mendez '18, Suzanne Del Rosario '18, Giselle Galan '18, Gianna Moreno '20, Khameelah Bailey '18, and Neve Rivera '20. Without the aforementioned people pushing me to keep writing and making nightly appointments to meet in the library to finish our respective writing assignments, this project may not have been completed. The words “thank you” cannot convey the gratitude that I feel for having your collective support. I could not have completed this program without one person, my Posse sister, Taniqua Huguley '15, MA '17, who looked out for me, fed me, and was a constant support throughout these two years. You've been my rock during our undergrad career and have remained my rock during our graduate studies as well. “I wouldn't have graduated college if I hadn't had you,” and wouldn't have graduated from graduate school if I didn't have you. I would also like to my advisor, Professor Maurice Wade, for agreeing to work on this project with me and for all of the support and encouragement that he has provided me. Without your guidance, this would not be possible. Finally, I would like to thank my family for their support in everything, without you all, none of this would be possible. I hope this has made you all proud and that I can continue to work to make you proud.

Introduction

There is currently widespread panic that the United States is undergoing a shortage of physicians nationally and in particular in the primary care discipline in rural areas. Primary care is not a single discipline, but is comprised of “family physicians, general internists, geriatricians, and general pediatricians.”¹ Nurse practitioners, physician-assistants, pharmacists, medical assistants, health educators, and other healthcare workers are also contributors to the primary care workforce, although the term “primary care” is typically used in reference to the physicians. Services by primary care practitioners can take place in varying settings, from hospital outpatient departments/clinics, community health centers, and small or medium sized private practices.² Most primary care physicians however practice in small settings, with only approximately 7% working in organizations that have more than eleven physicians.³ Of the nation’s current primary care physician population, approximately half conduct business in an office with one or two other physicians.⁴ Although primary care physicians do operate out of hospital outpatient departments, these are outliers, and are located in urban settings that have large teaching hospitals. Therefore, primary care is considered a “cottage-industry” which is a business conducted in a person’s home, meaning in an environment that is personal, small, and intimate.

¹ Bodenheimer, T., & Pham, H. (2010). Primary Care: Current Problems and Proposed Solutions. *Health Affairs*, 29 (5), 799-805.

² Bodenheimer, T., & Pham, H. (2010). Primary Care: Current Problems and Proposed Solutions. *Health Affairs*, 29 (5), 799-805.

³ Bodenheimer, T., & Pham, H. (2010). Primary Care: Current Problems and Proposed Solutions. *Health Affairs*, 29 (5), 799-805.

⁴ Bodenheimer, T., & Pham, H. (2010). Primary Care: Current Problems and Proposed Solutions. *Health Affairs*, 29 (5), 799-805.

Private primary care practices operate on a fee-for-service basis, but are paid significantly less for certain services than other disciplines. For example, a primary care physician who provides counseling to patients with diabetes would be paid significantly less than a specialist who performs imaging services.⁵ Moreover, primary care physicians are often not reimbursed for any care services “performed outside of patient visits” or for coordinating care.⁶

Primary care however, is beginning to change. The number of private practices is decreasing due to payment rates, as well as hospitals purchasing private practices. The fact that reimbursement rates for primary care physicians as compared to specialists, coupled with the immense amount of debt that residency students are incurring has caused them to abandon the tradition of private practices and instead join large organizations.

In the mid-1990s, primary care saw a resurgence with an increase from “67 to 90 per 10,000 population.”⁷ Along with an increase of supply, the percentage of medical students planning to pursue primary care rose by a span of 25% in 5 years, from 15% in 1992 to 40% in 1997.⁸ By the late 1990s however, health maintenance organizations (HMOs), which structured their care structure systems upon the molds of primary care

⁵ Bodenheimer, T., & Pham, H. (2010). Primary Care: Current Problems and Proposed Solutions. *Health Affairs*, 29 (5), 799-805.

⁶ Bodenheimer, T., & Pham, H. (2010). Primary Care: Current Problems and Proposed Solutions. *Health Affairs*, 29 (5), 799-805.

⁷ Bodenheimer, T., & Pham, H. (2010). Primary Care: Current Problems and Proposed Solutions. *Health Affairs*, 29 (5), 799-805.

⁸ Bodenheimer, T., & Pham, H. (2010). Primary Care: Current Problems and Proposed Solutions. *Health Affairs*, 29 (5), 799-805.

gatekeepers, were beginning to decline.⁹ There was fear that there would be too many physicians and this is where the rapid decline of primary care physicians began. The fear was further exasperated by the fact that having too many physicians would lead to increasing healthcare costs, as physicians generally could acquire income irrespective of patient demand.¹⁰ In addition, despite more duties being required of physicians, the income gap between primary care physicians and their counterparts who had specialized continued to widen. Having more physicians than the demand required meant that an oversupply of physicians would drain taxpayer dollars in training physicians that would not be needed. Thus, in 1996, a report titled *The Nation's Physician Workforce: Options for Balancing Supply and Requirements* was released by the Institute of Medicine, which stated that an immediate need for reducing the number of physicians-in-training was needed. The report proposed that this could be done by limiting medical school slots and slashing funding for post-medical graduate education, namely, residency programs. The rationale behind the report was due to the fact that the number of physicians had increased by 1.5 times the rate of the population between 1970 and 1992, whereas healthcare expenses and quality did not increase.¹¹ According to the report, this meant that an oversupply of physicians was occurring and would continue. Following this report, in 2001, the Association of American Medical Colleges (AAMC) hosted a colloquium in which it stated that the physician supply-to population ratio had finally

⁹ Bodenheimer, T., & Pham, H. (2010). Primary Care: Current Problems and Proposed Solutions. *Health Affairs* , 29 (5), 799-805.

¹⁰ Mitka, M. (2007). Looming Shortage of Physicians Raises Concerns About Access to Care. *Journal of American Medical Association* , 297 (10), 1045-1046.

¹¹ Mitka, M. (2007). Looming Shortage of Physicians Raises Concerns About Access to Care. *Journal of American Medical Association* , 297 (10), 1045-1046.

evened out and reached equilibrium.¹² By 2005 however, the Council of Graduate Medical Education (COGME), which was chaired by AAMCs, changed its tone and forecasted a shortage of about 85,000 physicians by 2020.¹³ In order to avoid the looming shortage of physicians forecasted by COGME, AAMCs responded by issuing a call-to-action of a 30% increase of medical school enrollment “over a 10-year period through the expansion of existing programs and the creation of new ones”.¹⁴ The only issue that both AAMCs and COGME failed to note was that the populations in question, the Baby Boomers, were soon going to reach the twilight of their professional careers and were to look forward towards their retirements soon. Thus, the most important factor that escaped both AAMCs and COGME was that the population was one that was aging. For this reason, calculating the physician supply is a difficult one because not only is the amount of physicians present an important factor, along with projected future physicians (which according to Kaplan, in 2015, approximately 39.3% of medical school applicants matriculated as medical school students), but also population growth, estimated disease patterns, and means of healthcare delivery.^{15, 16} Given the aforementioned statistics about medical school applicant matriculation, some have theorized that one of the many factors contributing to the nation’s current and looming epidemic of physician shortages is low

¹² Mitka, M. (2007). Looming Shortage of Physicians Raises Concerns About Access to Care. *Journal of American Medical Association* , 297 (10), 1045-1046.

¹³ Mitka, M. (2007). Looming Shortage of Physicians Raises Concerns About Access to Care. *Journal of American Medical Association* , 297 (10), 1045-1046.

¹⁴ Mitka, M. (2007). Looming Shortage of Physicians Raises Concerns About Access to Care. *Journal of American Medical Association* , 297 (10), 1045-1046.

¹⁵ *Med School Admissions by the Numbers*. (2016, 10 03). Retrieved from Kaplan: <https://www.kaptest.com/blog/med-school-pulse/2016/10/03/med-school-admission-by-the-numbers/>

¹⁶ Mitka, M. (2007). Looming Shortage of Physicians Raises Concerns About Access to Care. *Journal of American Medical Association* , 297 (10), 1045-1046.

acceptance rates. Others hypothesize that the issue at hand is an issue of allocation whereby there are enough physicians, just not appropriately dispersed across the nation, rather than an actual shortage. Statistics currently show that 55% of physicians in the work force are above the age of 65^{17, 18, 19, 20, 21}. This means that more than half of current physicians are nearing retirement age. Coupling the statistic that 55% of physicians in the workforce are above the age of 65, and that Americans over the age of 65 currently outnumber those who are younger, with the fact that 20% of the nation lives in healthcare professional shortage areas, makes for a crisis because American society and physicians are aging, while simultaneously not having enough physicians to look after those in underserved regions.²² The population of Americans 65 years of age or older by 2030 will equal approximately 70 million, who will require twice as many physician visits as those younger than 65.

This paper seeks to address the meaning of supply and demand as it relates to physician shortages, the claim that there is an actual shortage problem and the theory that

¹⁷ American Association of Medical Colleges. (2017, 03 14). *New Research Reaffirms Physician Shortage*. Retrieved from American Association of Medical Colleges: https://news.aamc.org/press-releases/article/workforce_projections_03142017/

¹⁸ *New Research Confirms Looming Physician Shortage*. (2016, 04 05). Retrieved from Association of American Medical Colleges: https://www.aamc.org/newsroom/newsreleases/458074/2016_workforce_projections_04052016.html

¹⁹ Marcus, M. B. (2017, 03 20). *New report predicts "troubling" shortage of doctors in the US*. Retrieved from CBS: <https://www.cbsnews.com/news/doctor-shortage-us-impact-on-health/>

²⁰ Moawad, H. (2017, 05 22). *Can the looming physician shortage be stopped?* Retrieved from Medical Economics: <http://medicaleconomics.modernmedicine.com/medical-economics/news/can-looming-physician-shortage-be-stopped>

²¹ Rovner, J. (2014, 11 24). *Is the US really facing a serious doctor shortage?* Retrieved from PBS: <http://www.pbs.org/newshour/rundown/u-s-really-facing-serious-doctor-shortage/>

²² Kirch, D., & Vernon, D. (2008). *Confronting the Complexity of the Physician Workforce Equation*. *Journal of American Medical Association*, 299 (22), 2680-2682.,

the issue is not one of a shortage but simply a misallocation of physicians, and explores some potential solutions to the issue with case studies highlighting China, and Australia, which have faced similar issues and have utilized innovative approaches to dealing with their problems.

Terminology

Prior to beginning the discussion of whether there actually exists a shortage of physicians in the United States, or whether what the US is facing is simply a misallocation of physicians, it is imperative to define supply and demand so that the terminology being used is uniform.

One of the issues surrounding the conversation of what is occurring in the US is the fact that there appears to be an issue of communication. In health economics literature, a “difficulty lies in the failure of economists and health professionals to fully communicate when using their respective terminology.”²³ Jeffers, Bognanno, and Bartlett explain that the term “demand” is found “most frequently in the writings of medical economists,” whereas “need” can be found in the writings of “health professionals, commissions, and agencies.”²⁴ The confusion is further compounded by “the fact that the two terms are used interchangeably” which leads to more confusion and “lack of understanding concerning the differences between them.”²⁵ These terms are not even differentiated in “the reports of various committees and special commissions” tasked with “estimating the magnitude of the current and future shortages of medical services.”²⁶

Thus, an important piece of examining and analyzing whether what is occurring currently

²³ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

²⁴ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

²⁵ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

²⁶ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

in the United States constitutes a shortage or not, involves observing who the author of a given piece is and noting their profession. This is important because as was previously mentioned, authors who are economists use different terminology and language than authors who are medical professionals, thus, the conversation is not understood because despite using the same words, the two groups are using them to mean completely different things.

Another issue noted about the terminology used by committees and special commissions tasked with determining the magnitude of the shortage (both current and future) is that they do not differentiate between the “quantity [of physicians] needed” and the “quantity demanded.”²⁷

A need for medical services is defined as “the quantity of medical services that [members of a community] ought to consume over a specified time period in order to remain or become “healthy” as is permitted by medical knowledge.”²⁸ Thus, a need is derived from the opinion of a medical expert. In order to be able to provide such an expert opinion, “perfect knowledge of the state of its [the community’s] members’ health, the existence of a well-defined standard of what constitutes “good health,” and perfect knowledge of what modern medicine can do to improve ill (or below standard) health.”²⁹

In addition to requiring perfect knowledge of the state of members’ health, what

²⁷ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

²⁸ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

²⁹ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

constitutes “good health,” and perfect knowledge of the powers of modern medicine, diagnostic procedures must also be up to par, as they provide the previously mentioned criteria.³⁰ Therefore, it is impossible to accurately measure “needs” as current diagnostic procedures are not capable of providing such information. Moreover, since “good health” is subjective, as different groups necessitate different factors to be in “good health”, there is no “clear-cut consensus as to what constitutes “good health”” even amongst health professionals.³¹ Despite this, a study to quantify need was conducted by Dr. Roger Lee and Dr. Lewis Jones. In this novel study, the two doctors consulted a panel of experts about the estimated number of physician hours (the time that a physician works) that would be required to “prevent, diagnose, and treat a list of specific diseases and conditions of illness.”³² Following the derivation of the estimated number of physician hours, the physician hours were then converted into an approximation of the number of physicians needed. Jeffers et al note that something that is important is that “in many cases, the population in question may view its own health needs as something other than what the medical profession views them as.”³³ Differences in consumer wants and what medical professions view as needs are attributed to “embarrassment which accompanies delivery [of medical services],” “inertia,” and the most significant is consumer

³⁰ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

³¹ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

³² Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

³³ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

ignorance.³⁴ Because most populations are ignorant as to what is considered medically sufficient and what comprises “good health,” they are also not aware of the capabilities and limitations of modern medicine.³⁵ Additionally, as medicine advances, consumer knowledge lags, so the knowledge gap widens. As Jeffers et al explain,

the lower a given population’s cultural, educational, and social status, and the more restrictive in terms of the consumption of medical services are its collective religious [not actually referencing religion, but belief systems that populations may have about medicine], the greater the gap between wants and needs.³⁶

Demand, on the other hand, stems from populations “attempting to satisfy their psychologically formulated wants.”³⁷ In order to evaluate the market, economists try to assume potential wants, and from there, infer the preferences of populations based upon wants. From the wants, they can then determine and graph “market consequences of any given set of tastes and preferences.”³⁸ Because the market functions on the exchange of money for goods and services, and since most consumers have finite amounts of money, they can not buy all of the goods that they want. Thus, Jeffers et al explain that consumers mix and match to be able to purchase the maximum amount of goods that can

³⁴ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

³⁵ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

³⁶ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

³⁷ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

³⁸ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

satisfy them with their finite amounts of money, given the prices of the market.³⁹ Thus, the amount of medical services “demanded” depends not only on the availability of the medical services, but also on the “collective consumer wants [which are their tastes and preferences], the price of medical services, the price of alternative goods and services, the size of the population, and the financial resources available to its members.”⁴⁰

Consequently, Jeffers et al defined the economic concept of a given population’s demand for medical services as:

*A multivariate functional relationship between the quantities of medical services that its members desire to consume over a relevant time period at given levels of prices of goods and services, financial resources, size and psychological wants of a population as reflected by consumer tastes and preferences for (all) goods and services.*⁴¹

With a formula of $q_{ms} = f(P_{ms}, P_0, F, N, W)$ where q_{ms} is the amount of medical services demanded, P_{ms} is the prices of medical services, P_0 is the prices of alternative goods and services, F is the amount of money that consumers with the population have, N is the size of that population, and W is the collective wants for all goods and services (this includes medical services).⁴² Hence, the need for medical services as seen through the perspective of the medical profession is correlated to the quantity of medical services “that expert

³⁹ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

⁴⁰ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

⁴¹ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

⁴² Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

medical opinion” not only considers available, but also accessible to members so that they can meet the “standards of good health.”⁴³

Need is independent of the prior mentioned factors (prices of medical services, financial resources, etc.). Assuming that a particular population knows what constitutes “good health” according to health standards, and has expert knowledge of the potential of modern medicine, the medical services wanted will be equal to that of the medical services needed. Will this hypothetical population be able to acquire all of the medical services that it wants? The answer to the question is no. The reason for this is that despite all of the perfect conditions, this population has limited buying power, so therefore, their finite money would expire. Since the “limiting step” is the finite financial resources that a population has, they are likely to compromise and consume less goods and services.

Demand however is not like need and is not independent of factors such as price, resources, and knowledge. Assuming that our aforementioned hypothetical population has perfect health, any other increase in information will affect demand either positively (increasing it) or negatively (decreasing it).⁴⁴

To this point, need and demand have been explained with examples for further clarify how they pertain to populations. To elide the two for the concept of shortage, one must acknowledge that like other goods, medical services are not free. Thus, not everyone will be able to purchase all of the medical services that they want due to finite money. Hence, because medical services are not free and because not everyone will have

⁴³ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

⁴⁴ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

the ability to purchase the medical services that they want, it is reasonable to ascertain that a majority of the medical needs in the US are not being met. Therefore, this situation is defined as a “crisis,” which is the “quantity of medical services currently being consumed is less than the quantity that *ought* to be consumed, meaning the amount that is actually needed.”⁴⁵ Even in a situation where money was infinite, where medical services were perfect, the prices of goods was stable according to consumer wants and needs (there is an equilibrium), then a shortage would still exist because the consumption of services would not be where it should be because medical knowledge would not be up to par since the needs and wants of that population would never be up to “good health” standards.⁴⁶ Thus, even if the market is perfect for medical services, a “shortage” would be considered a “value judgment based on non-market criteria.”⁴⁷ Additionally, consumers can not simply consume the amount of medical services that they “need” due to aforementioned restrictions like money, market value, preferences and availability of preferences; the fact that consumers are not able to consume the amount of services they need is not due to their own shortcomings, but as is put, “is much an economic “fact of life.”⁴⁸

⁴⁵ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

⁴⁶ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

⁴⁷ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

⁴⁸ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

Shortage Problem

In 1997, six organizations came together to conduct a study on the state of physicians in the United States of America. This six-organization panel concluded its findings by stating that there would be a surplus of physicians occurring in the future. Due to the findings and reporting of the panel, policy suggestions were made, with policy then being reformed based on the premise that there would be a physician surplus. However, due to single variable focus (where the focus primarily lies on one of many factors), alongside the findings of the six-organization panel, a pre-emptive national shift into other disciplines of medicine began what would become the physician shortage. Kirch and Vernon have broken down the problem of physician shortages by identifying key variables affecting supply and demand.⁴⁹ Key supply affecting variables include “physician retirement patterns, sex and generational differences in work patterns, length of training, education cost and debt, US MD and DO program enrollment, IMG (international medical graduate) importation, and number of residency positions.”⁵⁰ Key demand-affecting variables include “reforms in insurance coverage and reimbursement, delivery system changes, introduction of new technologies, nurse practitioner and physician assistant production, geographic distribution of clinicians, overall status of the economy, and the growth, aging, and health care use patterns of the population.”⁵¹ Of these factors, Kirch and Vernon have found that physician sex and generational

⁴⁹ Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association*, 299 (22), 2680-2682.,
D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association*, 299 (22), 2680-2682.

⁵⁰ Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association*, 299 (22), 2680-2682.,

⁵¹ Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association*, 299 (22), 2680-2682.,

differences are “emerging as major factors.”⁵² Physician sex and generational differences are major factors because half of medical school matriculants at the time were women, “younger physicians in general are expressing different expectations regarding work-life balance than older physicians.”⁵³ When surveyed, 71% of physicians younger than 50 years old stated that family/personal time was very important, while 42% said that long-term income potential, meaning the work was more important than family and personal time, was very important.⁵⁴ Kirch and Vernon have also found that only 72% of women are active full time in medicine as compared to 97% of their male counterparts. The disparity is attributed to family rearing, research interests and the like.⁵⁵ Kirch and Vernon conclude that in the future, it will be difficult to accurately predict and calculate the number of “clinical full-time equivalents” that will be part of the total physician workforce.⁵⁶

Of the major factors affecting demand, highlighted were the use of nonphysician professionals (NPPs) also referred to as physician-extenders.⁵⁷ The duo explain that nurse

⁵² Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association*, 299 (22), 2680-2682.,

⁵³ Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association*, 299 (22), 2680-2682.,
al of American Medical Association, 299 (22), 2680-2682.

⁵⁴ Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association*, 299 (22), 2680-2682.,
al of American Medical Association, 299 (22), 2680-2682.

⁵⁵ Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association*, 299 (22), 2680-2682.,
al of American Medical Association, 299 (22), 2680-2682.

⁵⁶ Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association*, 299 (22), 2680-2682.,
al of American Medical Association, 299 (22), 2680-2682.

⁵⁷ Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association*, 299 (22), 2680-2682.,
al of American Medical Association, 299 (22), 2680-2682.

practitioners and physician assistants equate to approximately 120,000 and 68,000 individuals in the workforce respectively.⁵⁸ Predictions for nonphysician professionals/physician-extendors are that they will eventually replace primary care physicians, although this prediction is obscure and not clear. Other predictions for nonphysician professionals/physician-extendors are that they will have “increased roles as members of medical-surgical specialty care teams.”⁵⁹

The American Association of Medical Colleges (AAMCs) has offered multiple predictions using projections about the state of the number of physicians in the US. AAMCs has reported that by 2025, the shortage of doctors in the United States will range from 34,000 to 88,000, with current production rates estimated to not be able to meet demands.⁶⁰ Furthermore, estimates have around 1,700 primary care physician slots being needed by 2035, but with a 10% reduction in ratio of population per primary care physician, 3,000 additional slots would be needed.⁶¹ As it stands, the United States is “ranked 23 out of 28 countries for having fewer practicing physicians per 1,000 people.”

62

⁵⁸ Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association*, 299 (22), 2680-2682., al of American Medical Association, 299 (22), 2680-2682.

⁵⁹ Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association*, 299 (22), 2680-2682., al of American Medical Association, 299 (22), 2680-2682.

⁶⁰ Marcus, M. B. (2017, 03 20). *New report predicts "troubling" shortage of doctors in the US*. Retrieved from CBS: <https://www.cbsnews.com/news/doctor-shortage-us-impact-on-health/>

⁶¹ Marcus, M. B. (2017, 03 20). *New report predicts "troubling" shortage of doctors in the US*. Retrieved from CBS: <https://www.cbsnews.com/news/doctor-shortage-us-impact-on-health/>

⁶² Carroll, A. (2016, 11 07). *A Doctor Shortage? A Closer Look*. Retrieved from NY Times: <https://www.nytimes.com/2016/11/08/upshot/a-doctor-shortage-lets-take-a-closer-look.html?mcubz=1>

According to Liu , by 2030, the number of Americans over the age of 65 will have doubled to approximately 72 million.^{63, 64, 65, 66, 67, 68} Liu explains that with increased age, comes increased continuous visits to the doctors.⁶⁹ Primary care physicians are especially important because as Liu notes, primary care practice serves as the “patient’s first point of entry into the health care system and as the continuing focal point for all needed health services.”⁷⁰ An aging America is an issue because AAMCs projected in 2008 that there

⁶³ Liu, B. (2015, 05 01). *Primary Care Physician Shortage: It Isn't Just About The Physicians*. Retrieved from Standford Journal Of Public Health: <https://web.stanford.edu/group/sjph/cgi-bin/sjphsite/the-looming-primary-care-physician-shortage-why-it-isnt-just-about-the-physicians/>

⁶⁴ Information Handling Services. *The 2017 Update: Complexities of Physician Supply and Demand: Projections from 2015 to 2030*. Retrieved from American Association of Medical Colleges: https://aamc-black.global.ssl.fastly.net/production/media/filer_public/a5/c3/a5c3d565-14ec-48fb-974b-99fafaecb00/aamc_projections_update_2017.pdf

⁶⁵ *New Research Confirms Looming Physician Shortage*. (2016, 04 05). Retrieved from Association of American Medical Colleges: https://www.aamc.org/newsroom/newsreleases/458074/2016_workforce_projections_04052016.html

⁶⁶ American Association of Medical Colleges. (2017, 03 14). *New Research Reaffirms Physician Shortage*. Retrieved from American Association of Medical Colleges: https://news.aamc.org/press-releases/article/workforce_projections_03142017/

⁶⁷ Marcus, M. B. (2017, 03 20). *New report predicts "troubling" shortage of doctors in the US*. Retrieved from CBS: <https://www.cbsnews.com/news/doctor-shortage-us-impact-on-health/>

⁶⁸ Moawad, H. (2017, 05 22). *Can the looming physician shortage be stopped?* Retrieved from Medical Economics: <http://medicaleconomics.modernmedicine.com/medical-economics/news/can-looming-physician-shortage-be-stopped>

⁶⁹ Liu, B. (2015, 05 01). *Primary Care Physician Shortage: It Isn't Just About The Physicians*. Retrieved from Standford Journal Of Public Health: <https://web.stanford.edu/group/sjph/cgi-bin/sjphsite/the-looming-primary-care-physician-shortage-why-it-isnt-just-about-the-physicians/>

⁷⁰ Liu, B. (2015, 05 01). *Primary Care Physician Shortage: It Isn't Just About The Physicians*. Retrieved from Standford Journal Of Public Health: <https://web.stanford.edu/group/sjph/cgi-bin/sjphsite/the-looming-primary-care-physician-shortage-why-it-isnt-just-about-the-physicians/>

would be a shortage of nearly 45,000 primary care physicians (PCPs) by 2020.⁷¹ An aging America is an issue because as Kirch and Vernon state, the elderly require more consistent visits to doctors; with a shortage of physicians, there will be limited personnel capable of taking care of the elderly. The Life Sciences division of IHS Inc., a company hired by the AAMC to investigate the magnitude of the shortage, has estimated the deficit to be anywhere between 14,900 and 35,00 primary care physicians by 2025, and an overall shortage of 61,700 and 94,700 total doctors across all disciplines and specialties within the next decade.^{72, 73} Moawad estimates the total deficit to be between 40,800 and 104,900 doctors in total.^{74, 75, 76, 77, 78} By 2030, the primary care physician deficit is

⁷¹ Information Handling Services. *The 2017 Update: Complexities of Physician Supply and Demand: Projections from 2015 to 2030*. Retrieved from American Association of Medical Colleges: https://aamc-black.global.ssl.fastly.net/production/media/filer_public/a5/c3/a5c3d565-14ec-48fb-974b-99fafaeeeb00/aamc_projections_update_2017.pdf

⁷² Information Handling Services. *The 2017 Update: Complexities of Physician Supply and Demand: Projections from 2015 to 2030*. Retrieved from American Association of Medical Colleges: https://aamc-black.global.ssl.fastly.net/production/media/filer_public/a5/c3/a5c3d565-14ec-48fb-974b-99fafaeeeb00/aamc_projections_update_2017.pdf

⁷³ Information Handling Services. *The Complexities of Physician Supply and Demand: Projections from 2014 to 2016*. Retrieved from American Association of Medical Colleges: https://www.aamc.org/download/458082/data/2016_complexities_of_supply_and_demand_projections.pdf

⁷⁴ Moawad, H. (2017, 05 22). *Can the looming physician shortage be stopped?* Retrieved from Medical Economics: <http://medicaleconomics.modernmedicine.com/medical-economics/news/can-looming-physician-shortage-be-stopped>

⁷⁵ Dill, M. J., & Salsberg, E. S. (2008). *The Complexities of Physician Supply and Demand: Projections Through 2025*. Center for Workforce Studies. http://www.innovationlabs.com/pa_future/1/background_docs/AAMC%20Complexities%20of%20physician%20demand,%202008.pdf

⁷⁶ Marcus, M. B. (2017, 03 20). *New report predicts "troubling" shortage of doctors in the US*. Retrieved from CBS: <https://www.cbsnews.com/news/doctor-shortage-us-impact-on-health/>

estimated to skyrocket to anywhere between 33,500 and 61,800.⁷⁹ Marcus estimates the deficit of non-primary care physicians is trending to be between 33,500 and 61,800 physicians by 2025.⁸⁰ Lakhan and Laird echo similar sentiments as they explain that in recent years, there has been a significant decrease in physicians pursuing primary care as compared to specialists, which have been on a steady rise.⁸¹ The AAMC's 2015 report concurs with the statement, explaining, "the number of PCPs is not keeping up with the pace [of PCPs needed]".⁸² Lakhan and Laird believe the lack of interest in the primary care field can be attributed to the "lack of prestige associated with the field," while Moawad explains that the stress of clinical work has caused doctors to feel burned out, and therefore caused more to pursue non-clinical careers.^{83, 84} The duo also go on to

⁷⁷ Krupa, C. (2010). *Physician shortage projected to soar to more than 91,000 in a decade*. Retrieved from American Medical Education News:

<http://www.amednews.com/static/index.html>

⁷⁸ Petterson, S. M., Liaw, W. R., Tran, C., & Bazemore, A. W. (2015, 03 14). Estimating the Residency Expansion Required to Avoid Projected Primary Care Physician Shortages by 2035. *Annals of Family Medicine* .

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4369588/>

⁷⁹ Marcus, M. B. (2017, 03 20). *New report predicts "troubling" shortage of doctors in the US*. Retrieved from CBS: <https://www.cbsnews.com/news/doctor-shortage-us-impact-on-health/>

⁸⁰ Marcus, M. B. (2017, 03 20). *New report predicts "troubling" shortage of doctors in the US*. Retrieved from CBS: <https://www.cbsnews.com/news/doctor-shortage-us-impact-on-health/>

⁸¹ Lakhan, S., & Laird, C. (2009, 05 09). *Addressing the primary care physician shortage in an evolving medical workforce*. Retrieved from International Archives of Medicine:

<https://intarchmed.biomedcentral.com/articles/10.1186/1755-7682-2-14>

⁸² Information Handling Services. *The 2017 Update: Complexities of Physician Supply and Demand: Projections from 2015 to 2030*. Retrieved from American Association of Medical Colleges: [https://aamc-](https://aamc-black.global.ssl.fastly.net/production/media/filer_public/a5/c3/a5c3d565-14ec-48fb-974b-99fafaeeeb00/aamc_projections_update_2017.pdf)

[black.global.ssl.fastly.net/production/media/filer_public/a5/c3/a5c3d565-14ec-48fb-974b-99fafaeeeb00/aamc_projections_update_2017.pdf](https://aamc-black.global.ssl.fastly.net/production/media/filer_public/a5/c3/a5c3d565-14ec-48fb-974b-99fafaeeeb00/aamc_projections_update_2017.pdf)

⁸³ Lakhan, S., & Laird, C. (2009, 05 09). *Addressing the primary care physician shortage in an evolving medical workforce*. Retrieved from International Archives of Medicine:

<https://intarchmed.biomedcentral.com/articles/10.1186/1755-7682-2-14>

explain several other factors that have contributed to the declining number of primary care physicians, two of the most pressing that they note are the number of medical school student enrollment rates, and the lack of support for international medical students.

Lakhan and Laird theorize that the demographics of students entering medical school are swaying the specializations that are being selecting. In the 1970s, affirmative action was integrated into admissions processes to alleviate the damage done by years of slavery, segregation, to quicken integration, and allow the same opportunities for those who were historically disenfranchised.⁸⁵ The issue with affirmative action however is that post-1996, it was seen as providing an opportunity for unqualified candidates to gain positions that they were not qualified for.⁸⁶ Thus, anti-affirmative action sentiment has been on the rise since 1996, and peaked recently in 2013 and then again in 2016 with the case of Abby Fisher who sued the University of Texas on the basis that she was denied due to a race-based admissions clause. The duo explain that the gap between primary care physicians and other specialties will only continue to widen if lack of diversity is not addressed.⁸⁷ The issue is thus that the physician workforce due to a lack of diversity, is not representative of U.S. demographics, and certainly not representative of shortage areas, which are primarily composed of minorities.

⁸⁴ Moawad, H. (2017, 05 22). *Can the looming physician shortage be stopped?* Retrieved from Medical Economics: <http://medicaleconomics.modernmedicine.com/medical-economics/news/can-looming-physician-shortage-be-stopped>

⁸⁵ Lakhan, S., & Laird, C. (2009, 05 09). *Addressing the primary care physician shortage in an evolving medical workforce*. Retrieved from International Archives of Medicine: <https://intarchmed.biomedcentral.com/articles/10.1186/1755-7682-2-14>

⁸⁶ Lakhan, S., & Laird, C. (2009, 05 09). *Addressing the primary care physician shortage in an evolving medical workforce*. Retrieved from International Archives of Medicine: <https://intarchmed.biomedcentral.com/articles/10.1186/1755-7682-2-14>

⁸⁷ Lakhan, S., & Laird, C. (2009, 05 09). *Addressing the primary care physician shortage in an evolving medical workforce*. Retrieved from International Archives of Medicine: <https://intarchmed.biomedcentral.com/articles/10.1186/1755-7682-2-14>

In the case of international medical students, Lakhan and Laird explain that the negative perception of international medical students as “foreigners taking places that belong to homegrown students” is a large obstacle.⁸⁸ Kirch and Vernon concur by stating that major factors influencing international medical student acceptance in the US include “attitudes [negative perceptions] toward the importation of IMGs from less developed countries, and future competition for IMGs in a truly health services market.”⁸⁹ According to Lakhan and Laird, by 2025, statistics indicate that the number of international medical graduates (IMGs) will balloon to 102,000.⁹⁰ Although IMGs tend to practice in rural areas and regions that are underserved, as well as fill residency positions that pay lower (family medicine, internal medicine, and pediatrics), there are conscious efforts to minimize the number of international applicants by making the competition suffocating and raising the costs of attending school.⁹¹ Kirch and Vernon state that there is a heavy reliance on IMGs to serve in underserved areas via J-1 visa waiver programs.⁹²

⁸⁸ Lakhan, S., & Laird, C. (2009, 05 09). *Addressing the primary care physician shortage in an evolving medical workforce*. Retrieved from International Archives of Medicine: <https://intarchmed.biomedcentral.com/articles/10.1186/1755-7682-2-14>

⁸⁹ Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association*, 299 (22), 2680-2682., *al of American Medical Association*, 299 (22), 2680-2682.

⁹⁰ Lakhan, S., & Laird, C. (2009, 05 09). *Addressing the primary care physician shortage in an evolving medical workforce*. Retrieved from International Archives of Medicine: <https://intarchmed.biomedcentral.com/articles/10.1186/1755-7682-2-14>

⁹¹ Lakhan, S., & Laird, C. (2009, 05 09). *Addressing the primary care physician shortage in an evolving medical workforce*. Retrieved from International Archives of Medicine: <https://intarchmed.biomedcentral.com/articles/10.1186/1755-7682-2-14>

⁹² Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association*, 299 (22), 2680-2682., *al of American Medical Association*, 299 (22), 2680-2682.

Despite more than 25% of first-year residents graduating from medical schools outside of the US, the rate of IMGs in workforce in the US in the future is uncertain.⁹³

In addition to a lack of diversity and efforts preventing international medical students from entering the workforce, Cassil explains that meager salaries, “inadequate funding, and insufficient supply of trained workers” are also driving forces behind the shortage.⁹⁴ Furthermore, Carroll states that finances play a huge role in the primary care physician shortage.⁹⁵ He explains that doctors who choose to specialize end up making more money over their career than primary care physicians. The debt to income ratio is extremely vast, with most medical school students having a debt of over \$180,000 in 2015, while their median income was \$52,000.⁹⁶

⁹³ Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association* , 299 (22), 2680-2682., *Journal of American Medical Association* , 299 (22), 2680-2682.

⁹⁴ Cassil, A. (2008, 09 1). *Rising rates of chronic health conditions: what can be done?* Retrieved from PubMed.gov: <https://www.ncbi.nlm.nih.gov/pubmed/19090046>

⁹⁵ Carroll, A. (2016, 11 07). *A Doctor Shortage? A Closer Look*. Retrieved from NY Times: <https://www.nytimes.com/2016/11/08/upshot/a-doctor-shortage-lets-take-a-closer-look.html?mcubz=1>

⁹⁶ Carroll, A. (2016, 11 07). *A Doctor Shortage? A Closer Look*. Retrieved from NY Times: <https://www.nytimes.com/2016/11/08/upshot/a-doctor-shortage-lets-take-a-closer-look.html?mcubz=1>

Issues With Analyzing Shortages

One of the issues in trying to analyze shortages is due to the fact the perfect, ideal market does not exist. There are several issues with the medical industry with some of the more prominent issues being “restrictions over the education of health professionals, licensing and certification procedures restricting entry into the health professions, and administrative price setting on the part of those managing “not for profit” health facilities.”⁹⁷ Furthermore, because institutions such as the aforementioned are controlled by health professionals, decisions about “what” will be produced, the means of producing, and the consumer demographic tends to be made by health professionals. With this in mind, health professionals often choose quality, over quantity in terms of medical services. However, because health professionals genuinely care for consumers, they will allow anyone to consume the amount of medical services that they need, hence answering the question “who will consume products.”⁹⁸

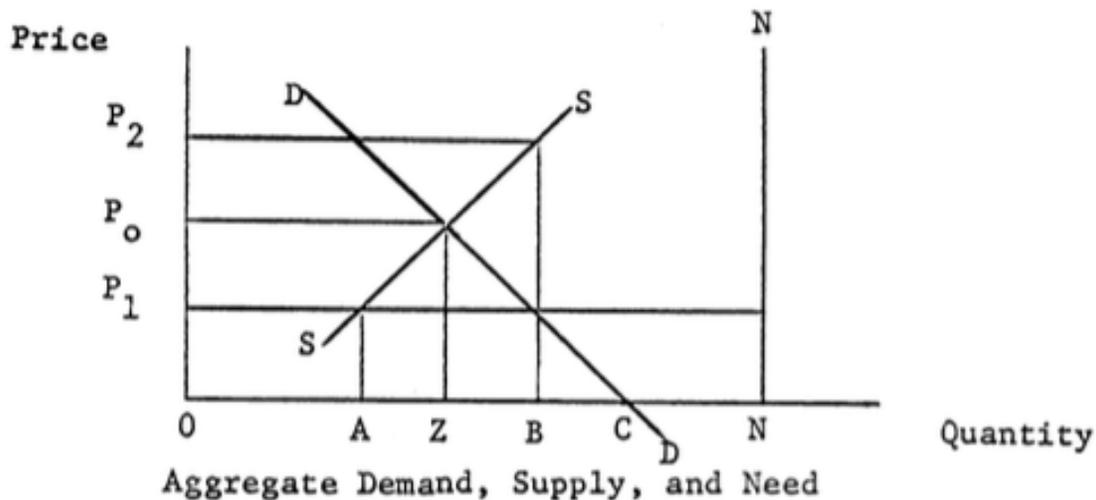
As noted earlier, finances are the limiting factor because consumers can not purchase all of the medical services that they need. In order to make prices affordable so that consumers can get the most pressing ailments taken care of, the medical industry subsidizes services through the use of things like sliding fee, lower charges to those who could not afford payment, and the like. A “market shortage” occurs when the difference between the quantity demanded and the quantity supplied for the price is substantial.

Using the following figure, Jeffers et al have visually represented the shortage as the

⁹⁷ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

⁹⁸ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

quantity of medical services being consumed (OZ) falling below (or short of) the quantity of medical services needed (ON).



Note. From “On The Demand Versus Need for Medical Services and the Concept of Shortage,” by James R. Jeffers, Mario F. Bognanno, and John C. Bartlett, 1971, *American Journal of Public Health*, Vol. 61, No. 1 p. 52. Copyright 1971 by Copyright Holder. Reprinted with permission.

In this figure, DD is aggregate demand of medical services, SS is the aggregate supply of medical services, N is the need, Z is the amount of services consumed, but A and B are not defined.

Professionals who have studied what is occurring in the US have unanimously agreed that what is currently taking place is a “health crisis.”⁹⁹ Evidence for this assertion includes the difficulty in obtaining medical services, which includes longer wait times, appointments that are unevenly distributed in span of time (months apart), the rising costs

⁹⁹ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

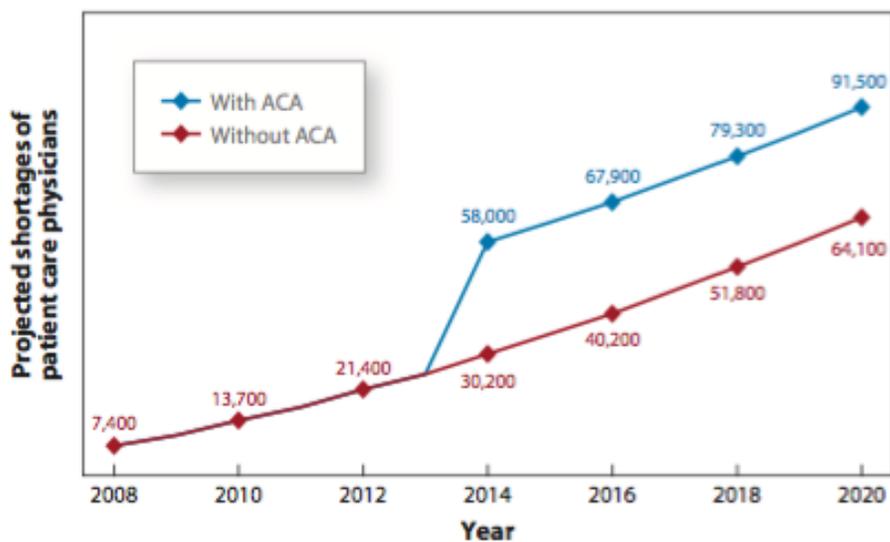
of hospitals and other services (insurance, ambulances, etc.), and the inability for the poor and those who live in rural areas to obtain medical services.¹⁰⁰

Using the figure above, for P_1 which is any given price for services, a “total” shortage exists at $ON-0A$. This kind of shortage is the kind that pieces such as AAMCs and other governmental agencies, panels and commissions try to estimate and recommend policy by which to eliminate. A “total” shortage is composed of a market shortage which is $OB-0A$ and a normative shortage which is $ON-OB$. A normative shortage is the more difficult of the two to sort because it involves intervention in the market. Interventions can come in the form of shifting supply, demand, or in certain cases, both. Examples of these kinds of interventions are subsidizing medical services, building more hospitals, and the like.

¹⁰⁰ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63.anno, & Barlett, 1971

The Affordable Care Act and Its Role in the Shortage

The Affordable Care Act (ACA) was an act seeking to provide coverage for healthcare coverage, particularly insurance that was passed under the Obama in 2010. It was estimated that the ACA would be providing coverage to about 30 million Americans by 2014. Previously, AAMCs predicted a shortage of about 39,600 physicians by 2015, but new predictions using ACA estimates that the shortage will be far more severe with predicted numbers nearing 63,000.¹⁰¹ By 2020, the predicted shortage is approximately 91,500 after the implementation of the ACA, and without the ACA, it would be around 64,100 as is shown in the figure below:



Note. From “Physician Workforce Projections in An Era of Health Care Reform,” by Darrell G. Kirch, Mackenzie K. Henderson, and Michael J. Dill, 2012, *The Annual Review of Medicine*, 63, p. 436. Copyright 2012 by Copyright Holder. Reprinted with permission.

¹⁰¹ Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association*, 299 (22), 2680-2682., Henderson, & Dill, Physician Workforce Projections in an Era of Health Care Reform, 2011

Using the aforementioned statistics, some lawmakers have urged for the repeal of the ACA. The repeal of the ACA is argued from a healthcare perspective for various reasons, with the main ones being that since more people are insured, it becomes extremely difficult to find a physician because some many no longer accept certain insurances due to the amount of patients assigned to physicians becomes more burdensome than the physician can handle as is shown in Massachusetts where 22.5% of the population have reported issues accessing providers due to 97% of the population of nonelderly residents becoming insured.¹⁰² The average wait-time to see an internist in Massachusetts was thirty-one days (31) in 2008, as compared to seventeen days (17) in 2005.¹⁰³ The issue that both Massachusetts and the ACA have faced is that although expanding access to health insurance is an admirable cause, without expanding access to care, there are not enough physicians to meet the demand. Joining the increasing physician demand due to an increased supply, with increased costs and undesirable insurance reimbursement rates have caused more physicians to accept less Medicare and Medicaid patients because it was impossible to find financial stability. The consequences of low insurance reimbursement rates have made it more difficult for those who have Medicaid as their health insurance to find physicians who accept them, than patients who are privately insured. A survey of primary care physicians conducted nationally in 2004 showed that “58 percent were accepting all new Medicare patients; 20 percent accepted new patients

¹⁰² Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association* , 299 (22), 2680-2682., Henderson, & Dill, *Physician Workforce Projections in an Era of Health Care Reform*, 2011

¹⁰³ Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association* , 299 (22), 2680-2682., Henderson, & Dill, *Physician Workforce Projections in an Era of Health Care Reform*, 2011

but restricted acceptance of Medicare beneficiaries; and 22 percent were not accepting any new patients.”¹⁰⁴ The findings of the survey showed that more than half of primary care physicians were accepting patients nationally, while some nearly the other half were not accepting or were restricting acceptance for Medicare beneficiaries. Immediately post-ACA, these numbers are expected to be significantly lower, however, in 2012, the “acceptance rate for new Medicare patients [by primary care physicians] was 87.4%.”¹⁰⁵ The Kaiser Family Foundation, a non-profit focusing on healthcare issues in the US, as well as the US’s role in global health, found that 93% of primary care physicians nationally accept Medicare in 2015, but also noted that 72% of primary care physicians are taking new Medicare patients, which was slightly lower than the average in 2012.¹⁰⁶ Simply put, in order to take insurance out of the equation so that health care services become more accessible across the board, “standardizing reimbursement rates among public and private insurers would mitigate this problem.”¹⁰⁷

¹⁰⁴ <http://medicaleconomics.modernmedicine.com/medical-economics/content/tags/centers-medicare-and-medicaid-services/hhs-study-most-doctors-still-a>

¹⁰⁵ <http://medicaleconomics.modernmedicine.com/medical-economics/content/tags/centers-medicare-and-medicaid-services/hhs-study-most-doctors-still-a>

¹⁰⁶ <http://files.kff.org/attachment/data-note-primary-care-physicians-accepting-medicare-a-snapshot>

¹⁰⁷ Bodenheimer, T., & Pham, H. (2010). Primary Care: Current Problems and Proposed Solutions. *Health Affairs* , 29 (5), 799-805.

Allocation Problem

Despite yearly reports by AAMC and several other sources that state a nationwide shortage of physicians is currently occurring and slated to get worse, some have explained the issue of not enough physicians as an allocation problem rather than a shortage. Allocation here means simply that the number of physicians are at appropriate levels, but their dispersal across the United States is not even. To give context, Bodenheimer found that “the ratio of primary care physicians to population in urban areas is 100 per 100,000 population.”¹⁰⁸ In rural areas however, the ratio is 46 per 100,000.¹⁰⁹ This means that while 21% of the entire US population resides in rural areas, only 10% of all physicians choose to practice in those areas.¹¹⁰ Designations of Primary Care Health Professional Shortage Areas are given to regions in which the ratios of population to primary care physician exceed 2000:1, as is ordained by the Health Resources and Services Administration (HRSA).¹¹¹ With approximately sixty-five million people living in shortage areas in 2009, HRSA has declared that more than 16,000 additional primary care physicians will be needed to care for those underserved regions. Given how large the population of those who live in underserved regions is, these medically disenfranchised communities tend to have “higher rates of emergency department visits and hospitalizations” because there is a larger concentration of “higher death and disease rates and greater health disparities than in communities where access to

¹⁰⁸ Bodenheimer, T., & Pham, H. (2010). Primary Care: Current Problems and Proposed Solutions. *Health Affairs*, 29 (5), 799-805.

¹⁰⁹ Bodenheimer, T., & Pham, H. (2010). Primary Care: Current Problems and Proposed Solutions. *Health Affairs*, 29 (5), 799-805.

¹¹⁰ Bodenheimer, T., & Pham, H. (2010). Primary Care: Current Problems and Proposed Solutions. *Health Affairs*, 29 (5), 799-805.

¹¹¹ Bodenheimer, T., & Pham, H. (2010). Primary Care: Current Problems and Proposed Solutions. *Health Affairs*, 29 (5), 799-805.

primary care is better.” Being that underserved regions are also increasing, from 1998 to 2006, there was a 52% increase in medically disenfranchised populations; additional primary care practitioners will be necessary.¹¹² Salsberg explains that the annual AAMCs reports are faulty because they do not include the number of physician assistants, are generally over-inflated, do not “include the reduction in demand for physicians as a result of incentives,” and “are a projection that relies on straight-line projections of supply and demand” without accounting for “evolution in response to new demand.”¹¹³ Rovner concurs and states that a committee brought together to investigate the physician shortage could not determine credible evidence or a source because the most commonly listed source is the AAMCs yearly report on the shortage.¹¹⁴ This poses a conflict of interest and is a means by which AAMC may attempt to obtain more money.¹¹⁵ As Salsberg explains, the AAMCs 2015 report does not account for the 7,578 physician assistants that were licensed in 2014, or the “100,000 active PAs in the United States.”¹¹⁶ Moreover, since 1997, the number of physicians has grown by 1.7% per year, with 30,000

¹¹² Bodenheimer, T., & Pham, H. (2010). Primary Care: Current Problems and Proposed Solutions. *Health Affairs*, 29 (5), 799-805.

¹¹³ Salsberg, E. (2015, 09 09). *Is the Physician Shortage Real? Implications for the Recommendations of the Insitute of Medicine Committee on the Governance and Finance of Graduate Medical Education*. Retrieved from Pubmed.gov: <https://www.ncbi.nlm.nih.gov/pubmed/26177529>

¹¹⁴ Rovner, J. (2014, 11 24). *Is the US really facing a serious doctor shortage?* Retrieved from PBS: <http://www.pbs.org/newshour/rundown/u-s-really-facing-serious-doctor-shortage/>

¹¹⁵ Salsberg, E. (2015, 09 09). *Is the Physician Shortage Real? Implications for the Recommendations of the Insitute of Medicine Committee on the Governance and Finance of Graduate Medical Education*. Retrieved from Pubmed.gov: <https://www.ncbi.nlm.nih.gov/pubmed/26177529>

¹¹⁶ Salsberg, E. (2015, 09 09). *Is the Physician Shortage Real? Implications for the Recommendations of the Insitute of Medicine Committee on the Governance and Finance of Graduate Medical Education*. Retrieved from Pubmed.gov: <https://www.ncbi.nlm.nih.gov/pubmed/26177529>

physicians entering the workforce per year.¹¹⁷ Both Salsberg and Rovner conclude that the issue is thus not a shortage, but a “mismatch between the kinds of doctors needed and the kinds of doctors being produced.”^{118, 119}

Similarly, Carroll states that the nation is facing a distribution problem rather than a shortage issue.¹²⁰ Most doctors live in cities because they are under the assumption that living in cities will result in higher reimbursements, so they end up living in places that they already wanted to live. As a result of this, Carroll emphasizes that the shortage is not nationwide, but only in rural areas and cities that are not popular.¹²¹

The second issue that Carroll notes is the issue of specialization distribution. The US ranks number 24 out of 28 countries in doctors per 1,000 people, but ranks 11th in specialists.¹²²

¹¹⁷ Salsberg, E. (2015, 09 09). *Is the Physician Shortage Real? Implications for the Recommendations of the Insitute of Medicine Committee on the Governance and Finance of Graduate Medical Education*. Retrieved from Pubmed.gov:

<https://www.ncbi.nlm.nih.gov/pubmed/26177529>

¹¹⁸ Salsberg, E. (2015, 09 09). *Is the Physician Shortage Real? Implications for the Recommendations of the Insitute of Medicine Committee on the Governance and Finance of Graduate Medical Education*. Retrieved from Pubmed.gov:

<https://www.ncbi.nlm.nih.gov/pubmed/26177529>

¹¹⁹ Rovner, J. (2014, 11 24). *Is the US really facing a serious doctor shortage?* Retrieved from PBS: <http://www.pbs.org/newshour/rundown/u-s-really-facing-serious-doctor-shortage/>

¹²⁰ Carroll, A. (2016, 11 07). *A Doctor Shortage? A Closer Look*. Retrieved from NY Times: <https://www.nytimes.com/2016/11/08/upshot/a-doctor-shortage-lets-take-a-closer-look.html?mcubz=1>

¹²¹ Carroll, A. (2016, 11 07). *A Doctor Shortage? A Closer Look*. Retrieved from NY Times: <https://www.nytimes.com/2016/11/08/upshot/a-doctor-shortage-lets-take-a-closer-look.html?mcubz=1>

¹²² Carroll, A. (2016, 11 07). *A Doctor Shortage? A Closer Look*. Retrieved from NY Times: <https://www.nytimes.com/2016/11/08/upshot/a-doctor-shortage-lets-take-a-closer-look.html?mcubz=1>

Analyzing the Allocation Theory Problem

Given that there are some who think that there are enough physicians in the United States, but that the issue is simply one of misallocating them, Jeffers et al respond by stating that policies simply crafted to mitigate a normative shortage (one that requires intervention in the market by tampering with supply, demand, or both), do not take into account that barriers to access simply produce a misallocation of resources¹²³. Therefore, the misallocation theory which is used to explain the physician phenomena in the US, may simply be one in which there is an actual shortage, but with access to medical services is restricted, thereby resulting in what appears to be “misallocation.” To illustrate this, in the case of policies that are designed to increase supply, demand is often ignored and it can not be, because to have huge supply but no demand for it results in products that are not being consumed, which is an actual misallocation of resources.

To further illustrate how a misallocation of resources occurs, the following hypothetical is put forth: suppose that the solution to the problem of health services was an increase in supply equivalent to what was deemed necessary by medical opinion and that all of these medical services were free (meaning at a price of zero). Using the previous Figure, Jeffers et al calculated that the quantity of medical services available would be the equivalent of ON . With no demand though, the amount of services available would be equivalent to zero, and the quantity of medical services would be equal to OC . The amount of services not consumed would be equal to $ON-OC$, which would mean that those services would be unused. These services would remain unused due to several

¹²³ Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of “Shortage”. *American Journal of Public Health* , 61 (1), 46-63

reasons including inaccessibility due to ignorance or lack of knowledge about medical standards. Jeffers et al therefore provide the thought-provoking idea that the analysis of most commissions and panels which have reached the conclusion that there is no shortage, but a misallocation of physicians, is completely ignoring the fact that there may not be a demand for the physicians in the locations that they are put in, thereby meaning an actual shortage is happening.

Given the two competing ideas, it can also be miscommunicated that an actual shortage can be occurring due to the misallocation of physicians. The misallocation could be occurring due to the fact that there is an actual shortage, which continues a perpetual and recurring cycle. The conversation about medical services in the US is often phrased as either a shortage or a misallocation of physicians, but there is never consideration that the phenomena could be due to both a shortage and a misallocation of physicians. To say this is to state the US is not producing enough physicians (thereby a shortage) in the primary care discipline, and that of those that are being produced, not enough of them are being placed in the correct regions (hence a misallocation) simultaneously.

Solutions

There have been several solutions proposed to deal with the issue of physician shortages. One of the novel ideas to combat the shortage of physicians in particular specializations is a program by Jefferson Medical College called the “Physician Shortage Area Program” (PSAP). PSAP was a program established in 1974, which gave preference to applicants who pledged to practice in shortage areas, thus owing to its name.¹²⁴ The program’s graduates were shown to be five times more likely to practice family medicine in rural areas than those who did not participate in the program, and four times more likely to practice in shortage areas.¹²⁵ Thus, Rabinowitz concludes that the admissions process can sway not only the specialization of medical school students, but also their “geographic location of practice.”¹²⁶

Moawad offers several points.¹²⁷ One of the innovative approaches that is further to be explored is the use of technology. Moawad explains that often times, physicians need not be physically present to be able to diagnose and prescribe medication, thus,

¹²⁴ Rabinowitz, H. (1988). *Evaluation of a Selective Medical School Admissions Policy to Increase the Number of Family Physicians in Rural and Underserved Areas*. Retrieved from The New England Journal of Medicine:

<http://www.nejm.org/doi/pdf/10.1056/NEJM198808253190805>

¹²⁵ Rabinowitz, H. (1988). *Evaluation of a Selective Medical School Admissions Policy to Increase the Number of Family Physicians in Rural and Underserved Areas*. Retrieved from The New England Journal of Medicine:

<http://www.nejm.org/doi/pdf/10.1056/NEJM198808253190805>

¹²⁶ Rabinowitz, H. (1988). *Evaluation of a Selective Medical School Admissions Policy to Increase the Number of Family Physicians in Rural and Underserved Areas*. Retrieved from The New England Journal of Medicine:

<http://www.nejm.org/doi/pdf/10.1056/NEJM198808253190805>

¹²⁷ Moawad, H. (2017, 05 22). *Can the looming physician shortage be stopped?*

Retrieved from Medical Economics:

<http://medicaleconomics.modernmedicine.com/medical-economics/news/can-looming-physician-shortage-be-stopped>

mediums that allow physicians to diagnose from afar would help alleviate the need to have physicians physically present.¹²⁸

AAMC has also produced a list of potential solutions in its yearly report. Some solutions that AAMC has proposed include increasing the number of residency positions available, which would require Congress to lift the cap on residency positions that are federally funded, larger class sizes, and more team-based approaches to medicine.^{129, 130, 131, 132} In order to allow for more residency positions, Congress introduced the Physician Shortage Minimization Act of 2015, which required an increase in residency positions, “specified the process for distributing positions,” and mandates a study to increase diversity in the physician workforce.¹³³ A solution that has been commonly proposed includes more support for international medical students. By 2025, the number of international medical students will be 102,000, and because they tend to take lower

¹²⁸ Moawad, H. (2017, 05 22). *Can the looming physician shortage be stopped?* Retrieved from Medical Economics:

<http://medicaleconomics.modernmedicine.com/medical-economics/news/can-looming-physician-shortage-be-stopped>

¹²⁹ *New Research Confirms Looming Physician Shortage*. (2016, 04 05). Retrieved from Association of American Medical Colleges:

https://www.aamc.org/newsroom/newsreleases/458074/2016_workforce_projections_04052016.html

¹³⁰ Information Handling Services. *The Complexities of Physician Supply and Demand: Projections from 2014 to 2016*. Retrieved from American Association of Medical Colleges:

https://www.aamc.org/download/458082/data/2016_complexities_of_supply_and_demand_projections.pdf

¹³¹ Lakhan, S., & Laird, C. (2009, 05 09). *Addressing the primary care physician shortage in an evolving medical workforce*. Retrieved from International Archives of Medicine: <https://intarchmed.biomedcentral.com/articles/10.1186/1755-7682-2-14>

¹³² Marcus, M. B. (2017, 03 20). *New report predicts "troubling" shortage of doctors in the US*. Retrieved from CBS: <https://www.cbsnews.com/news/doctor-shortage-us-impact-on-health/>

¹³³ H.R. 6276 – *Physician Shortage Minimization Act of 2015*. Retrieved from <https://www.congress.gov/114/bills/hr6276/BILLS-114hr6276ih.pdf>

paying residency positions, decreasing regulations required for them to obtain work visas will allow them to select positions that are actually needed and therefore, buffer the gap in needed physicians.¹³⁴ Lakhan and Laird also suggest the de-stigmatization of osteopathic medicine, while also increasing the number of osteopathic medical schools to output more doctors to help to alleviate the shortage.¹³⁵

The Wall Street Journal asked several experts for their input on solutions to this particular issue. The solutions stated include increasing the role of nurses in patient care since they have extensive medical training, the usage of physician-assistants, relieving doctors of their student debt which would allow them to go into the specialties that they desire rather than ones that will help them pay debt off, increasing pay, matching “physicians with tasks that require their contributions,” increasing the number of medical schools, and finally to have physicians focus on tasks that require their skillset rather than menial tasks like inputting information which is requires an increasing amount of time from physicians.¹³⁶

¹³⁴ Lakhan, S., & Laird, C. (2009, 05 09). *Addressing the primary care physician shortage in an evolving medical workforce*. Retrieved from International Archives of Medicine: <https://intarchmed.biomedcentral.com/articles/10.1186/1755-7682-2-14>

¹³⁵ Lakhan, S., & Laird, C. (2009, 05 09). *Addressing the primary care physician shortage in an evolving medical workforce*. Retrieved from International Archives of Medicine: <https://intarchmed.biomedcentral.com/articles/10.1186/1755-7682-2-14>

¹³⁶ Potempa, K. (2013, 06 20). *The Experts: What Should Be Done to Fix the Predicted U.S. Doctor Shortage?* Retrieved from The Wall Street Journal: <https://www.wsj.com/articles/SB10001424127887323393804578555741780608174>

Increased Supply of Physicians

According to the authors of *Confronting the Complexities of the Physician Workforce Equation*, the national economic output has outpaced the gross domestic growth by a ratio of 1.5 to 1.0. This means that 1.0% increase in 1.0% gross domestic product would result in a .75% increase in physician supply.¹³⁷ This particular correlation has led many authors, including the authors of the aforementioned piece to advocate for more production of physicians by medical schools and residency programs to keep up with the economic growth.

In order for more physicians to be produced by medical schools, Kirch and Vernon have argued that a reorganization of financing delivery must occur. Kirch and Vernon refer to “financing delivery reorganization” to simply mean a reinvestment in medical schools, which will result in an organic increase in enrollment, which was thought to have a positive correlation to increased healthcare spending and the number of specialists.¹³⁸ Thus, Kirch and Vernon are arguing that should more money be invested in medical schools, class sizes would increase, and thereby more physicians would be produced. However, AAMCs released statements noting that by 2015, enrollments must increase by 30% if the shortage is to be appropriately and timely curbed.¹³⁹ The only caveat to increased enrollments and reinvestment in medical schools is that the number of

¹³⁷ Kirch, D., & Vernon, D. (2008). *Confronting the Complexity of the Physician Workforce Equation*. *Journal of American Medical Association*, 299 (22), 2680-2682. & Vernon, *Confronting the Complexity of the Physician Workforce Equation*, 2008

¹³⁸ Kirch, D., & Vernon, D. (2008). *Confronting the Complexity of the Physician Workforce Equation*. *Journal of American Medical Association*, 299 (22), 2680-2682. & Vernon, *Confronting the Complexity of the Physician Workforce Equation*, 2008

¹³⁹ Kirch, D., & Vernon, D. (2008). *Confronting the Complexity of the Physician Workforce Equation*. *Journal of American Medical Association*, 299 (22), 2680-2682. & Vernon, *Confronting the Complexity of the Physician Workforce Equation*, 2008

residents being trained annually is capped by Medicare support, thus making this step in the process the “rate limiting step.”¹⁴⁰ Moreover, Kirch and Vernon state that other key variables include reformation of the insurance coverage and reimbursement system which is abused, delivery system changes, introduction to new technology, distribution, and aging and health care.¹⁴¹ In reference to health care services, Kirch and Vernon note that it is becoming increasingly more difficult to differentiate between “wasteful consumption of services” and the “meritorious services” that can improve health.¹⁴² Thus, attempting to limit healthcare expenditures as is often proposed, will “likely eliminate both valuable and wasteful care.”¹⁴³

One of the difficulties with quantifying and predicting the success of the health care system however as is noted by Kirch and Vernon is the fact that the US is differently geographically and houses much socioeconomic diversity, which makes it difficult to “fully understand the variation in health services use.”¹⁴⁴ As a result of the geographic and economic diversity, Kirch and Vernon conclude that it would be difficult to have a

¹⁴⁰ Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association* , 299 (22), 2680-2682. & Vernon, Confronting the Complexity of the Physician Workforce Equation, 2008

¹⁴¹ Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association* , 299 (22), 2680-2682. & Vernon, Confronting the Complexity of the Physician Workforce Equation, 2008

¹⁴² Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association* , 299 (22), 2680-2682. & Vernon, Confronting the Complexity of the Physician Workforce Equation, 2008

¹⁴³ Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association* , 299 (22), 2680-2682. & Vernon, Confronting the Complexity of the Physician Workforce Equation, 2008

¹⁴⁴ Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association* , 299 (22), 2680-2682. & Vernon, Confronting the Complexity of the Physician Workforce Equation, 2008

“sweeping national shift toward decreased health care use that will decrease the demand for physicians.”¹⁴⁵

¹⁴⁵ Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association* , 299 (22), 2680-2682. & Vernon, Confronting the Complexity of the Physician Workforce Equation, 2008

Loan-Debt Forgiveness and Scholarships

Loan and debt forgiveness is a huge contributor to the physician shortage, particularly to the shortage of primary care physicians because physicians are having to choose residency programs that have high potential incomes to offset the cost of the debts incurred for school. The debt to income ratio is extremely vast, with most median medical school students having a debt over \$180,000 in 2015, while their median incomes was only \$52,000.¹⁴⁶ The cap for loan and debt forgiveness as placed by the Obama administration was \$57,500.¹⁴⁷ Within loan and debt forgiveness, an important aspect is that by increasing the number of medical schools, the amount of interest that is attached to each loan decreases. Currently, the American Association of Medical Colleges (AAMCs) lobbied for the interest rate to be between 10% and 15%.¹⁴⁸ If the loan rates were to stay consistent, then approximately 30,000 more aspiring physicians would be able to attend medical school.¹⁴⁹ If this trend continues, then by calculations, the shortage would be negated in approximately 10 years. With the increase in schools and the interest rate staying the same, then the money lost to lower interest rates could be made back easily due to the increased amount of schools, and thereby larger classes.

¹⁴⁶ Carroll, A. (2016, 11 07). *A Doctor Shortage? A Closer Look*. Retrieved from NY Times: <https://www.nytimes.com/2016/11/08/upshot/a-doctor-shortage-lets-take-a-closer-look.html?mcubz=1>

¹⁴⁷ Student Loan Forgiveness. 2017. Retrieved from American Association of Medical Colleges https://www.aamc.org/advocacy/meded/79048/student_loan_repayment.html

¹⁴⁸ Student Loan Forgiveness. 2017. Retrieved from American Association of Medical Colleges https://www.aamc.org/advocacy/meded/79048/student_loan_repayment.html

¹⁴⁹ Salsberg, E. (2015, 09 09). *Is the Physician Shortage Real? Implications for the Recommendations of the Institute of Medicine Committee on the Governance and Finance of Graduate Medical Education*. Retrieved from Pubmed.gov: <https://www.ncbi.nlm.nih.gov/pubmed/26177529>

One of the major agencies that sought to address the issue of shortages was the National Health Service Corps, through scholarships and debt forgiveness. The Corps however has not been able to sustain continued activities due to being underfunded. The amount of scholarships that it provided has decreased, with it only being able to provide “76 scholarships for 950 applicants and 867 loan repayment awards to 2,713 applicants” in 2008.¹⁵⁰ Moreover, federal grants through Title VII of the Public Health Service Act that target primary care training have proven to draw more physicians to underserved regions. More funding to Title VII would increase the number of primary care physicians in underserved areas.¹⁵¹

¹⁵⁰ Steinbrook, R. (2009, June 25). Easing the Shortage in Adult Primary Care — Is It All about Money? *The New England Journal of Medicine* , 2697., 2009)

¹⁵¹ Steinbrook, R. (2009, June 25). Easing the Shortage in Adult Primary Care — Is It All about Money? *The New England Journal of Medicine* , 2697., 2009)

Increasing Physician Productivity

One of the more interesting solutions proposed in order to mitigate the effects of the shortage of primary care physicians is not to increase the amount of physicians in the US, but simply to increase their effectiveness and efficiency. The effectiveness and efficiency of physicians can be increased through after-hour clinics. A 2007 survey found that a meager 28% of respondents stated that their primary care physician had evening or weekend hours.¹⁵² The issue with after-hour services however is that primary care physicians are often not compensated for time involved not being in contact with the patient during regular hours, hence, after-hours. Due to this, patients will turn to hospital emergency departments and ambulatory departments for care, which is costly. It was found that Medicaid patients who visited primary care facilities that had weekend or evening hours that were more than twelve hours per week, were 20 percent less likely to use emergency rooms, which reduced costs.¹⁵³ To incentivize after-hour clinics, primary care physicians should be paid for after-hour services and patient care coordination.¹⁵⁴

¹⁵² Bodenheimer, T., & Pham, H. (2010). Primary Care: Current Problems and Proposed Solutions. *Health Affairs* , 29 (5), 799-805.

¹⁵³ Bodenheimer, T., & Pham, H. (2010). Primary Care: Current Problems and Proposed Solutions. *Health Affairs* , 29 (5), 799-805.

¹⁵⁴ Bodenheimer, T., & Pham, H. (2010). Primary Care: Current Problems and Proposed Solutions. *Health Affairs* , 29 (5), 799-805.

Introduction to Physician-Extenders

One particular intriguing proposal is the use of physician-extenders. Physician-extenders are defined as medical professionals who are not physicians but can also perform the duties of a physician not requiring a medical doctorate; they are generally physician's assistants or nurses. Given the grim statistics, the use of physician extenders is the most plausible option because the structure supporting such an option exists already. The infrastructure in place includes nursing schools, schools for physician assistants and training protocols. As noted by The Wall Street Journal, many experts believe that increasing the roles of nurses and physician's assistants would help alleviate the shortage significantly since they undergo extensive medical training.¹⁵⁵ In particular, The Wall Street Journal notes that physicians on average spend approximately 6 minutes with each patient, and most of a physician's time is spent doing menial work that does not require their skillset.¹⁵⁶ Moreover, with increasing technological advances, physician assistants could seek the medical advice and help of physicians who are not physically within their vicinity, which would allow them to provide the appropriate care needed for patients.

Due to Connecticut being a physician shortage area, I calculated the costs of attending the University of Connecticut's School of Medicine, and compared the pricing

¹⁵⁵ Potempa, K. (2013, 06 20). *The Experts: What Should Be Done to Fix the Predicted U.S. Doctor Shortage?* Retrieved from The Wall Street Journal:

<https://www.wsj.com/articles/SB10001424127887323393804578555741780608174>

¹⁵⁶ Potempa, K. (2013, 06 20). *The Experts: What Should Be Done to Fix the Predicted U.S. Doctor Shortage?* Retrieved from The Wall Street Journal:

<https://www.wsj.com/articles/SB10001424127887323393804578555741780608174>

to that of its School of Nursing.¹⁵⁷ Since nurses only require an Associate's degree to be able to practice, the cost is significantly lower to have nurses function as physician-extendors rather than employing physicians. The difference is \$501,982 since medical school graduates can not practice until after completing their residency program, which cost approximately \$150,000.¹⁵⁸ Increasing the number of medical schools will play no role in the usage of physician-extendors, since physician-extendors do not go to medical school. Using physician-extendors would create approximately 100,000 "physician-equivalents" per year since they would be able to perform lower level medical procedures that don't require medical doctorates.¹⁵⁹

¹⁵⁷ Tuition and Fees, University of Connecticut. 2017. Retrieved from <http://admissions.uconn.edu/cost-aid/tuition>

¹⁵⁸ Wynn, B. , Smalley, R. , Cordasco, K. (2013). Does it Cost More to Train Physicians or to Replace Them?. Retrieved from RAND Corporation https://www.rand.org/content/dam/rand/pubs/research_reports/RR300/RR324/RAND_R324.pdf

¹⁵⁹ Salsberg, E. (2015, 09 09). *Is the Physician Shortage Real? Implications for the Recommendations of the Insitute of Medicine Committee on the Governance and Finance of Graduate Medical Education*. Retrieved from Pubmed.gov: <https://www.ncbi.nlm.nih.gov/pubmed/26177529>

Costs

Accordingly, the cost of using physician-extenders is significantly less than the cost of employing physicians. The reason for this is because nurses for example, must only complete an Associate's degree to be able to practice, whereas physicians from start to finish take approximately 12 years to be able to treat patients depending on residency programs. Using the example of the University of Connecticut's School of Nursing as compared to the University of Connecticut's School of Medicine to calculate such a cost shows a difference of \$501, 982 due to Connecticut being a shortage area.

Moreover, Congress has placed a cap on residency programs that are federally funded. This cap includes the reduction of funding for residency programs from \$150,000 per resident to \$95,000.¹⁶⁰ In addition, hospitals with 75% or more residents in primary care are charged \$150,490 as compared to those with less than 25% primary-care physicians, which are only charged \$116,626.¹⁶¹ Furthermore, the Obama Administration capped the amount of loan and debt forgiveness for medical school students at \$57,500, with AAMCs having fought to cap the interest rate on loans to being between 10% and 15% of principle.¹⁶² In addition, with the debt-to-income ratio for medical school students in 2015 being \$180,000 to a median income of only \$52,000, it is extremely difficult for

¹⁶⁰ Wynn, B. , Smalley, R. , Cordasco, K. (2013). Does it Cost More to Train Physicians or to Replace Them?. Retrieved from RAND Corporation https://www.rand.org/content/dam/rand/pubs/research_reports/RR300/RR324/RAND_R324.pdf

¹⁶¹ Wynn, B. , Smalley, R. , Cordasco, K. (2013). Does it Cost More to Train Physicians or to Replace Them?. Retrieved from RAND Corporation https://www.rand.org/content/dam/rand/pubs/research_reports/RR300/RR324/RAND_R324.pdf

¹⁶² Student Loan Forgiveness. 2017. Retrieved from American Association of Medical Colleges https://www.aamc.org/advocacy/meded/79048/student_loan_repayment.html

most students who do not come from wealthy backgrounds to attend medical school, and those who do not pick lucrative residency programs will not be able to pay back loans.¹⁶³

A study by Hooker also found that the cost of visits for physician assistants as compared to physicians was less.¹⁶⁴ This was despite physician assistants working in the same department, ordering the same tests, and using the same equipment. Moreover, despite physician assistants ordering less exams, there was no difference in diagnosis rates. Hooker concludes that physician assistants are “not only cost effective from a labour standpoint but are also cost-beneficial to employers.”¹⁶⁵ Hooker also goes on to state that the cost of treatment overall from physician assistants is economical.¹⁶⁶

¹⁶³ Carroll, A. (2016, 11 07). *A Doctor Shortage? A Closer Look*. Retrieved from NY Times: <https://www.nytimes.com/2016/11/08/upshot/a-doctor-shortage-lets-take-a-closer-look.html?mcubz=1>

¹⁶⁴ Hooker RS. A cost analysis of physician assistants in primary care. *Journal of the American Academy of Physician Assistants*. 2002;15(11):39–48.

¹⁶⁵ Hooker RS. A cost analysis of physician assistants in primary care. *Journal of the American Academy of Physician Assistants*. 2002;15(11):39–48.

¹⁶⁶ Hooker RS. A cost analysis of physician assistants in primary care. *Journal of the American Academy of Physician Assistants*. 2002;15(11):39–48.

The Role of Physician-Extenders in the Physician Shortage

Due to the national shortage, physician-extenders, in particular physician assistants (PAs) are being forced to enter into specialties including emergency medicine and surgery. Japsen notes that there are approximately 108,000 physician assistants across the country, which means that if all were given greater scope-of-practice, they could help end the shortage.¹⁶⁷ This is because physician assistants receive extensive and intensive training, often two and three year master's programs in order to be able to offer a multitude of services, including counseling, writing prescriptions, and diagnosing patients. All of these are also skills that a physician possesses, but the role can be filled by physician assistants or other physician-extenders such as registered nurses (RNs). Hooker notes that in a study, physician assistants and nurse practitioners wrote 60% of all prescriptions for visits in a metropolitan area, and in particular, 1.3 prescriptions per visit.¹⁶⁸ The study further revealed that both physician assistants and nurse practitioners prescribed medication in manners that were consistent with physicians.¹⁶⁹ Thus, Hooker concludes that physician assistants are performing in a manner consistent to physicians who specialize in ambulatory care.¹⁷⁰

Another study detailing productivity explained that while physician assistants “performed 61.4 outpatient visits as compared to 74.2 performed by physicians,” those

¹⁶⁷ Japsen, Bruce. (2016). Physician Assistants Moving Into Specialties Amid Doctor Shortage. Retrieved from <https://www.forbes.com/sites/brucejapsen/2016/07/14/physician-assistants-moving-into-specialties-amid-doctor-shortage/#389e5a985874>

¹⁶⁸ Hooker RS, Cawley JF. The hidden rheumatology workforce. *Arthritis Practitioner*. 2005;1(3):34.

¹⁶⁹ Hooker RS, Cawley JF. The hidden rheumatology workforce. *Arthritis Practitioner*. 2005;1(3):34.

¹⁷⁰ Hooker RS, Cawley JF. The hidden rheumatology workforce. *Arthritis Practitioner*. 2005;1(3):34.

physicians were full-time employees, therefore skewing the numbers.¹⁷¹ Moreover, physician assistants in rural areas were more productive due to their general knowledge and “generalist” background.¹⁷² Moreover, Hooker notes that a policy analysis comparing the productivity of solo practice physicians as compared to those who have physician assistants show increased productivity as the number of visits from patients increased from 116.4 to 127.2.¹⁷³ Another study detailing the productivity of physician assistants and nurse practitioners in Utah, a shortage area, explains that despite them only making up 6.3% of the state’s combined clinicians, they account for 7.2% of patient care.¹⁷⁴ These particular physician-extendors report working more hours per week than physicians. These numbers are consistent with Jacobson who explains that “there is significant overlap in the competencies of physician assistants and doctors.”¹⁷⁵ To further complement this, Coulter explains that a study in which 1,363 doctors were surveyed about cancer screening procedures showed that between 73% and 79% of family physicians and 70% of internists would allow physician assistants to perform the procedure, while 46% of those physicians (approximately 630 physicians) have actually

¹⁷¹ Larson EH, Hart LG, Ballweg RM. National estimates of physician assistant productivity. *Journal of Allied Health*. 2001;30(3):146–152.

¹⁷² Larson EH, Hart LG, Ballweg RM. National estimates of physician assistant productivity. *Journal of Allied Health*. 2001;30(3):146–152.

¹⁷³ Hooker RS, Nicholson J, Le T. Does the employment of physician assistants and nurse practitioners increase liability? *Journal of Medical Licensure and Discipline*. 2009;95(2):6–16.

¹⁷⁴ Pedersen DM, Chappell B, Elison G, Bunnell R. The productivity of PAs, APRNs, and physicians in Utah. *Journal of The American Academy of Physician Assistants*. 2008;21(1):42–47.

¹⁷⁵ Coulter I, Jacobson P, Parker LE. Sharing the mantle of primary female care: physicians, nurse practitioners, and physician assistants. *Journal of the American Medical Women’s Association*. 2000;55(2):100–103.

allowed their physician assistants or nurse practitioners to perform at least one or more cancer-screening exams.¹⁷⁶

Given these alternatives, the key political, social, and institutional constraints that will influence the outcome of any given policy choice are many. One of the factors includes the legislation that was passed, such as the Shortage Act of 2015. This legislation explains that physicians would be classified as independent contractors for the purposes of lessening taxes upon the hospitals that hire them, so as to make it financially feasible to hire more doctors. This legislation was passed in Connecticut. The second important constraint is the stigma associated with physicians'-assistants and nurses. The stigma with physician assistants' is that they did not have the qualities to be physicians, and so therefore, had to resort to something lesser. The use of physician-extenders would require the social stigma that is associated with being a nurse and being a physician's assistant to dissipate. A financial constraint is the fact that the cost of training per resident decreased from \$150,000 to \$95,000 as per Congress.¹⁷⁷ The implication of this is that residents are no longer receiving top training due to the amount of money allocated for their training being significantly reduced. Finally, the most important constraint is the fact that hospitals with 75% or more residents in primary care are charged \$150,490 as

¹⁷⁶ Coulter I, Jacobson P, Parker LE. Sharing the mantle of primary female care: physicians, nurse practitioners, and physician assistants. *Journal of the American Medical Women's Association*. 2000;55(2):100–103.

¹⁷⁷ Wynn, B. , Smalley, R. , Cordasco, K. (2013). Does it Cost More to Train Physicians or to Replace Them?. Retrieved from RAND Corporation https://www.rand.org/content/dam/rand/pubs/research_reports/RR300/RR324/RAND_RR324.pdf

compared to those with less than 25% primary care physicians (\$116,626).¹⁷⁸ This particular constraint is extremely important because the shortage despite it being generally all physicians, is also specifically in the field of primary care. With hospitals being charged such a substantial amount of money for producing predominantly primary care physicians, it de-incentivizes the field for hospitals, and creates a perpetual cycle that continues to feed the shortage.

¹⁷⁸ Wynn, B. , Smalley, R. , Cordasco, K. (2013). Does it Cost More to Train Physicians or to Replace Them?. Retrieved from RAND Corporation https://www.rand.org/content/dam/rand/pubs/research_reports/RR300/RR324/RAND_RR324.pdf

China

China's village doctor system, also called the barefoot doctor system, was praised by the World Health Organization (WHO) for its effectiveness and was seen as a "successful example in developing countries."¹⁷⁹ However, when the cooperative medical system, "a heavily subsidized voluntary health insurance program," collapsed in the early 1980s, the village doctor system lost structural support, both in terms of infrastructure and finances.¹⁸⁰ The number of village doctors began to decline slowly.

China is also facing issues similar to that of the United States in respect to physician shortages, particularly in rural villages. In 1980, the ratio of village doctors per 1000 rural residents was 1.79; in 2003, that number fell to .98, which was the lowest it had ever been, and then slowly began to increase.¹⁸¹ By 2011, the number climbed slowly to 1.27, but never fully returned to or rose above its 1980 equivalent of 1.79.¹⁸²

In rural parts of China, physicians are extremely important because they are "the most important public health service providers," but yet are having to deal with heavier

¹⁷⁹ Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2). Understanding the shortage of village doctors in China and solutions under the policy of basic public health service equalization: evidence from Changzhou. *The International Journal of Health Services*, 44(4), 611-621.

¹⁸⁰ Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2). Understanding the shortage of village doctors in China and solutions under the policy of basic public health service equalization: evidence from Changzhou. *The International Journal of Health Services*, 44(4), 611-621.

¹⁸¹ Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2). Understanding the shortage of village doctors in China and solutions under the policy of basic public health service equalization: evidence from Changzhou. *The International Journal of Health Services*, 44(4), 611-621.

¹⁸² Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2). Understanding the shortage of village doctors in China and solutions under the policy of basic public health service equalization: evidence from Changzhou. *The International Journal of Health Services*, 44(4), 611-621.

workloads due to public health policies.¹⁸³ Through the use of national statistics, researchers from Fudan University's Department of Health Policy and University of Nevada's Department of Health Care Administration and Policy investigated the physician shortage phenomenon in search of potential solutions.

National statistics were gathered through surveys of eight hundred and forty-four village doctors and "995 health decision makers," with some surveys being conducted face to face.¹⁸⁴ Of the village doctors surveyed, 51.3 percent were at least 50 years old or older, with 8.5 percent of respondents stating that they were older than 65.¹⁸⁵ Of the village doctors surveyed, 9.4 percent had gone to college and received a college education or higher, with a majority, 70.4 percent explaining that they had "received their education from village-doctor-specific training programs," which are programs in which villages select one or a cohort of young farmers to "attend village-doctor oriented certificate or associate degree programs in medical schools."¹⁸⁶ Post graduation, the cohorts returned to their villages and begin working as village doctors. Of the doctors surveyed 92.3 percent said that they would not want their children to become village

¹⁸³ Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2). Understanding the shortage of village doctors in China and solutions under the policy of basic public health service equalization: evidence from Changzhou. *The International Journal of Health Services*, 44(4), 711-721.

¹⁸⁴ Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2). Understanding the shortage of village doctors in China and solutions under the policy of basic public health service equalization: evidence from Changzhou. *The International Journal of Health Services*, 44(4), 711-721.

¹⁸⁵ Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2). Understanding the shortage of village doctors in China and solutions under the policy of basic public health service equalization: evidence from Changzhou. *The International Journal of Health Services*, 44(4), 711-721.

¹⁸⁶ Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2). Understanding the shortage of village doctors in China and solutions under the policy of basic public health service equalization: evidence from Changzhou. *The International Journal of Health Services*, 44(4), 711-721.

doctors due to low salary and lack of social security.¹⁸⁷ Some village doctors felt that it was unfeasible to provide all of the services required by law. Of the health decisions makers, 74 percent felt that more village doctors were needed, whereas at the local village level, only 58 percent of people agreed.¹⁸⁸ Responding to the question “What is the best way to stabilize village doctors,” 33 percent of respondents thought that an increase in salary would be the most paramount solution, while others chimed that assigning a rotating schedule that saw doctors from townships and medical trainees, working in village health provisionally would help to offset the load of village doctors.¹⁸⁹ Another answer that 11.8 percent of the respondents gave was to increase the social security benefits for village doctors.¹⁹⁰

Much like the United States and the ACA, some feel that China’s policy of public health service equalization has a role to play in the village doctor shortage. In 2009, the Chinese government sought to reform health care and began to put to work a “National Guide for Basic Public Health Services,” which was overseen by the Ministry of Health. The guideline included nine categories, which were required for basic health services,

¹⁸⁷ Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2). Understanding the shortage of village doctors in China and solutions under the policy of basic public health service equalization: evidence from Changzhou. *The International Journal of Health Services*, 44(4), 611-621.

¹⁸⁸ Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2). Understanding the shortage of village doctors in China and solutions under the policy of basic public health service equalization: evidence from Changzhou. *The International Journal of Health Services*, 44(4), 611-621.

¹⁸⁹ Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2). Understanding the shortage of village doctors in China and solutions under the policy of basic public health service equalization: evidence from Changzhou. *The International Journal of Health Services*, 44(4), 611-621.

¹⁹⁰ Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2). Understanding the shortage of village doctors in China and solutions under the policy of basic public health service equalization: evidence from Changzhou. *The International Journal of Health Services*, 44(4), 611-621.

with each category having a subset of two or three specific services, for a total of “21 specific services in the package.”¹⁹¹ Examples of the services include keeping health records for any person residing in the area for more than 6 months with focus on children 3 years of age or younger, the elderly, those with chronic diseases, mental illnesses, and women.¹⁹² In 2011 however, the required categories were increased to 11, and the specific services ballooned to 41.¹⁹³ With an increase in specific services, the subsidies for public health per person also increased from 15 renminbi (RMB) per person per year in 2009 to 25 RMB per person per year.¹⁹⁴

Similar to the US, China has also faced challenges in bringing the policy goals of the health services equalization plan to fruition. The issues that China faced are parallel to those of the US, with some of the overlaps being “shortage of manpower in rural areas, lack of funding, lack of an efficient monitoring system, lack of interest in receiving public health services, and inequity in public health services.”¹⁹⁵ Moreover, another

¹⁹¹ Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2). Understanding the shortage of village doctors in China and solutions under the policy of basic public health service equalization: evidence from Changzhou. *The International Journal of Health Services*, 44(4), 745-754.

¹⁹² Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2). Understanding the shortage of village doctors in China and solutions under the policy of basic public health service equalization: evidence from Changzhou. *The International Journal of Health Services*, 44(4), 745-754.

¹⁹³ Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2). Understanding the shortage of village doctors in China and solutions under the policy of basic public health service equalization: evidence from Changzhou. *The International Journal of Health Services*, 44(4), 745-754.

¹⁹⁴ Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2). Understanding the shortage of village doctors in China and solutions under the policy of basic public health service equalization: evidence from Changzhou. *The International Journal of Health Services*, 44(4), 745-754.

¹⁹⁵ Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2). Understanding the shortage of village doctors in China and solutions under the policy of

common issue is that the public health service equalization policy increase the workload of village physicians without increasing their compensation. The four most common responses about obstacles to improving health care delivery in rural areas were: “lack of funding, ineffective administration of public health services, shortage in village doctors and poor quality of care provided by village doctors.”¹⁹⁶ The research team found that most of the factors associated with the shortage of village doctors were related with low compensation with “unattractive pension plans” and poor working environment, the hefty workload, and diminished opportunities for furthering education.¹⁹⁷

In order to alleviate the shortage of village doctors, a new cooperative of medical scheme (NCMS) was established by the central government in 2003. The NCMS provided considerable support, both financially and structurally to village doctors, which they lost have due to the collapse of the cooperative system in the early 1980s. Following the implementation of the NCMS, village doctor numbers slowly began to increase from 2003.¹⁹⁸ Following the enactment of the basic public health guidelines in 2009, which combined with funding policies, the number of village doctors began to rise swiftly, but did not reach hallmarks similar to those of the 1980s. Thus, researchers concluded that

basic public health service equalization: evidence from Changzhou. The Internation Jo, et al., 2014

¹⁹⁶ Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2).

Understanding the shortage of village doctors in China and solutions under the policy of basic public health service equalization: evidence from Changzhou. The Internation Jo, et al., 2014

¹⁹⁷ Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2).

Understanding the shortage of village doctors in China and solutions under the policy of basic public health service equalization: evidence from Changzhou. The Internation Jo, et al., 2014

¹⁹⁸ Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2).

Understanding the shortage of village doctors in China and solutions under the policy of basic public health service equalization: evidence from Changzhou. The Internation Jo, et al., 2014

the new policy helps to alleviate the shortage issue, but supplemental efforts are required to fully contain the problem. To fully contain the problem, old doctors must be retained and new doctors must be recruited with adequate subsidies. Of the 15 RMB per person subsidy that was implemented, only 3 RMB was given to village clinics, and the rest to county and township health centers. One pilot program for village doctors has mandated that pay for village doctors not be less than the “minimum subsistence level,” and in Zhejiang, village doctors are paid the same as urban area workers.¹⁹⁹ New village doctors are needed because current village doctors are aging, but also “salary and nonsalary factors” affect the lucrativeness of the job.²⁰⁰ Researchers proposed that although rotational schedules of township and city doctors and provisionally having doctors from other areas work in villages can be part of a short-term solution, it is not feasible in the long run. Thus, a more feasible and applicable solution is to train local residents to become village doctors. The approach of training local residents to become village doctors ensures that residents return to their villages after medical training because of the ties that they have established. This approach is also considerably more applicable because of the various local languages that are spoken across China. By having village residents be trained to be village doctors, the challenges of effective communication are hurdled, and local residents who become village doctors will also better understand the socioeconomic conditions and factors that their fellow village residents are experiencing,

¹⁹⁹ Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2). Understanding the shortage of village doctors in China and solutions under the policy of basic public health service equalization: evidence from Changzhou. *The International Journal of Health Services*, 44(4), 700-710.

²⁰⁰ Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2). Understanding the shortage of village doctors in China and solutions under the policy of basic public health service equalization: evidence from Changzhou. *The International Journal of Health Services*, 44(4), 700-710.

and therefore, be able to holistically approach their care. Additionally, by recruiting younger doctors who are technologically capable, health records and other provisions of the health care equalization policy will be actualized. Current village doctors over the age of 50 have explained that because they have limited knowledge of technological and its utilization, they feel that “it is especially challenging to conduct public health service tasks, such as creating health records for all residents in [their] village.”²⁰¹ Another suggestion proposed was to train people who understand how computer technology functions so that they can work part-time to assist the village doctors with inputting information and the upkeep of digital health records.

²⁰¹ Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2). Understanding the shortage of village doctors in China and solutions under the policy of basic public health service equalization: evidence from Changzhou. *The International Journal of Health Services*, 44(4), 701-711. doi:10.1177/0020717914531111

Australia

Australia is no different from other industrialized countries in that it too is experiencing a shortage of doctors in rural areas despite supply being steady. In Australia, 29 percent of the population lives in remote and rural areas with low accessibility to health care services.²⁰² Factors contributing to the rural doctor shortage include “professional and social isolation, family education, and the education and training of medical undergraduates and postgraduates.”²⁰³

In order to pinpoint the aforementioned factors, researchers used data collected via survey about students who graduated from the University of Newcastle, in New South Wales, Australia in 1990; the cross-sectional survey includes information about doctors who had completed their medical schooling and graduated between 1982 and 1988. Of the 331 surveyed individuals, 226 responded for a total response rate of 68.3 percent.²⁰⁴ Of those who graduated between 1982 and 1986, 162 responded for a response rate of 75 percent.²⁰⁵ From the respondents, 113 (70 percent) worked in urban areas, 36 (22

²⁰² Rolfe, I., Pearson, S., O’Connell, D., & Dickinson, J. (1995). Finding Solutions to the Rural Doctor Shortage: The Roles of Selection versus Undergraduate Medical Education at Newcastle. *Australia and New Zealand Journal of Medicine* , 25, 512-517.

²⁰³ Rolfe, I., Pearson, S., O’Connell, D., & Dickinson, J. (1995). Finding Solutions to the Rural Doctor Shortage: The Roles of Selection versus Undergraduate Medical Education at Newcastle. *Australia and New Zealand Journal of Medicine* , 25, 512-517.

²⁰⁴ Rolfe, I., Pearson, S., O’Connell, D., & Dickinson, J. (1995). Finding Solutions to the Rural Doctor Shortage: The Roles of Selection versus Undergraduate Medical Education at Newcastle. *Australia and New Zealand Journal of Medicine* , 25, 512-517.

²⁰⁵ Rolfe, I., Pearson, S., O’Connell, D., & Dickinson, J. (1995). Finding Solutions to the Rural Doctor Shortage: The Roles of Selection versus Undergraduate Medical Education at Newcastle. *Australia and New Zealand Journal of Medicine* , 25, 512-517.

percent) in rural areas and 11 (8 percent) “were unable to be classified or had missing data and were excluded from further analysis.”²⁰⁶

Researchers found that 30 percent of respondents who were married or had partners, had partners who were in the medical field. A statistically significant relationship was present between “partners’ employment and practice location.”²⁰⁷

Researchers also found that of the reasoning of 55 graduates who had reported that they were working in, or considered to work in rural areas, was due to lifestyle, whereas the 76 graduates who reported working in urban areas and reported that they were not intending in working in rural areas gave education and training as their reasoning.²⁰⁸

After further investigation, a statistically significant relationship was found between place of residence prior to medical school and location of employment post-medical school.²⁰⁹ Doctors who lived in rural areas prior to medical school were 2.49 times more likely to work in rural settings than those who lived in urban areas.²¹⁰ Furthermore, researchers also found that physicians who work in rural areas in their fifth year of school were 3.02 times more likely to be work in the rural regions than those who chose to work

²⁰⁶ Rolfe, I., Pearson, S., O’Connell, D., & Dickinson, J. (1995). Finding Solutions to the Rural Doctor Shortage: The Roles of Selection versus Undergraduate Medical Education at Newcastle. *Australia and New Zealand Journal of Medicine* , 25, 512-517.

²⁰⁷ Rolfe, I., Pearson, S., O’Connell, D., & Dickinson, J. (1995). Finding Solutions to the Rural Doctor Shortage: The Roles of Selection versus Undergraduate Medical Education at Newcastle. *Australia and New Zealand Journal of Medicine* , 25, 512-517.

²⁰⁸ Rolfe, I., Pearson, S., O’Connell, D., & Dickinson, J. (1995). Finding Solutions to the Rural Doctor Shortage: The Roles of Selection versus Undergraduate Medical Education at Newcastle. *Australia and New Zealand Journal of Medicine* , 25, 512-517.

²⁰⁹ Rolfe, I., Pearson, S., O’Connell, D., & Dickinson, J. (1995). Finding Solutions to the Rural Doctor Shortage: The Roles of Selection versus Undergraduate Medical Education at Newcastle. *Australia and New Zealand Journal of Medicine* , 25, 512-517.

²¹⁰ Rolfe, I., Pearson, S., O’Connell, D., & Dickinson, J. (1995). Finding Solutions to the Rural Doctor Shortage: The Roles of Selection versus Undergraduate Medical Education at Newcastle. *Australia and New Zealand Journal of Medicine* , 25, 512-517.

in urban settings.²¹¹ Investigators also found that doctors from rural areas being more likely to work in rural areas than those who are from urban areas “was in agreement with North American literature” and supported by other studies conducted in Australia. This finding is important because it suggests that medical schools should recruit students from rural areas, if they want to quell the rural area physician shortage, as those who lived in rural regions prior to medical school are more like to return to working in rural regions.

Due to the way medical school admission is set up at the University of Newcastle, there are two means to reach medical school. The first is called the academic mode, which comprises half of the matriculating class. The academic mode is based on academic achievement, where the aspiring matriculant must score within the top 1-2 percent of the New South Wales (NSW) higher school certificate (HSC) or it’s equivalent, or gain a ““distinction” average in tertiary studies” along with passing a written psychometric exam.²¹² The second means of matriculation is called the composite mode, which requires that students “achieve marks in the top 2-10 percent in the HSC or at least a “credit” average in their tertiary studies” along with performance on the written psychometric exam and a personal interview.²¹³ The mode of entry is important because researchers found that students from rural backgrounds

...have difficulty obtaining the aggregate marks required to enter into medical schools with traditional entry criteria and even if successful, such

²¹¹ Rolfe, I., Pearson, S., O’Connell, D., & Dickinson, J. (1995). Finding Solutions to the Rural Doctor Shortage: The Roles of Selection versus Undergraduate Medical Education at Newcastle. *Australia and New Zealand Journal of Medicine* , 25, 512-517.

²¹² Rolfe, I., Pearson, S., O’Connell, D., & Dickinson, J. (1995). Finding Solutions to the Rural Doctor Shortage: The Roles of Selection versus Undergraduate Medical Education at Newcastle. *Australia and New Zealand Journal of Medicine* , 25, 512-517.

²¹³ Rolfe, I., Pearson, S., O’Connell, D., & Dickinson, J. (1995). Finding Solutions to the Rural Doctor Shortage: The Roles of Selection versus Undergraduate Medical Education at Newcastle. *Australia and New Zealand Journal of Medicine* , 25, 512-517.

students tend to apply less frequently for medical school than those from the city.²¹⁴

Rural area students in Australia struggling academically is similar to the United States, where students from rural areas struggle academically due to the lack of resources, particularly underfunded school systems, and lack of supplemental academic courses. The implication is therefore that teachers should directly pay special heed to the “teaching and aspirations of rural high school students, prior to their university application.”²¹⁵

Analyzing the admissions suggest that by lowering the academic threshold slightly, would result in an increase of rural students admitted as compared to their traditional academic mode entrant counterparts. Further analysis of matriculants shows that students who gain acceptance via the composite mode, by which most rural applicants are admitted, perform just as well as those who entered via the academic mode. Researchers thus concluded that by altering its admissions policy, the University of Newcastle has the potential to admit more students from rural region, and graduate them, which would result in more doctors working in rural areas since they have an affinity and propensity for rural work areas.

Another trend found was that undergraduate exposure to rural practice is positively associated with rural career practice. Researchers found that a statistically

²¹⁴ Rolfe, I., Pearson, S., O’Connell, D., & Dickinson, J. (1995). Finding Solutions to the Rural Doctor Shortage: The Roles of Selection versus Undergraduate Medical Education at Newcastle. *Australia and New Zealand Journal of Medicine* , 25, 512-517.

²¹⁵ Rolfe, I., Pearson, S., O’Connell, D., & Dickinson, J. (1995). Finding Solutions to the Rural Doctor Shortage: The Roles of Selection versus Undergraduate Medical Education at Newcastle. *Australia and New Zealand Journal of Medicine* , 25, 512-517.

significant relationship exists between "final year general practice attachment and eventual employment in a rural location," which may suggest causal relationship.²¹⁶

A similar study conducted at Flinders University in South Australia found comparable results. The study conducted at Flinders University however was different because it involved governmental intervention, which resulted in the formation of the Flinders University Parallel Rural Community Curriculum (PRCC). The PRCC was the first of its kind in that it was the first program developed with a community based approach designed specifically based in rural general practice, and was developed "on the hypothesis that increased rural practice exposure during undergraduate medical education would influence students to pursue a rural career path."²¹⁷ The PRCC is also unique in that it detoured away from the traditional medical school curriculum, which saw student rotations spanning from 2 to 6 weeks in rural clinical placements. Moreover, the PRCC is also unique in that students can apply for it, and between 50 to 60 percent of PRCC slots are filled by students from rural areas.²¹⁸

In order to investigate the effects of the PRCC on the number of medical students choosing rural employment, researchers conducted a survey of 86 contactable graduates of the 98 students that had participated in PRCC between 1997 and 2005. Of the 86 graduates surveyed, 49 responded, with three stating that they did not have a definite

²¹⁶ Rolfe, I., Pearson, S., O'Connell, D., & Dickinson, J. (1995). Finding Solutions to the Rural Doctor Shortage: The Roles of Selection versus Undergraduate Medical Education at Newcastle. *Australia and New Zealand Journal of Medicine* , 25, 512-517.

²¹⁷ Stagg, P., Greenhill, J., & Worley, P. (2009). A New Model to Understand the Career Choice and Practice Location Decision of Medical Graduates. *Rural and Remote Health* , 1-10

²¹⁸ Stagg, P., Greenhill, J., & Worley, P. (2009). A New Model to Understand the Career Choice and Practice Location Decision of Medical Graduates. *Rural and Remote Health* , 1-10

career choice, resulting in them being removed for the data set; thus, 46 graduates responded for a response rate of 53 percent.²¹⁹

Of the 46 respondents, 54 percent stated that they were “on a rural career pathway,” with an equal divide between those coming from a rural background and those with an urban background.²²⁰ From those respondents who had reported having a rural background, 24 percent stated that they would be on an urban career path.²²¹ The respondents who stated that they had a rural background and would be on an urban career path stated that “limited rural options influenced [their decision] to practice in a non-rural location.”²²² The remaining 22 percent of respondents had urban backgrounds and stated that they would be pursuing urban career paths.²²³ The statistics on who is choosing urban and rural backgrounds show that having had exposure to a particular background, for example rural, would later influence the choice of practice region. Researchers thus concluded that a positive correlation exists between exposure to the rural career pathway and exposure to it, as well as making the decision to pursue practice in rural regions prior

²¹⁹ Stagg, P., Greenhill, J., & Worley, P. (2009). A New Model to Understand the Career Choice and Practice Location Decision of Medical Graduates. *Rural and Remote Health*, 1-10

²²⁰ Stagg, P., Greenhill, J., & Worley, P. (2009). A New Model to Understand the Career Choice and Practice Location Decision of Medical Graduates. *Rural and Remote Health*, 1-10

²²¹ Stagg, P., Greenhill, J., & Worley, P. (2009). A New Model to Understand the Career Choice and Practice Location Decision of Medical Graduates. *Rural and Remote Health*, 1-10

²²² Stagg, P., Greenhill, J., & Worley, P. (2009). A New Model to Understand the Career Choice and Practice Location Decision of Medical Graduates. *Rural and Remote Health*, 1-10

²²³ Stagg, P., Greenhill, J., & Worley, P. (2009). A New Model to Understand the Career Choice and Practice Location Decision of Medical Graduates. *Rural and Remote Health*, 1-10

to or during actual schooling.²²⁴ Moreover, researchers found that “a positive relationship existed between graduates in vocational training on an urban career path and making their decisions after graduation from medical school.”²²⁵ Ultimately, researchers found that having a rural background coupled with exposure to rural interning during undergrad, was what was influencing a career choice in rural regions, with the PRCC playing a role in addressing the rural physician shortage in Australia.²²⁶

²²⁴ Stagg, P., Greenhill, J., & Worley, P. (2009). A New Model to Understand the Career Choice and Practice Location Decision of Medical Graduates. *Rural and Remote Health* , 1-10

²²⁵ Stagg, P., Greenhill, J., & Worley, P. (2009). A New Model to Understand the Career Choice and Practice Location Decision of Medical Graduates. *Rural and Remote Health* , 1-10

²²⁶ Stagg, P., Greenhill, J., & Worley, P. (2009). A New Model to Understand the Career Choice and Practice Location Decision of Medical Graduates. *Rural and Remote Health* , 1-10

Recommendations

Given the information presented about the physician phenomenon in the US, prior to making policy recommendations to alleviate the problem, one must be able to fully understand the many moving pieces, and be able to summarize the issue concisely. The first is to acknowledge that what is occurring in the US is not a misallocation of physicians, but that it is in fact a shortage of primary care physicians, both rurally and nationally. Secondly, we must recognize that at the core of the issue are five main issues: hospital restructuring, reorganization of primary care services, market-driven management, the use of medical technology, and finally fixing and fine-tuning the balance between requirement (demand) and supply.²²⁷ Within these five categories, are four sub-categories that we must also be cognizant of, with them being: requirements and supply determination techniques, physician immigration and emigration, geographic, social and specialty distribution issues, and graduate medical education structure and refinancing.²²⁸

There have been policies to deal with hospital restructuring in which physicians can be hired via the Resident Physician Reduction Act of 2015, which allows hospitals to hire physicians as independent contractors, so as to not cause cap-space congestion. Moreover, suggestions have been made about de-stigmatizing the Emergency Department (ED), as it often becomes a means by which those who can not afford primary care physician visits can get the care that they need. An additional and necessary change that needs to be implemented in hospital restructuring is more funding and structure provided

²²⁷ Stoddard, J., Sekscenski, E., & Weiner, J. (1998). The Physician Workforce: Broadening The Search for Solutions. *Health Affairs* , 17 (1).

²²⁸ Stoddard, J., Sekscenski, E., & Weiner, J. (1998). The Physician Workforce: Broadening The Search for Solutions. *Health Affairs* , 17 (1).

to Ambulatory Care. Trends show that Ambulatory Care will be the location where most of the services provided by primary care physicians will be administered in rural areas. Thus, funding for Ambulatory Care will be imperative.

The second step in formulating policy to alleviate the physician shortage in the US is finding accurate means by which to determine the demand and necessary supply of primary care physicians both nationally and rurally. Part of the issue is that there is no clear way to determine the amount of physicians needed, and how many are being made. As was shown in the section titled "Terminology," part of the problem is that literature about the shortage is written by authors from two different disciplines, medical economists and actual health professionals. These two disciplines are never communicating with each other because the terminology they use is used differently, so they are often communicating at each other, and never to each other. Using common terminology will allow both disciplines to not only effectively communicate with each other, but to also come to common ground on definitions which will allow them to begin analyzing and seeking solutions to the physician shortage problem.

The third step in alleviating the physician shortage both rurally and nationally is the reorganization and restructuring of primary care services. Physicians are often having to spend their time on menial tasks such as updating electronic health medical records instead of seeing patients. By increasing the scope of practice for physician-extenders such as physician-assistants, medical assistants, and nurse practitioners, and having them tend to tasks that do not require the expertise of a physician, the time of physicians' can be spent seeing patients. Moreover, increasing the scope of practice for physician-extenders will not only allow physicians to tend to more patients, but also allow

physician-assistants, medical assistants, nurse practitioners, and other non-physician health care professional to gain experience and put their formal medical training to optimal use. In restructuring primary care services, reimbursement rates for Medicare and Medicaid patients, as well as other forms of non-private insurance must also increase. Physicians are not spending enough time with patients because they have to balance the amount of patients they need to see in order to cover money lost due to low reimbursement rates from non-private insurers.

Reorganizing and restructuring primary care services will inevitably require the use of advancing medical technology. By increasing the scope of practice for physician-extendors this will free up physicians to do things such as use medical technology to diagnose patients, prescribe prescriptions, offer treatment plans, and several other things from afar. Moreover, using medical technology will allow physicians from other regions to assist in shortage areas from afar as well.

Of the four sub-categories, physician immigration and emigration is an important one to note. Physicians will often migrate to regions that are developed because the thought process is that regions where jobs are easily found, are pockets of wealth. The negation is also true, where undeveloped regions are poverty stricken. Thus, physicians will often times select developed regions to reside and work in. In order to combat this, policies such as the PRCC that was developed by Australia, where recruitment from rural regions results in students selecting rural regions to work in, and also strategies such as those implemented by the Chinese in their village doctor system of training village residents to be village doctors, will be highly beneficial. In regards to physician immigration, by de-stigmatizing IMGs as foreigners who want to take jobs from

Americans, and lowering the barriers to access, steps to alleviating the physician shortage can be taken.

By restructuring graduate medical education and the financing for it, we can also begin to take steps to alleviating the physician shortage. Graduate medical education as it currently stands is extremely costly, with it costing about half a million dollars (\$500,000) to make a physician (from medical school through to residency). With the median income for a primary care physician being \$52,000 per year, the debt-to-income ratio is extremely difficult to hurdle. Thus, primary care needs to be incentivized in order to attract more future physicians. Means of incentivization include recruiting more students from rural regions as was done by Australia with the PRCC, increasing the wage/salary of primary care physicians, fixing the insurance system so as to allow higher reimbursement rates, lifting the Congressional cap on the amount of funding that is available for residency programs, and finally, providing more scholarships for medical students entering into primary care so that the total debt incurred is reduced. The final option is to be a means of reducing debt, should increasing wages for primary care physicians become impossible. Moreover, providing lower interest rate loans, or debt-forgiveness programs for primary care physicians would greatly incentivize the discipline.

The final means by which the primary care physician shortage both nationally and rurally is to be alleviated is via the geographic distribution of physicians. By limiting initiating a database of where physicians are going, and thereby placing a cap on the amount of physicians in a particular area as compared to the population of that area via law, a more even distribution of physicians can occur.

Conclusion

Conclusively, the physician shortage problem is a complex one stemming from various reasons such as geographical location, salary and finances, nationality, and lack of prestige. Some have argued that the issue is an actual shortage as is evidenced by multiple statistical reports, while others have contended that the heart of the problem is a lack of appropriate specialization distribution. Despite the underlying cause, both sides agree that appropriate solutions include programs incentivizing specializing in shortage fields and shortage areas, debt and loan forgiveness, the use of non-physician healthcare professionals, and an increase in residency programs.

References

- American Association of Medical Colleges. (2017, 03 14). *New Research Reaffirms Physician Shortage*. Retrieved from American Association of Medical Colleges: https://news.aamc.org/press-releases/article/workforce_projections_03142017/
- Bodenheimer, T., & Pham, H. (2010). Primary Care: Current Problems and Proposed Solutions. *Health Affairs* , 29 (5), 799-805.
- Carroll, A. (2016, 11 07). *A Doctor Shortage? A Closer Look*. Retrieved from NY Times: <https://www.nytimes.com/2016/11/08/upshot/a-doctor-shortage-lets-take-a-closer-look.html?mcubz=1>
- Cassil, A. (2008, 09 1). *Rising rates of chronic health conditions: what can be done?* Retrieved from PubMed.gov: <https://www.ncbi.nlm.nih.gov/pubmed/19090046>
- Coulter I, Jacobson P, Parker LE. Sharing the mantle of primary female care: physicians, nurse practitioners, and physician assistants. *Journal of the American Medical Women's Association*. 2000;55(2):100–103.
- Dill, M. J., & Salsberg, E. S. (2008). *The Complexities of Physician Supply and Demand: Projections Through 2025*. Center for Workforce Studies. http://www.innovationlabs.com/pa_future/1/background_docs/AAMC%20Complexities%20of%20physician%20demand,%202008.pdf
- H.R. 2267 - *Resident Physician Shortage Reduction Act of 2017*. Retrieved from Congress.gov: <https://www.congress.gov/bill/115th-congress/house-bill/2267?q=%7B%22search%22%3A%5B%22physician+shortage%22%5D%7D&r=2>
- <https://www.congress.gov/bill/114th-congress/senate-bill/2371/all-info>
- Information Handling Services. *The 2017 Update: Complexities of Physician Supply and Demand: Projections from 2015 to 2030*. Retrieved from American Association of Medical Colleges: https://aamc-black.global.ssl.fastly.net/production/media/filer_public/a5/c3/a5c3d565-14ec-48fb-974b-99fafaecb00/aamc_projections_update_2017.pdf
- Information Handling Services. *The Complexities of Physician Supply and Demand: Projections from 2014 to 2016*. Retrieved from American Association of Medical

Colleges:

https://www.aamc.org/download/458082/data/2016_complexities_of_supply_and_demand_projections.pdf

- Hooker RS. A cost analysis of physician assistants in primary care. *Journal of the American Academy of Physician Assistants*. 2002;15(11):39–48.
- Hooker RS, Cawley JF. The hidden rheumatology workforce. *Arthritis Practitioner*. 2005;1(3):34.
- Hooker RS, Nicholson J, Le T. Does the employment of physician assistants and nurse practitioners increase liability? *Journal of Medical Licensure and Discipline*. 2009;95(2):6–16.
- Japsen, Bruce. (2016). Physician Assistants Moving Into Specialties Amid Doctor Shortage. Retrieved from <https://www.forbes.com/sites/brucejapsen/2016/07/14/physician-assistants-moving-into-specialties-amid-doctor-shortage/#389e5a985874>
- Jeffers, J., Bognanno, M., & Barlett, J. (1971). On the Demand Versus Need for Medical Services and the Concept of "Shortage". *American Journal of Public Health*, 61 (1), 46-63.
- Kirch, D., & Vernon, D. (2008). Confronting the Complexity of the Physician Workforce Equation. *Journal of American Medical Association*, 299 (22), 2680-2682.
- Kirch, D., Henderson, M., & Dill, M. (2011). Physician Workforce Projections in an Era of Health Care Reform. *The Annual Review of Medicine* (63), 435-445.
- Krupa, C. (2010). *Physician shortage projected to soar to more than 91,000 in a decade*. Retrieved from American Medical Education News: <http://www.amednews.com/static/index.html>
- Med School Admissions by the Numbers*. (2016, 10 03). Retrieved from Kaplan: <https://www.kaptest.com/blog/med-school-pulse/2016/10/03/med-school-admission-by-the-numbers/>
- Lakhan, S., & Laird, C. (2009, 05 09). *Addressing the primary care physician shortage in an evolving medical workforce*. Retrieved from International Archives of Medicine: <https://intarchmed.biomedcentral.com/articles/10.1186/1755-7682-2-14>
- Li, X., Cochran, C., Lu, J., Shen, J., Hao, C., Wang, Y., et al. (2014, July 2). Understanding the shortage of village doctors in China and solutions under the policy

of basic public health service equalization: evidence from Changzhou. *The International Journal of Health Planning And Management* , 42-55.

- Liu, B. (2015, 05 01). *Primary Care Physician Shortage: It Isn't Just About The Physicians*. Retrieved from Standford Journal Of Public Health: <https://web.stanford.edu/group/sjph/cgi-bin/sjphsite/the-looming-primary-care-physician-shortage-why-it-isnt-just-about-the-physicians/>
- Marcus, M. B. (2017, 03 20). *New report predicts "troubling" shortage of doctors in the US*. Retrieved from CBS: <https://www.cbsnews.com/news/doctor-shortage-us-impact-on-health/>
- Mitka, M. (2007). Looming Shortage of Physicians Raises Concerns About Access to Care. *Journal of American Medical Association* , 297 (10), 1045-1046.
- Moawad, H. (2017, 05 22). *Can the looming physician shortage be stopped?* Retrieved from Medical Economics: <http://medicaleconomics.modernmedicine.com/medical-economics/news/can-looming-physician-shortage-be-stopped>
- New Research Confirms Looming Physician Shortage*. (2016, 04 05). Retrieved from Association of American Medical Colleges: https://www.aamc.org/newsroom/newsreleases/458074/2016_workforce_projections_04052016.html
- Pedersen DM, Chappell B, Elison G, Bunnell R. The productivity of PAs, APRNs, and physicians in Utah. *Journal of The American Academy of Physician Assistants*. 2008;21(1):42–47.
- Petterson, S. M., Liaw, W. R., Tran, C., & Bazemore, A. W. (2015, 03 14). Estimating the Residency Expansion Required to Avoid Projected Primary Care Physician Shortages by 2035. *Annals of Family Medicine* . <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4369588/>
- Potempa, K. (2013, 06 20). *The Experts: What Should Be Done to Fix the Predicted U.S. Doctor Shortage?* Retrieved from The Wall Street Journal: <https://www.wsj.com/articles/SB10001424127887323393804578555741780608174>

- Salsberg, E. (2015, 09 09). *Is the Physician Shortage Real? Implications for the Recommendations of the Institute of Medicine Committee on the Governance and Finance of Graduate Medical Education*. Retrieved from Pubmed.gov: <https://www.ncbi.nlm.nih.gov/pubmed/26177529>
- Stagg, P., Greenhill, J., & Worley, P. (2009). A New Model to Understand the Career Choice and Practice Location Decision of Medical Graduates. *Rural and Remote Health* , 1-10.
- Steinbrook, R. (2009, June 25). Easing the Shortage in Adult Primary Care — Is It All about Money? *The New England Journal of Medicine* , 2697.
- Stoddard, J., Sekscenski, E., & Weiner, J. (1998). The Physician Workforce: Broadening The Search for Solutions. *Health Affairs* , 17 (1).
- Student Loan Forgiveness. 2017. Retrieved from American Association of Medical Colleges https://www.aamc.org/advocacy/meded/79048/student_loan_repayment.html
- Tuition and Fees, University of Connecticut. 2017. Retrieved from <http://admissions.uconn.edu/cost-aid/tuition>
- Rabinowitz, H. (1988). *Evaluation of a Selective Medical School Admissions Policy to Increase the Number of Family Physicians in Rural and Underserved Areas*. Retrieved from The New England Journal of Medicine: <http://www.nejm.org/doi/pdf/10.1056/NEJM198808253190805>
- Rolfe, I., Pearson, S., O'Connell, D., & Dickinson, J. (1995). Finding Solutions to the Rural Doctor Shortage: The Roles of Selection versus Undergraduate Medical Education at Newcastle. *Australia and New Zealand Journal of Medicine* , 25, 512-517.
- Rovner, J. (2014, 11 24). *Is the US really facing a serious doctor shortage?* Retrieved from PBS: <http://www.pbs.org/newshour/rundown/u-s-really-facing-serious-doctor-shortage/>
- Wynn, B. , Smalley, R. , Cordasco, K. (2013). Does it Cost More to Train Physicians or to Replace Them?. Retrieved from RAND Corporation https://www.rand.org/content/dam/rand/pubs/research_reports/RR300/RR324/RAND_RR324.pdf