Masthead Logo

Nova Southeastern University
NSUWorks

Health Sciences Program Student Theses, Dissertations and Capstones

Department of Health Sciences

1-1-2014

Investigation of physician assistants' choice of rural or underserved practice and framing methods of recruitment and retention

Jennifer A. Snyder
Nova Southeastern University

This document is a product of extensive research conducted at the Nova Southeastern University College of Health Care Sciences. For more information on research and degree programs at the NSU College of Health Care Sciences, please click here.

Follow this and additional works at: https://nsuworks.nova.edu/hpd_hs_stuetd

Part of the Medicine and Health Sciences Commons

All rights reserved. This publication is intended for use solely by faculty, students, and staff of Nova Southeastern University. No part of this publication may be reproduced, distributed, or transmitted in any form or by any means, now known or later developed, including but not limited to photocopying, recording, or other electronic or mechanical methods, without the prior written permission of the author or the publisher.

NSUWorks Citation

Jennifer A. Snyder. 2014. *Investigation of physician assistants' choice of rural or underserved practice and framing methods of recruitment and retention.* Doctoral dissertation. Nova Southeastern University. Retrieved from NSUWorks, College of Health Care Sciences – Health Science Department. (3)
https://nsuworks.nova.edu/hpd_hs_stuetd/3.

This Dissertation is brought to you by the Department of Health Sciences at NSUWorks. It has been accepted for inclusion in Health Sciences Program Student Theses, Dissertations and Capstones by an authorized administrator of NSUWorks. For more information, please contact nsuworks@nova.edu.

Investigation of Physician Assistants' Choice of Rural or Underserved Practice and Framing Methods of Recruitment and Retention

By

Jennifer A. Snyder

A Dissertation Submitted to the Health Professions Division

in Partial Fulfillment of the Requirements

for the Degree of Ph.D. in Health Science

Nova Southeastern University

July 28, 2014

Signature (Approval) Page

We hereby certify that this dissertation, submitted by Jennifer A. Snyder, conforms to acceptable standards and is fully adequate in scope and quality to fulfill the dissertation requirement for the degree of Ph.D. in Health Science.

_____ _____

Guy Nehrenz, Ed.D., RRT — Date
Chairperson of Dissertation Committee

_____ _____

Randy Danielsen, Ph.D., PA-C — Date
Dissertation Committee Member

_____ _____

Don Pedersen, Ph.D., PA-C — Date
Dissertation Committee Member

Approved:

_____ _____

Brianna Black Kent, Ph.D., RN — Date
Program Director

_____ _____

Sandrine Kenney, Ed.D. — Date
Chair of the Department

_____ _____

Stanley H. Wilson, P.T., Ed.D., CEAS — Date
Dean College

Abstract

Objective: This dissertation analyzed one state's physician assistant (PA) workforce focusing on recruitment and retention. The goal was to identify factors associated with Indiana PAs working in medically underserved, rural, and primary-care medicine. The study evaluated characteristics of PAs who chose initially to work in rural versus urban areas and who have continued to do so. From the literature and as a result of study outcomes, a framework was developed, upon which recommendations were made for effective methods of increasing and retaining the number of PAs in primary care within rural areas. **Subjects**: Data were obtained from applications for PA licensure submitted to the Indiana Professional Licensing Agency between the years 2000 and 2010. Additionally, PAs working in Indiana who graduated during this period were surveyed. **Methods**: Descriptive statistics quantitatively defined the Indiana PA workforce. Survey questions to this population focused on provider upbringing, education, and specialization interest, as well as recruitment and retention to rural, primary-care, or underserved areas. Chi Square tests and logistic regression were used, where appropriate, to examine the influence of independent variables on the choice of practicing in rural, primary-care, and medically underserved areas. Based on these responses, recommendations were developed for strategies to increase the supply of physician assistants in rural areas. **Findings**: Among applicants for PA licensure in Indiana from 2000 to 2010, there were more females (70%) than males (30%), and the median age of applicants was 35 years. Respondent PAs predominantly worked in counties that were designated by the United States Department of Agriculture as metropolitan (91.3%) and largely in areas designated

as Code 1 according to Rural-Urban Continuum Codes, the highest level of urbanicity. Additionally, more PAs worked in a specialty area (79%) than in primary care (21%). Chi Square analyses revealed significant relationships ($p < .05$) between primary care and gender; educated outside of Indiana and working in an underserved area; and being born in a rural area and choosing to practice in a rural area. Binary logistic regression identified that female gender was predictive of the decision to practice in primary care, and birth in a rural area was predictive of current rural practice. In reflecting upon their first employment following training, 70 percent of respondents believed that the job offer was neither directly nor indirectly a result of having completed a clinical rotation at that particular site, or having worked with a particular preceptor, during their experiential training. A relationship was found between the respondents' initial job location being urban and living in a metro location at the time of high school graduation. Finally, educational debt influenced males' initial practice location and specialty but did not similarly affect choice of practice among females. **Conclusions**: There were several important characteristics of recently licensed PAs in Indiana that were identified in this study. Educational institutions, policymakers, and communities may increase recruitment and retention of PAs to rural and primary-care practice by actively identifying PAs who possess selected characteristics for the area of interest and providing incentives to reduce educational debt.

Keywords: rural, medically underserved areas, primary care, physician assistants, Indiana, educational debt

Acknowledgments

The thoughtful and patient counsel from the members of my dissertation committee, Drs. Don Pedersen and Randy Danielsen, and especially committee chair, Dr. Guy Nehrenz, were of great value. Their encouragement was never ending and provided a balance of guidance and independence for me to complete my dissertation.

I want to thank Drs. Pat Kelly and Brianna Kent, dedicated directors of the respective DHSc and Ph.D. programs, for support early in this journey.

I would also like to thank my family—husband Jack, daughters Taryn and Hannah—who patiently supported me throughout this academic pursuit.

Table of Contents

Page

Abstract iii

Acknowledgments v

Table of Contents vi

List of Tables viii

List of Figures xi

Chapter 1: Introduction 1
Indiana 1
Health Status 2
Primary-Care Workforce 2
Rural and Medically Underserved Areas 3
Physicians 7
Physician Assistant Practice Act 10
Physician Assistant Programs 15
Physician Assistants 16
Statement of Problem 17
Significance of Study 18
Research Questions 18
Definitions of Terms 19
Summary 22

Chapter 2: Literature Review 24
Introduction 24
Historical Overview of the Theory and Research Literature 24
Summary of What is Known and Unknown 25
Physician Studies 25
Physician Assistant Studies 28
Contributions This Study Will Make 31
Summary 32

Chapter 3: Methodology 33
Introduction 33
Population and Setting 33
Research Methods 33
Specific Procedures 34
Secondary Analysis of Data 34
Survey of Recent Graduates 40
Retention 50

Resource Requirement 51
Reliability and Validity 53

Chapter 4: Results 54
Introduction 54
Data Analysis 54
Secondary Analysis of Data and Survey Responses 54
Retention 55
Findings 56
Secondary Analysis of IPLA Dataset 56
Survey of Recent Graduates and Retention 81
Summary of results 106
Secondary Analysis of IPLA Dataset 106
Survey of Recent Graduates and Retention 107

Chapter 5: Discussion 108
Introduction 108
Discussion 108
Recommendations 110
Implications of Research 115
Limitation and Delimitations 116

Appendices
A Letter to Participate in Survey 118
B Survey 119

References 129

Tables

Page

Table 1: Indiana primary-care provider FTE per 100,000 population, 2012 2

Table 2: Indiana physician assistant practice acts.....12

Table 3: Indiana physician assistant programs 15

Table 4: Variables for the population PAs graduating between 2000 and 2010 36

Table 5: Physician assistant records used in this study.....40

Table 6: Variables for 2014 recruitment and retention study: 43

Table 7: 2013 Rural-Urban Continuum Codes 52

Table 8: Secondary analysis of IPLA dataset: Age and gender of actively licensed Indiana physician assistants 56

Table 9: Secondary analysis of IPLA dataset: State of birth 56

Table 10: Secondary analysis of IPLA dataset: PA education institution 57

Table 11: Secondary analysis of IPLA dataset: Most common specialties 59

Table 12: Secondary analysis of IPLA dataset: 2013 Rural-Urban Continuum Code of current practice locations 60

Table 13: Secondary analysis of IPLA dataset: Mission of PA programs.....62

Table 14: Secondary analysis of IPLA dataset: Chi Square test results for current practice in primary care 63

Table 15: Secondary analysis of IPLA dataset: Chi Square test results for current practice in MUA 66

Table 16: Secondary analysis of IPLA dataset: Chi Square test results for current practice in rural areas 69

Table 17: Secondary analysis of IPLA dataset: Binary logistic regression for primary-care practice with 95% confidence intervals 72

Table 18: Secondary analysis of IPLA dataset: Binary logistic regression for medically underserved area with 95% confidence intervals 74

Table 19: Secondary analysis of IPLA dataset: Binary logistic regression for practicing in a rural area with 95% confidence intervals 76

Table 20: Power calculation for binary logistic regression of current practice in primary care 78

Table 21: Power calculation for logistic regression and current practice in medically underserved areas 79

Table 22: Power calculation for binary logistic regression and current practice in rural areas 80

Table 23: Comparison of demographics of survey respondents to total population.....82

Table 24: Race/ethnicity of Indiana's population.....83

Table 25: Growing up, the respondent PA's household perceived income was.....83

Table 26: 2014 recruitment and retention study: Perceived effect of educational debt and influence on specialty and location choice 84

Table 27: 2014 recruitment and retention study: Chi Square distribution of respondents, by gender, for perceived debt's influence.....85

Table 28: 2014 recruitment and retention study: Earliest known time period respondent indicated they first knew they wanted to be a physician assistant 86

Table 29: 2014 recruitment and retention study: Effects of program training on location and specialty of practice 88

Table 30: 2014 recruitment and retention study: Recruitment to work as a PA 89

Table 31: 2014 recruitment and retention study: Primary reason work location was chosen by those electing rural practice initially after graduation 91

Table 32: 2014 Recruitment and retention study: reason initial practice choice 92

Table 33: 2014 Recruitment and retention study: Factor that most influenced respondent PAs to a particular practice location 93

Table 34: 2014 Recruitment and retention study: Distribution of respondents' first and current job locations 94

Table 35: 2014 Recruitment and retention study: Distribution of respondents for first practice location rural versus urban 95

Table 36: 2014 Recruitment and retention study: Distribution of respondents for first practice location, rural and stayed rural versus moved to an urban location 97

Table 37: 2014 Recruitment and retention study: Distribution of respondents for first practice location, urban and stayed urban versus moved to rural location 99

Table 38: 2014 Recruitment and retention study: Power calculation for first practice location rural versus urban 102

Table 39: 2014 Recruitment and retention study: Power calculation for first practice location, rural and stayed rural, versus moved to an urban location 103

Table 40: 2014 Recruitment and retention study: Power calculation for first practice location rural versus urban 104

Table 41: 2014 recruitment and retention study: Binary logistic regression predicting first practice location in a rural versus urban area 105

Figures and Graphs

Page

Figure 1: Indiana counties classified by Rural-Urban Continuum Codes 5

Figure 2: Indiana medically underserved areas 6

Figure 3: Estimated number of physician FTEs in Indiana per county, 2011 8

Figure 4: Estimated number of primary-care physician FTEs in Indiana per county, 2011 9

Figure 5: Conceptual model of the process of primary-care specialty choice 24

Figure 6: Secondary analysis of IPLA dataset: Current specialties.....58

Figure 7: Secondary analysis of IPLA dataset: Location of practice.....61

Figure 8: 2014 recruitment and retention study: Percentage of respondent PA life experiences reflecting a metro or nonmetro area 90

Chapter 1: Introduction

U.S. public-health needs in recent decades have intensified. The reasons are varied, and include, in part, an aging baby boomer population, people living longer due to advances in medical care and technology (Institute of Medicine, 2012; Knickman & Snell, 2002; Sargen, Hooker, & Cooper, 2011), an increase in the number of people living with chronic disease states, and an aging population of primary-care providers (Doescher, Fordyce, & Skillman, 2009). While the effects are unknown at this time, implementation of the federal Patient Protection and Affordable Care Act (2010), which aims to expand coverage and affordability of health care to U.S. citizens, could have a significant public-health impact (Zinberg, 2011). Further, the U.S. health-care system is faced with a growing shortage of primary-care physicians, in the areas of family medicine, internal medicine, and pediatrics (Whitcomb & Cohen, 2004). As a result of increasing health-care demands, access to care for patients in some areas of this country has been severely restricted (Healthy People 2020, 2013). In light of the burgeoning needs, it is important for policymakers, regulators, health-care educators, and others to determine strategies and tactics through which the U.S. health-care system can address these shortcomings.

Indiana

Health Status

Indiana spans 35,826 square miles and has an estimated population of 6,570,902 (United States Census Bureau, 2013). Indianapolis, the capital city, is located in Marion County, in the center of the state. The state's largest cities are Indianapolis, Fort Wayne, and Evansville. According to the most recent U.S. census (2010), 84% of the state's population is white, 9% is black/African-American, 2% is Asian, and 6% is of Hispanic/Latino origin (United States

Census Bureau, 2010). Unauthorized immigrants comprise 110,000 people or 2% of the state's population (Pew Hispanic Center, 2010).

The Centers for Disease Control and Prevention's Behavioral Risk Factor Surveillance System illustrates the state's poor general health status. This report ranks Indiana's median population health worse than the median of all states combined relative to rates of smoking, coronary heart disease, obesity, diabetes, and chronic obstructive pulmonary disease (Centers for Disease Control and Prevention, 2012). The CDC has also determined that citizens of Indiana are less likely to participate in early-detection health screening, including mammograms in women over 40, Pap tests in women over 18, and colorectal cancer screening in patients over 50. Additionally, the Kaiser Family Foundation, in its State Health Facts, has documented Indiana as having a higher than average infant mortality rate, a lower percentage of children age 19-35 months who are immunized, higher than average teen pregnancy rates, and lower life expectancy when compared to the rest of the United States. These indicators document that Indiana has many unmet health needs.

Primary-Care Workforce

According to a 2012 Indiana Primary Care Clinician Workforce Report, there were almost 4,000 primary-care provider full-time equivalents (FTEs) in Indiana in that year (Table 1) (Lewis, Scheff, Zollinger, & Allen, 2012). The report indicated that nearly one-third (31%) of all primary-care provider FTEs in Indiana were age 55 or older, and therefore, relatively close to the age of retirement. The percentage of older primary-care providers is very similar in both rural and urban counties (34% and 31%, respectively).

Table 1

Indiana primary-care provider full-time equivalents per 100,000 population, 2012

	Urban	Rural	Total
	n =	n =	n =
Physicians	2,389	491	2,880
Physician Assistants	79	18	97
Nurse Practitioners	772	203	975
Total	3,240	712	3,952

Lewis, Scheff, Zollinger, & Allen. (2012).

Andrew Bazemore, MD, MPH, of the Director, Robert Graham Center Policy Studies in Family Medicine & Primary Care in Washington D.C., reports they have identified an inflection in several key outcomes of interest (e.g., ACS hospitalizations, costs) in areas with somewhere between 1:1000 and 1:1100 primary-care providers to populations (personal communications, 6-4-2014). According to the 2012 Indiana Primary Care Clinician Workforce Report, rural counties across Indiana averaged 18 primary-care provider FTEs per 100,000 population, while urban counties averaged 83 (Lewis, et al., 2012). While both fall below the Graham Center's identified levels, the ratio in urban counties is much higher than in rural areas.

Rural and Medically Underserved Areas

More than 56% of Indiana counties are considered rural (Figure 1), and approximately 28% of the state's population lives in these areas (Indiana Office of Community and Rural

Affairs, 2005). In 2011, the Indiana State Department of Health identified 61% of the 92 counties in Indiana as medically underserved areas (Figure 2).

Figure 1

Indiana counties classified by Rural-Urban Continuum Codes

Urban counties (RUCC 1-3) are white and rural counties (RUCC 4-9) are blue

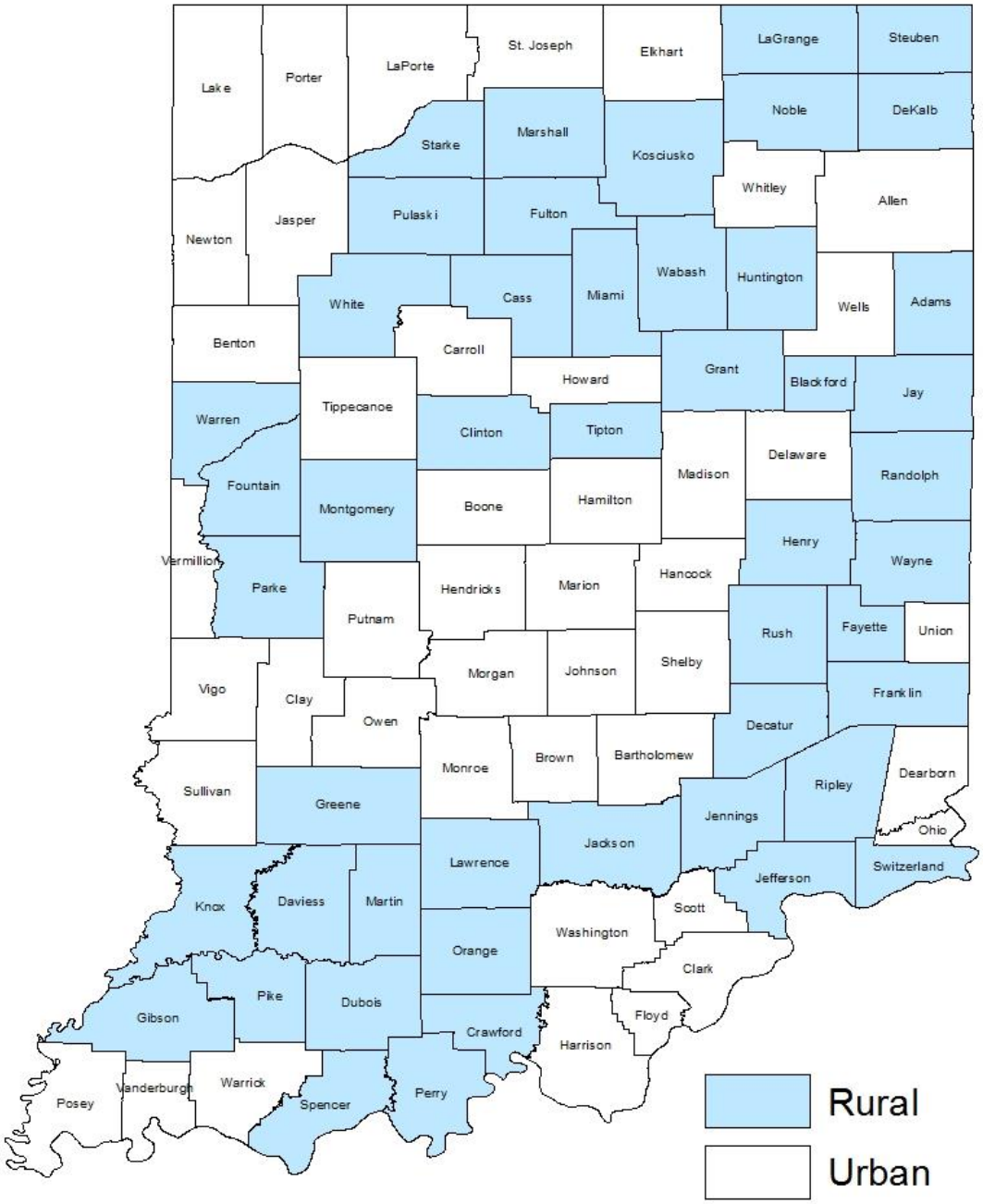
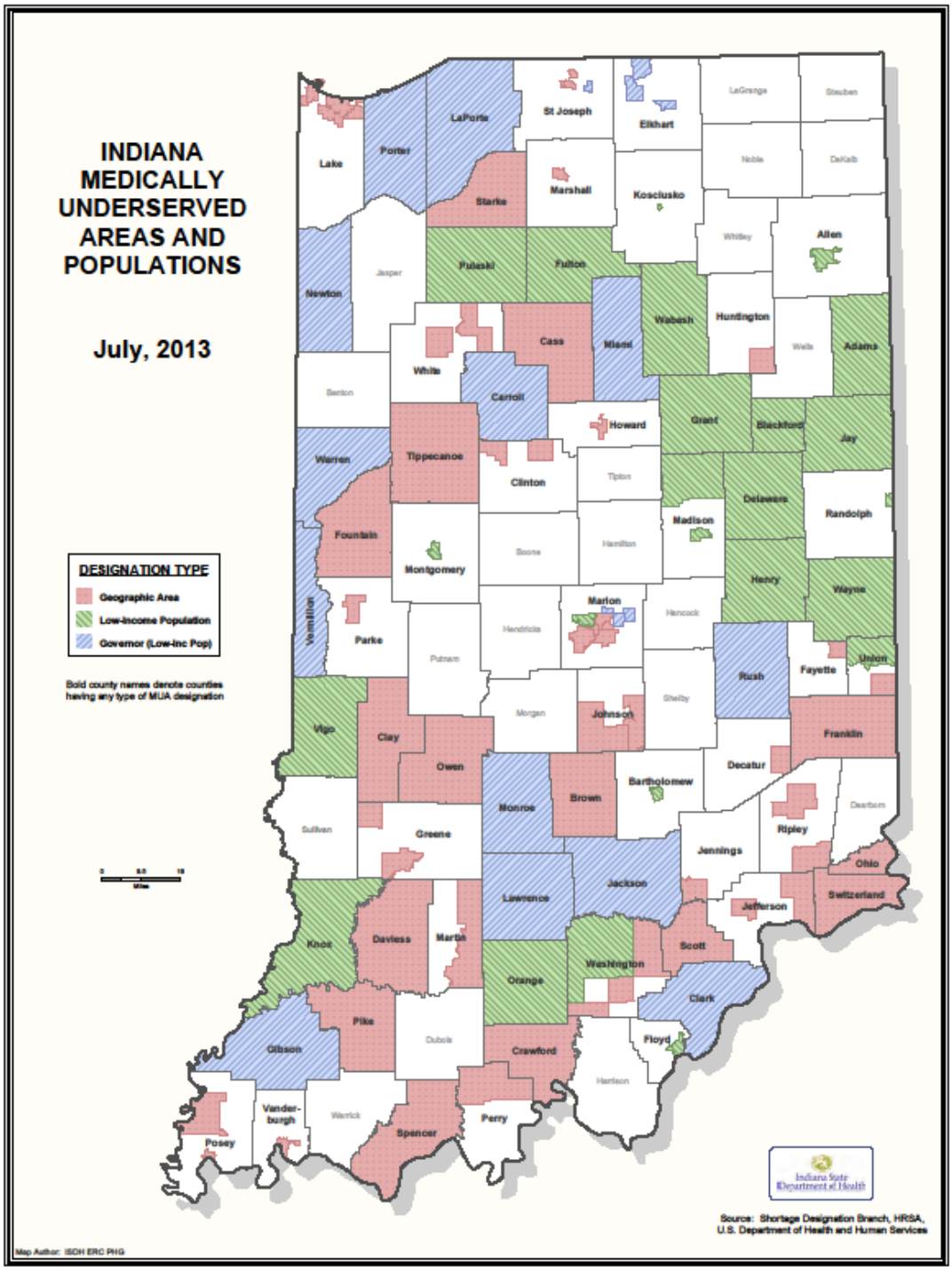


Figure 2

Indiana medically underserved areas



Indiana State Department of Health Medically Underserved Area Designations

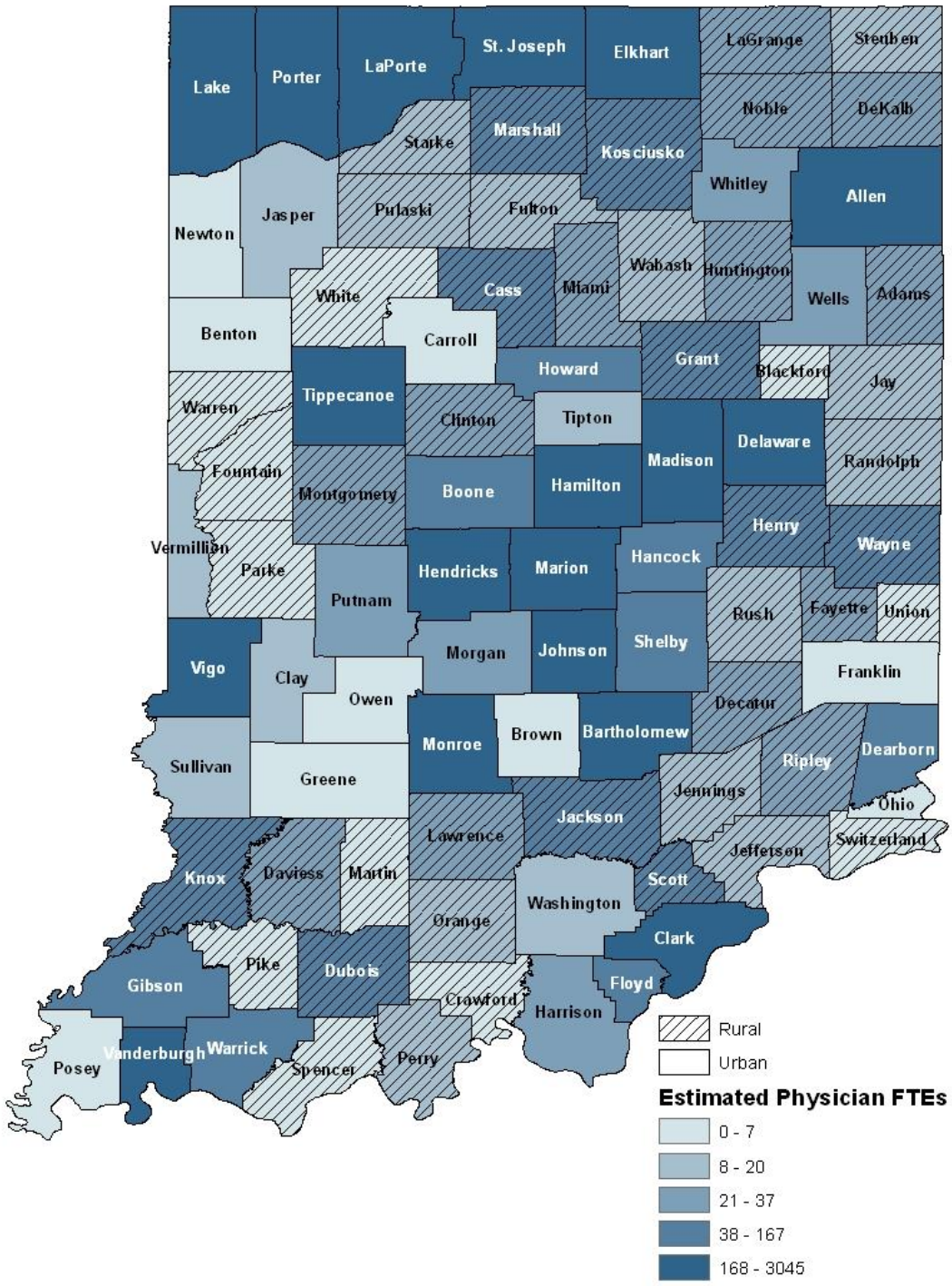
Physicians

From 1903 to 2013, Indiana University School of Medicine (IUSOM) was the state's only medical school (Indiana University, 2014). There are 4,600 IUSOM graduates currently practicing in Indiana, a number that comprises more than 53% of the total physician population (The Robert Graham Center, 2013). Twenty-two percent of the allopathic graduates from IUSOM work in primary care, and 11% practice in rural areas. In the fall of 2013, Marian University opened a College of Osteopathic Medicine, becoming the state's second medical school and its first osteopathic school of medicine (Marian University, 2014).

According to the 2011 Physician Licensure Report produced by the Indiana Center for Health Workforce Studies, 18% of Indiana's physician licenses issued or renewed (Figure 3) were to family-medicine physicians (Lewis, Scheff, Allen, & Zollinger, 2013). According to re-licensure figures, family medicine was the most common medical specialty. In this same study, counties with the largest populations tended to have the highest number of primary-care physician FTEs (Figure 4).

Figure 3

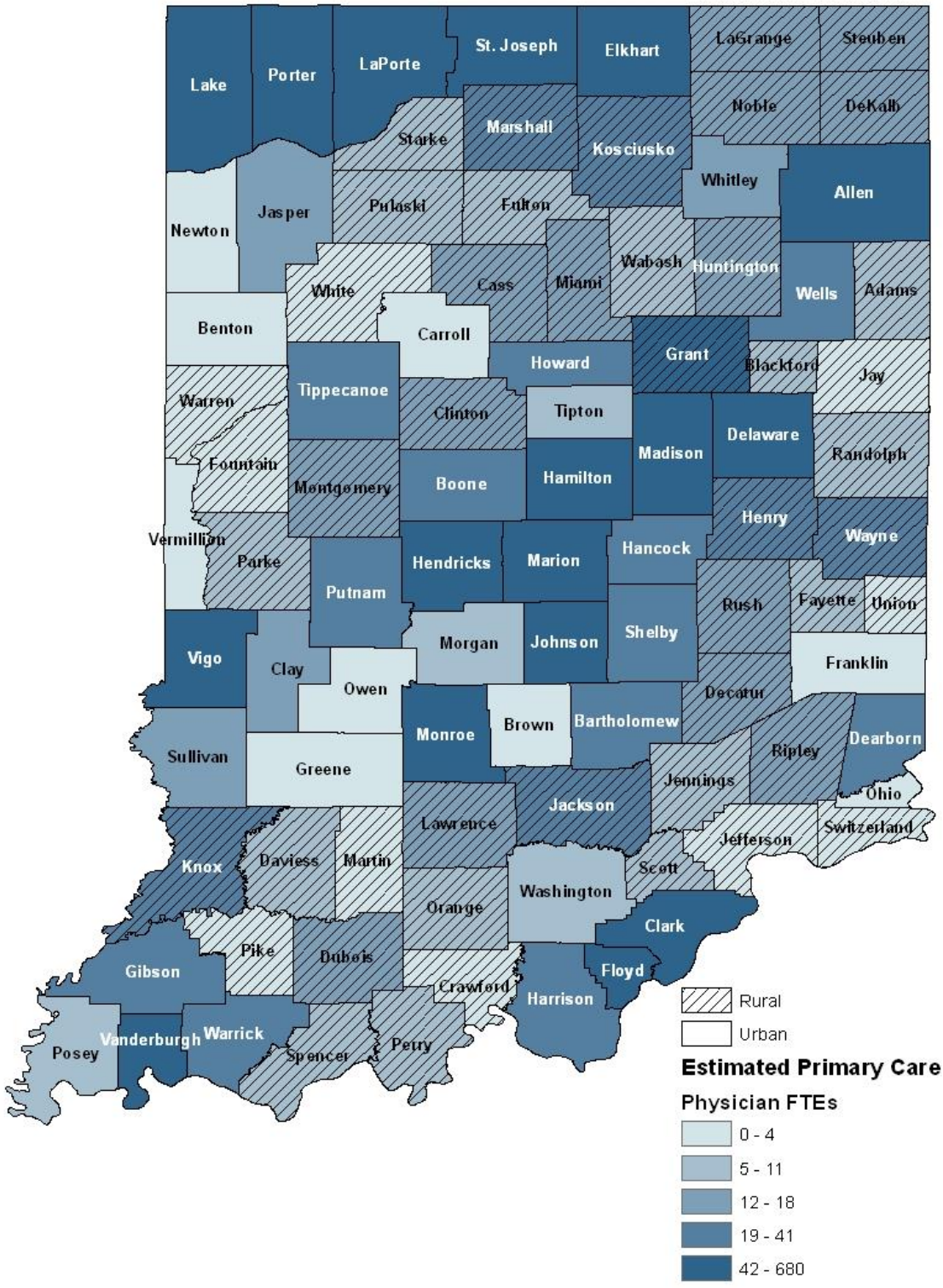
Estimated number of physician FTEs in Indiana per county, 2011



From the 2011 Indiana Physician Licensure Survey Report, p. 32, by Lewis, Scheff, Allen, & Zollinger, 2013. Reprinted with permission.

Figure 4

Estimated number of primary-care physician FTEs in Indiana per county, 2011



From the 2011 Indiana Physician Licensure Survey Report, p. 37, by Lewis, Scheff, Allen, & Zollinger, 2013. Reprinted with permission.

According to the same physician licensure report, Marion County has the largest number of primary-care physician FTEs at 679. The second-largest population of family physicians (306 FTEs) was found in Lake County. Other counties with large numbers of primary-care physician FTEs were Allen, Hamilton, St. Joseph, and Vanderburgh (Lewis et al., 2013). All of these counties also encompass a large urban center. There were 19 counties (21%) with fewer than five primary-care physician FTEs. Unfortunately, the trend since 2003 has been a decline in the proportion of the physician workforce practicing in primary care.

Prior to the implementation of the Patient Protection and Affordable Care Act, it was estimated that Indiana needed 5,000 more physicians, with 1,000 of those practicing in primary care to meet the growing population demands of the state (McKeag, Zollinger, Allen, Przybylski, Holloway, & Kochhar, 2007). The same study indicated that by 2020, Indiana would need an additional 2,000 primary-care physicians to satisfy state demands. The chasm between those who provide care and those who need care in Indiana has grown and appears to be widening. Therefore, due to the maldistribution and limited supply of physicians in rural areas in Indiana, effective methods of increasing and retaining the number of physicians and PAs in primary care within rural areas are needed.

Physician Assistant Practice Act

In Indiana, physician assistants have been in clinical practice since 1974 (Yountsey & Bock, 1975). However, Indiana did not pass legislation allowing PAs to legally practice in the state until 1977 (IAPA, 2011). A person educated as a PA, who has passed the national certification examination and desires to work in Indiana, must apply to the Indiana Professional Licensing Agency (IPLA) (Medical Licensing Board of Indiana, 2014). PAs must participate in

dependent practice with a supervising physician. According to the current Indiana PA practice act, the licensed individual may perform those duties that are delegated by the supervising physician and are within the physician's scope of practice. As shown in Table 2, the practice act in Indiana underwent major revisions in 2007 and again in 2013.

According to the American Academy of Physician Assistants (2011), in order to ensure that PAs can practice to the full extent of their training, six key elements should be included in every state PA practice act: licensure (not certification), scope of practice individually determined by supervising physician and PA, adaptable supervising requirements, full prescription writing authority, co-signature requirements maintained at the practice site, and a determination at the practice level of the number of PAs a physician may supervise. Presently Indiana meets four of the six key elements of a good PA state practice act (AAPA, 2014).

Table 2

Indiana physician assistant practice acts

	1977 – June 2007	July 2007 – June 2013	July 2013 – present day
General	NCCPA certification is required for licensure and renewal. 100 hours of CME every 2 years and renew state licensure with the IPLA every 2 years.	NCCPA certification is required for licensure and renewal. 100 hours of CME every 2 years and renew state licensure with the IPLA every 2 years.	NCCPA certification is required for licensure and renewal. 100 hours of CME every 2 years and renew state licensure with the IPLA every 2 years.
Regulatory Credential	Certification	Licensure	Licensure
Scope of Practice	Determined by supervising physician and PA; within physician scope of practice	Determined by supervising physician and PA; within physician scope of practice	Determined by supervising physician and PA; within physician scope of practice
Prescribing	PAs not authorized to write prescriptions	After one year of practice (1,800 hours), PAs may prescribe, dispense, and administer drugs and medical devices,	Full prescriptive authority: PAs may prescribe Schedule III-V medications, and are eligible to prescribe Schedule II

		including Schedule III-V controlled medications. PAs may issue a drug order for Schedule II medications in an inpatient setting under certain circumstances.	controlled substances after one year of practice experience.
Case review	Supervising physician must review 100% of PA cases within 24 hours	Supervising physician must review 100% of cases within 72 hours of patient encounters for the first three years of employment of the physician assistant by the same employer and at least 50% thereafter.	Patient encounters require review within 72 hours for the following: • 100% of the charts for the first year in that specialty • 50% for the second year in that specialty • 25% for the third year in that specialty. For the first year PA obtains authority to prescribe controlled substances, review is required for 100% of the patient cases for which a controlled substance is being dispensed or prescribed.
Supervision	Must be continuous but does not require the physical presence of the supervising physician at the time and place that		

	services are rendered.		
Additional supervision	Immediately available for consultation	Immediately available for consultation and is either in the county of or in a contiguous county to the on-site location in which services are rendered or tasks are performed by the PA, or the physician or PA is practicing at a hospital or health facility, or traveling to or from the facility	The supervising physician must be within reasonable travel distance from the facility to personally ensure proper care of the patients.
Physician may supervise	Two PAs	Two PAs	A physician may practice with an unlimited number of PAs, so long as they only supervise two PAs at any given time.

CME = continuing medical education; IPLA = Indiana Professional Licensing Agency; NCCPA = National Commission on the Certification of Physician Assistants

Physician Assistant Programs

Since 1974, four accredited institutions have graduated PAs in Indiana (Table 3). The first program, which was offered by Indiana University-Fort Wayne, granted a certificate at completion of the curriculum. The program closed in 1977. Before closing, Indiana University-Fort Wayne graduated 70 students. Two educational programs that transitioned from a bachelor's degree to a Master of Physician Assistant Studies degree are currently in operation. Butler University (Indianapolis) has graduated 289 students with bachelor's degrees (1996-2007) and 280 students with master's degrees (2008-2013); the University of Saint Francis (Fort Wayne) has graduated 38 students with bachelor's degrees (1997-2003) and 219 students with master's degrees (2004-2013). A fourth program, at Indiana State University, began as a master's degree program in 2011 and graduated its first cohort of 29 students in August 2013. A fifth program, at Indiana University-Indianapolis, accepted its inaugural class into a master's degree program in August 2013. Its first class has an expected graduation date of August 2015.

Table 3

Indiana physician assistant programs

Program—City	County	Year matriculated first students	Approximate number of graduates
Indiana University-Fort Wayne	Allen	1974*	70
Butler University-Indianapolis	Marion	1995	569
University of Saint Francis-Fort Wayne	Allen	1996	257
Indiana State University-Terre Haute	Vigo	2011	29
Indiana University-Indianapolis	Marion	2013	0

*closed 1977

Physician Assistants

There were 989 total PA license renewals and initial licensures completed in Indiana during the 2012-2013 period (Scheff, Zollinger, Barclay, Allen, & Banti, 2014). There has been a 97% increase in the number of active licensed PAs in Indiana between 2002 and 2010 (Snyder, Zorn, Gjerde, Burkhart, & Rosebrock, 2011), and most recently, the 2012 Physician Assistant Licensure Survey Report estimated a 40% increase in the number of PAs active in Indiana since 2010. Indiana was ranked in the lowest five states in the U.S. at 14 PAs per 100,000 population, outranking only Missouri, Alabama, Arkansas, and Mississippi, in an initial analysis of the National Commission on Certification of Physician Assistants (NCCPA) using data from the 2012 PA Professional Profile (Glicken, 2014). According to this same report, the overall national average during that same period was 33 PAs per 100,000 population.

Responses to the 2012 Indiana Physician Assistant Re-licensure Survey (response rate 89%) indicated that the majority of PAs were white (93%), non-Hispanic (98%), and female (66%); typically they delivered direct patient care at least 40 hours per week (70%) in hospital or private-practice settings (80%) in urban counties (89%).

According to a 2011 Physician Licensure Report survey, only one-eighth (13%) of the physician respondents indicated they supervised at least one physician assistant at their practice (Lewis, et al., 2013). Physician assistants most commonly worked in emergency medicine (22%) (Scheff, et al., 2014). The majority of PAs (56%) responding to the re-licensure survey indicated they made between $75,001 and $100,000 per year at their current position. This report did not tie the number of hours worked per week with salary earned. Approximately one in five PAs (18%) were licensed in additional states, most commonly those contiguous with Indiana (Illinois, Kentucky, Ohio, and Michigan). Further, PAs primarily held a master's degree as their highest

credential (59%). Scheff et al. (2014) indicated that nearly one-fifth (19%) of physician assistants received a scholarship to help with the costs of PA education, and the majority of PAs (57%) had between $25,001 and $100,000 in student loan debt. The authors indicated that the majority of PAs (89%) practiced in metro counties. Marion County had the highest number of PA FTEs (190) and had the highest ratio of PAs to population (21 PA FTEs per 100,000 population) of any Indiana county.

Statement of Problem

Lack of access to primary health care in the U.S. is a widely acknowledged problem. Both rural public health care and the medically underserved have been hit especially hard. "While 20% of Americans live in rural areas, only 9% of the Nation's physicians practice there," resulting in decreased access and delivery of care for millions of rural citizens (Van Dis, 2002, p. 108). Physicians will often complete residency training in urban medical centers and stay in those areas to set up their initial practice, further exacerbating the problem (Ricketts & Randolph, 2008). The authors of the Graham Center study indicated that according to the 2009 American Medical Association Physician Masterfile, 56% of family-medicine residents stay within 100 miles of where they complete their residency (Fagan, Finnegan, Bazemore, Gibbons, & Petterson, 2013). Simultaneously, given the trend of fewer physicians going into primary care, the number of available providers to serve in rural and medically underserved areas has been decreasing. The numbers and changes associated with physicians in Indiana are consistent with national trends.

Significance of Study

The objective of this study was to further understand the distribution, recruitment, and retention of PAs in Indiana. The study identified common characteristics of graduate PAs initially choosing to work in medically underserved areas and in rural, primary-care medicine. This study also analyzed characteristics of those individuals who continued to work in rural areas. The factors that influence a PA to initially choose rural practices are quite different from those that cause a PA to continue to stay in that location. The characteristics identified serve as a framework to develop strategies for those interested in recruiting PAs to rural areas. Educational institutions, policymakers, and communities may increase the recruitment and retention of PAs to practice within rural areas, and within primary-care settings, by actively identifying PAs with these selected characteristics.

Research Questions

This study employed a conceptual model of the process of primary-care specialty choice (Figure 5). The number of individuals providing primary care in rural and medically underserved areas must be adequate to meet the needs of individuals living in these areas. This research explored these issues and evaluated the following questions:

1. What is the distribution of PA practice location and specialty in Indiana?
2. Are there identifiable characteristics associated with Indiana PAs who practice in medically underserved, primary, and rural health-care areas?
3. Do upbringing or student experiences influence the PA graduate to practice in rural settings?

4. Are there identifiable characteristics associated with PAs practicing in Indiana whose first and most recent work sites are rural (remained rural); whose first and most recent work sites are urban (remained urban), and those who have moved from a rural to urban or from an urban to rural work site?

Definition of Terms

The following terms and definitions are imperative in understanding this study regarding PAs practicing in rural, primary-care, and medically underserved areas in Indiana. These definitions were collected from a number of resources and served as a starting point in understanding the PA workforce in Indiana.

Family Practice is defined as a medical specialty that encompasses wide-ranging health care for the patient and family over the patient's lifetime. The comprehensive scope of family medicine includes both young and old, and females and males. It includes health promotion and disease prevention for optimal health and care for all disease manifestations in between (modified from the American Academy of Family Physicians, accessed online at aafp.org/medical-school-residency/choosing-fm/value-scope.html).

Full-time equivalents (FTEs) were assigned to providers based on the average number of hours per week they spent in direct patient care. Full-time equivalents are not equal to the number of providers. Those who worked full time were considered 1 FTE, whereas providers who worked less than full time were labeled as an appropriate proportion of an FTE.

Indiana Professional Licensing Agency (IPLA) regulates licensed professionals in Indiana to ensure the health and safety of the citizens in the state (from the IPLA, accessed online at in.gov/pla).

Internal Medicine is a medical specialty focusing on the practice of health promotion, disease prevention, and all stages of illness and treatment of females and males from late teenage years to old age (modified from American College of Medicine, accessed online at acponline.org/medical_students/career_paths).

Medically underserved areas are identified by the U.S. Department of Health and Human Services (HHS) Health Resources and Services Administration (HRSA) as areas or populations with insufficient number of care providers and/or with high rates of infant mortality, poverty, and proportions of the population who are elderly (modified from the HRSA, accessed online at muafind.hrsa.gov).

National Health Service Corps Loan Repayment Program provides repayment for loans to nonphysician clinicians and primary-care physicians who agree to work in selected areas designated medically underserved by HHS (modified from the National Health Services Corps, accessed online at nhsc.hrsa.gov/corpsexperience).

Nonphysician clinicians are health-care providers who are either physician assistants or nurse practitioners.

Obstetrics and Gynecology (OBGYN) is a medical specialty that provides medical and surgical care of the female reproductive system and associated disorders (modified from the American Board of Obstetricians/Gynecologists, accessed online at acog.org).

Pediatrics is a medical specialty addressing the health and wellness of patients from birth to 21 years of age. Pediatricians are focused on prevention and management of disease that affects children (modified from the American Academy of Pediatrics, accessed online at aap.org).

Physician is a graduate of an accredited allopathic or osteopathic medical education program.

Physician Assistant is a graduate of an accredited PA program and therefore is eligible to become nationally certified and state-licensed to practice medicine. PA education is general and not restricted to a specific medical specialty; specialization occurs in the context of the medical practice and supervising physician (modified from American Academy of Physician Assistants, accessed online at aapa.org).

Physician Assistant Training Program or *Physician Assistant Program* must meet standards established by the Accreditation Review Commission on the Education for the Physician Assistant (ARC-PA). Most such programs typically last two years, with the first year dedicated to didactic and laboratory experiences and the second year spent in supervised experiential rotations in a variety of medical and surgical specialties. Primary care is a required experience. Graduates are then eligible to sit for the national certification examination, and passage is required to practice (Physician Assistant Education Association, accessed online at paeaonline.org and Accreditation Review Commission on the Education for the Physician Assistant at arc-pa.org).

Primary Care for the purposes of this study is defined as family medicine, general medicine, geriatric care, internal medicine, obstetrics and gynecology, and pediatric medicine.

Provider for the purposes of this study is defined as a physician, physician assistant, or nurse practitioner.

Retention for the purposes of this study is defined as continuing to work in the type of practice (urban, rural, primary-care, etc.) that was chosen initially upon graduation and licensure.

Rural is defined by the Economic Research Services of the U.S. Department of Agriculture (USDA) on a county-wide basis as nonmetro areas with some combination of open countryside, towns with fewer than 2,500 people, and urban areas with populations up to 49,999 that are not part of larger labor-market areas (modified from the USDA, accessed online at ers.usda.gov/topics/rural-economy-population/rural-classifications/what-is-rural.aspx). Also see Rural-Urban Continuum Code.

Rural upbringing is defined as spending all of one's childhood in a rural location, residing more than 10 years in a rural location, or calling a rural place one's childhood home (Laven & Wilkinson, 2003).

Rural-Urban Continuum Code is a 2013 categorization system whereby each county is designated with a code (1 to 9) that classifies metropolitan areas by population size (based on U.S. Census) and nonmetro areas by level of urbanization (Table 1) (USDA, accessed online at ers.usda.gov/data-products/rural-urban-continuum-codes.aspx). For purposes of this study, Codes 1-3 were considered metro and 4-9 were nonmetro.

Specialty refers to a medical discipline that is practiced by a medical professional who has received advanced training (modified from the American Association of Colleges of Osteopathic Medicine, accessed online at aacom.org).

Summary

Evidence suggests that the number of providers in underserved and rural communities in Indiana is inadequate and must be increased. Nonphysician clinicians, like PAs, may partially help solve the shortage. It has been important to identify characteristics associated with PA providers who have chosen to work in rural areas as well as those who have been retained in

these communities. These identified characteristics have served as the framework for strategy development. Recruitment and retention recommendations have been developed. These strategies should be used by educational programs, policymakers, and communities looking to increase health-care providers within certain specialties or areas in Indiana.

Chapter 2: Literature Review

Considerable attention has focused on how to address the continuing need for more primary-care physicians and PAs to provide health care for the people who live in medically underserved and rural areas (e.g., Chan et al., 2005; Petterson et al., 2012; Wade et al., 2007; Whitcomb & Cohen, 2004). Nevertheless, educational institutions will need to work with communities to increase the supply of physician and nonphysician clinicians in an attempt to meet the nation's health care needs (Grumbach & Bodenheimer, 2004; Larson & Hart, 2007).

Historical Overview of the Theory and Research Literature

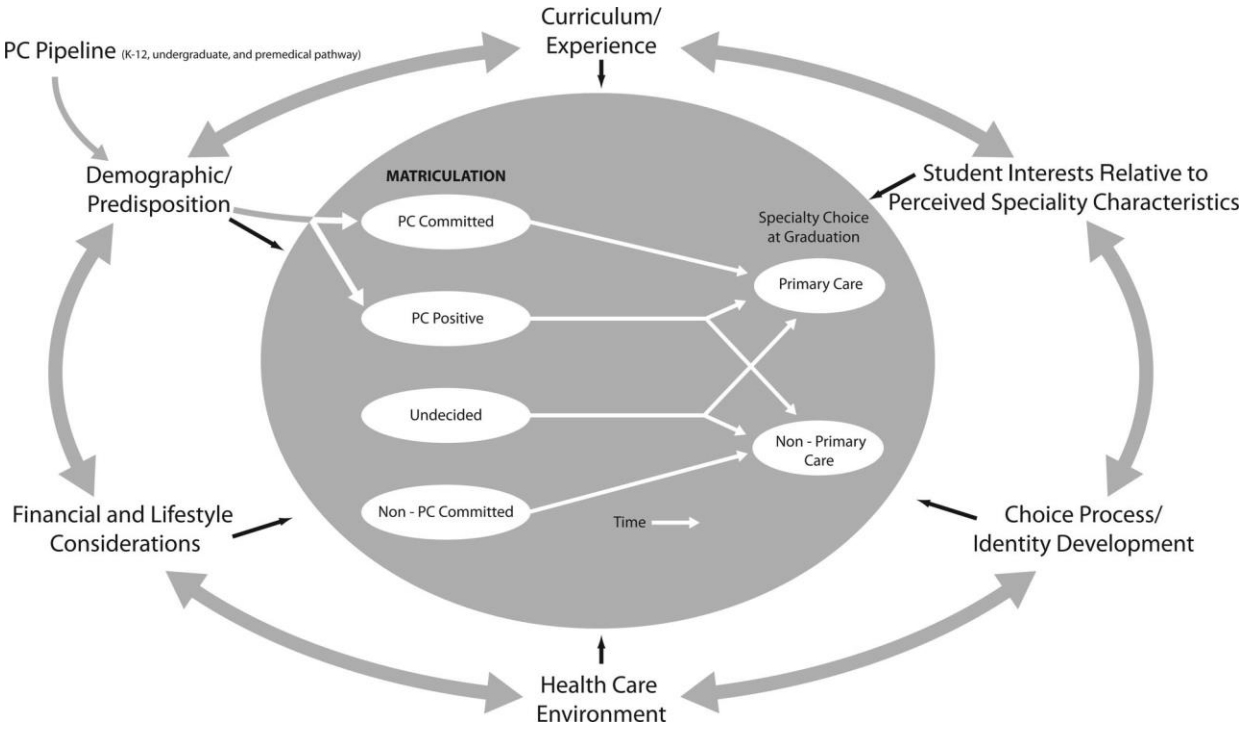
This study used the conceptual model of the process of primary-care specialty choice (Figure 5) developed by Bennett & Phillips, 2010, which focuses on graduate medical students who chose a primary-care specialty and the factors that influence providers' decisions over time, including demographic/predisposition, curriculum/experience, identity development, health-care environment, and financial/lifestyle considerations. The authors do not rank factors as being more important in the decision-making process but note that each factor plays a role in choosing or not choosing a primary-care specialty at graduation.

Understanding the relationship between PA provider characteristics and the choice to practice in medically underserved, rural, or primary-care areas in Indiana has provided a basis for strategy development for increasing the number of clinicians and thereby improving access to health care for citizens in need. Like the physician studies of Curran & Rourke (2004) and Chan et al. (2005), this study incorporated the factors included in the conceptual model of the process of primary-care specialty choice and attempted to determine if there was an association with the

graduate PA and their upbringing and/or student experiences. This study also explored how these factors might influence the PA graduate to stay and continue to practice in rural medicine.

Figure 5

Conceptual model of the process of primary-care specialty choice



PC = primary care

Summary of What Is Known and Unknown

Physician Studies

There have been a number of studies that have evaluated physicians' characteristics and location of practice choice (e.g., Chan et al., 2005; Laven & Wilkinson, 2003; Rabinowitz, Diamond, Markham, & Paynter, 2001; Wade et al., 2007). Easterbrook et al. (1999), Hyer et al.

(2007), Chan et al. (2005), Laven & Wilkinson (2003), and Rabinowitz et al. (2001) found that physicians from rural hometowns were more likely to practice rurally after graduation than those from nonrural hometowns. Specifically in Indiana, Wade et al. (2007) found that family physicians who had graduated from the Indiana University School of Medicine and who were from nonmetro (rural) hometowns were more than 4.7 times as likely to choose a nonmetro location to practice medicine. In a 2011 national survey of final-year medical residents, participants were asked to rate those factors they look for when assessing practice opportunities (Merritt Hawkins, 2011). "Geographic location" was rated as a "most important" factor by 81% of residents participating in the survey, a higher rating than for any other consideration. The authors of the study concluded that this reinforced that "many residents have a specific location in mind for their first practice — often a location within 50 miles from where they trained, where they grew up, or where their spouse or significant other grew up." Further, this study revealed that 69% of residents indicated they would most like to practice in a community with a population of more than 250,000.

A cross-sectional survey at one Arizona osteopathic medical school was administered to determine characteristics associated with the intent of rural practice (Royston, Mathieson, Leafman, & Ojan-Sheehan, 2012). Characteristics that were identified as significantly different between those who planned to or didn't plan to practice in a rural area were identified by Pearson's Chi Square test. Those identified as being significant in bivariate analysis were then evaluated by multiple regression. Of the 141 medical students (63%) responding to the survey, the intent to practice in rural primary care was associated with the student or spouse (significant other) having a "rural upbringing" ($p < 0.05$). The medical student's age, gender, and ethnicity were not significantly associated. Another study using Chi Square and logistic regression

analyses evaluated physicians who practiced in rural Indiana to identify significant associations (Bellinger, 2009). The findings provided further support that age was not a predictor of rural practice but location of upbringing influenced the physician's choice to practice in these areas.

A literature review by Curran & Rourke (2004) identified rural student recruitment, admissions policies, rural-oriented medical curricula, and learning experiences in rural practice as areas over which medical schools have control. Further, these are factors that increase the likelihood of medical students entering rural primary-care practice at graduation. In a survey of more than 650 rural Canadian physicians, Chan et al. (2005) concluded that exposure to rural practice during the clerkship years was more likely to be associated with practice in a rural setting after graduation. The authors suggested that it is indeed possible to entice physicians who grew up in urban areas into rural practice through curricular emphasis. Further, evidence would suggest that medical schools with a curriculum focus and a mission to educate rural health providers, like Jefferson Medical College at Thomas Jefferson University (Philadelphia), are successful in producing physicians who stay in rural areas to practice (Rabinowitz, Diamond, Markham, & Santana, 2013). Using Jefferson Medical College graduate data, Rabinowitz et al. confirmed that more than 70% of graduates from 1976 to 1986 who initially went into primary care were retained in rural areas 20-25 years later. This longitudinal study suggests that graduates of programs with a rural focus are not only likely to enter rural primary care, but are also likely to stay in rural practice for years.

A literature review by Thompson, Huntington, Hunt, Pinsky, & Brodie (2003) of eight studies involving more than 72 different schools that included 522 medical students and 166 residents found that international health electives were positively associated with medical students and residents choosing to practice in primary care and medically underserved areas. A

recent study analyzed the level of growing education debt and primary-care practice choice (Youngclaus, Koehler, Kotlikoff, & Wlecha, 2013). The authors found that physicians in all specialties could repay the current level of education debt without incurring more debt. However, some scenarios, typically those with higher borrowing levels, required tradeoffs and compromises, including repayment options beyond the standard 10-year repayment plan or living in a lower-cost area.

Physician Assistant Studies

Two national consumer surveys indicated that patients were willing to see a nonphysician clinician for their health care (Dill, Pankow, Erikson, & Shipman, 2013), and more than 94% were willing to be seen by a physician assistant instead of a physician (National Commission on Certification of Physician Assistants, 2014). A number of studies have confirmed that nonphysician clinicians and family physicians are more likely to care for rural patients than are physicians in other medical specialties (e.g., Coombs, Morgan, Pedersen, & Alder, 2011; Dehn, 2006; Gumbach, Hart, Mertz, Coffman, & Palazzo, 2003; Staton, Bhosle, Camacho, Feldman, & Balkrishnan, 2007).

There have been published studies regarding the characteristics of PAs working in rural communities (e.g., Coombs et al., 2011; Dehn, 2006; Diemer, Nehrenz, & Larson, 2012; Jones, 2008; Martin, 2000; Shannon & Jackson, 2011; Smith, Muma, Burks, & Muck Lavoie, 2012). In an early survey in the state of Pennsylvania, Martin (2000) found that PAs in general were more likely to practice in rural health than were physicians, but female PAs were more likely to work in urban settings than were male PAs. According to a secondary analysis of data obtained through an American Academy of Physician Assistant (AAPA) national survey, older PAs were

more likely to work in rural primary-care medicine than were younger PAs (Duryea & Hooker, 2000).

Using a legislatively mandated database, which was constructed and is maintained by the University of Iowa Office of Statewide Clinical Education Programs, Dehn (2006) analyzed the distribution of physician and nonphysician clinicians in Iowa and revealed that a greater proportion of PAs practiced in more sparsely populated geographic areas when compared to physicians and advanced-practice nurses. Physician assistants were therefore helping to alleviate the geographical maldistribution of medical providers in that state. In a cross-sectional survey design, Coombs et al. (2011) found that odds were lower for female PAs to end up working in rural and primary-care areas compared to male PAs in Utah. Through a database query of the Texas Medical Board website, Jones (2008) found that nearly half of the "frontier" PAs were female. This study's findings challenged earlier outcomes that women do not work in remote or rural practice sites.

A cross-sectional survey by Brock, Wick, Evans, & Gianola (2011) of the MEDEX program in Washington State evaluated graduates who matriculated with a military background and found they were more likely than those without a military background to enter primary, rural practice than specialty, urban care. The authors postulated that graduates with former military experience were better able to handle the rigors of working alone or in teams and dealt more effectively with the stressors of a rural environment. Unfortunately, it does not appear that the authors controlled for age or other factors that may or may not affect the dependent variables. Therefore, the study may have had uncontrolled confounders. The University of Colorado Child Health Associate/Physician Assistant Program initiated an approach to deploy more PAs into rural areas (Ruff, Gray, Arthur, & Merenstein, 2006). As one strategy, applicants who had an

interest in primary care were also placed in rural track rotations. Additionally, the program utilized focused applicant selection and increased rural clinical rotations. Despite its small number of participants (n = 11), the program was deemed successful, with 54% of graduates choosing to practice in rural areas, and most in primary-care settings.

Hart, Muus, & Pan (1996) randomly surveyed 2,500 PAs nationwide to determine factors influencing PA practice location. In the study, which had a response rate of 62%, the authors used a block multiple regression analysis and reported that the size of the town where the respondent lived at 12 years of age was a significant predictor for a PA choosing to work rurally. More than 450 student PA post-rural-rotation questionnaires in the West Virginia Rural Health Education Partnership's electronic database were evaluated from 2001 to 2010. In this study, Shannon & Jackson (2011) identified that the variable most predictive of eventual rural practice was a rural high school hometown.

Despite a low response rate (11%), a survey by Diemer et al. (2012) corroborated such findings, establishing through Chi Square analysis that a rural background increased the likelihood that a PA in Texas would return to rural practice. Interestingly, in that same Texas study, pay received or financial debt owed did not affect the choice of PAs who actually decided to work in rural communities. Muma, Kelley, & Lies (2010) found from a random sampling of PAs that those from households with income of less than $50,000 at the time of high school graduation were more likely to practice in primary-care settings and with underserved populations than those from households of incomes higher than $50,000. The authors did not hypothesize as to the reason. In a methodological flaw, however, the study surveyed PAs whose high school education spanned 1960 through 2000 but did not clearly represent household income in inflation-adjusted dollars. Smith et al. (2012) conducted a cross-sectional survey of

2,000 PAs nationwide, using factor analysis. The authors concluded that the most important variable for PAs' choice of first practice location, either rural or urban, was support for their spouse or partner. An AAPA national survey of PAs by Coplan, Cawley, & Stoehr (2013) found that women, older clinicians, and Hispanics were more likely to practice in primary care. In a study by Cawley & Jones (2013), which analyzed the growing trend of private institutional sponsorship in PA education, the authors hypothesized that a private education likely produced a greater student debt burden, but the effect of student debt on postgraduate practice location remained unknown.

There have been very few studies specifically regarding retention of PAs in rural areas. Demographic data from an early national survey by Larson, Hart, Goodwin, Geller, & Andrilla (1999) showed that compared to PAs initially practicing in urban areas, PAs who initially practiced in rural areas were more likely to leave their initial practice in the first four years. Additionally, male PAs working initially in rural locations were slightly more likely to stay in rural practice than were females. According to the 1999 study, PAs starting in rural areas had a 41% attrition rate to urban areas, while only 10% of the PAs who started in urban areas moved later to rural areas. More current data about retention of PAs in rural areas, as well as data that are specific to Indiana, are needed.

Contributions This Study Will Make

This study critically analyzed characteristics of PAs in Indiana working in rural areas, primary care, and medically underserved areas. Predictors were analyzed to determine why a provider continued to work in rural communities. Relationships were evaluated between Indiana PAs' hometown size, professional education program, age, gender, and other factors identified

previously as being significant. The study generated a framework for development of recommendations that may be used to help recruit and retain PAs to practice in rural, primary care. Policymakers and health-care institutions should use the information to understand the workforce supply of PAs within Indiana and to develop resources for recruitment and retention. Further, Indiana physician-assistant educators should incorporate the recruiting strategies to enhance the number of students matriculating into educational institutions who ultimately enter into primary care in rural areas after graduation.

Summary

There appears to be agreement in the literature regarding correlations between physician characteristics (rural vs. urban upbringing, age, curriculum focus, type of clerkship, etc.) and location of practice. The literature also indicates that in at least some states, PAs tend to provide a proportionately larger amount of care in rural areas than do primary-care or family-practice physicians. However, the characteristics of the PA provider associated with rural health-care areas have been unclear due to inconsistencies in study outcomes or methodological limitations. There was little evidence in the literature regarding factors and strategies that affect the retention of PAs in rural areas of practice. Further investigation was warranted.

Chapter 3: Methodology

Introduction

This study applied a quantitative design to explore educational experiences, practice specialty, and location choices of PAs who practice in Indiana. The study was grounded in a review of literature to establish a viable approach to answering the research questions. Approval was obtained from the Butler University and Nova Southeastern University Institutional Review Boards prior to data collection and analyses.

Population and Setting

Physician assistant participant information was obtained from the Indiana Professional Licensing Agency (IPLA). The IPLA data file is the most complete and authoritative source of information on PAs licensed to practice in the state of Indiana. Further, the database is reliable for workforce studies. Data were obtained from PAs who graduated between 2000 and 2010, and personal identifiers were removed prior to analyses. The study methodology is described below.

Research Methods

The study was based on a secondary analysis of data and responses from a 2014 cross-sectional survey of PAs licensed in Indiana, further referenced here as "2014 recruitment and retention" study. Practicing PAs were mapped and percentages calculated for proportions of total PAs who practiced in primary care and in areas that were medical underserved, rural, and urban. The 2013 Rural-Urban Continuum Codes were used to identify county-level urbanicity or rurality. A correlational study design was used.

Specific Procedures

To further understand the characteristics of PAs working in Indiana, beyond information from the IPLA dataset, an online survey instrument was constructed based on literature and adapted to address this study's research questions. Survey responses were confidential and reported only in aggregate. Participants were advised that completion of the survey was considered consent to participate. Variables related to demographic information were available from responses to the survey and from secondary data analysis to show frequency distributions and central tendencies, where appropriate.

Secondary Analysis of Data

The first portion of this study was a secondary analysis of publicly available, archival data obtained through the IPLA website as well as from copies of the original license applications submitted by PAs and required by law to practice in Indiana. Data were obtained from those PAs in Indiana with an active license who graduated between the years 2000-2010, and the following steps were taken:

1. In Indiana, when PAs register with the IPLA to obtain a license to practice clinically, the location of the office where they practice is the address included on their application to prescribe medications. This information was used to identify all PAs who have obtained an Indiana license and served as the population for this portion of the study.
    a. Copies of original license applications are publicly available and were obtained by requesting the information from the IPLA website: in.gov/pla/download.htm.

2. The data were recorded within a Microsoft Excel 2010 spreadsheet and stored on the primary investigator's password-protected computer.
3. A dummy coding system was used to convert categorical variables into a usable format.
4. Data analysis was performed using IBM's Statistical Package for the Social Sciences software (SPSS 19).
5. Descriptive statistics analysis that was performed on demographic information included measure of central tendency and dispersion (e.g., mean, standard deviation, median, mode, range) and frequency/percentages, where appropriate.
6. Independent variables were directly and indirectly derived from the IPLA form and are found in Table 4.
7. Univariate analysis was performed.
    a. Chi Square analyses were performed to determine whether any significant relationships existed between practice specialty, location, and selected independent variables.
        i. No more than 20% of cells in the Chi Square table were allowed to contain expected frequencies of < 5.
            1. If expected frequencies were too small, a Chi Square correction test was performed (Fisher Exact Test).
        ii. The alpha level was set at .05.
8. Binary logistic regression analyses were used to examine the impact of the independent factors on a dichotomous outcome of working in a rural practice or not, primary care or not, and medically underserved area or not.

Table 4

Variables for the population of actively licensed Indiana PAs graduating between January 1, 2000 and December 31, 2010

Independent variable	Description	Derived	Code	Variable type	Statistical test
Gender	Gender of the physician assistant	Directly, from Date of Birth, IPLA application sheet	0 = Male 1 = Female	Categorical	Demographic: Frequency Univariate analysis = Chi Square. Binary logistic regression
Current Age	Age as of March 15, 2014.	Indirectly, from Date of Birth, IPLA application sheet		Continuous—years	Demographic: Median Age
Born in Indiana or Not	Birth location	Directly, from IPLA application sheet	0 = Indiana 1 = Outside of Indiana but in the U.S. 2 = Outside of the U.S.	Categorical	Demographic: Frequency Binary logistic regression
Birth Rural-Urban Continuum Code	2013 Rural-Urban Continuum Code of the PA's location of birth. Those born outside of the U.S. were excluded from analyses associated with Birth RUCC.	Indirectly. The Rural-Urban Continuum Code was obtained by knowing the participant's state and county. These numbers are assigned by the U.S. Department of Agriculture and are, in part, related to the 2010 U.S. Census. ers.usda.gov/data-products/rural-urban-continuum-codes.aspx	1 = Metro: Counties in metro areas of 1 million population or more 2 = Metro: Counties in metro areas of 250,000 to 1 million population 3 = Metro: Counties in metro areas of fewer than 250,000 population 4 = Nonmetro: Urban population of 20,000 or more, adjacent to a metro area 5 = Nonmetro: Urban population of 20,000 or more, not adjacent to a metro area 6 = Nonmetro: Urban population of 2,500 to 19,999, adjacent to a metro area 7 = Nonmetro: Urban population of 2,500 to 19,999, not adjacent to a metro area 8 = Nonmetro: Completely rural or	Categorical	Univariate analysis = Chi Square. Binary logistic regression

			less than 2,500 urban population, adjacent to a metro area 9 = Nonmetro: Completely rural or less than 2,500 urban population, not adjacent to a metro area		
Public or private PA program	Attendance at a public or private PA program	Indirectly, from PA program, IPLA application form, and program website	0 = Public 1 = Private 2 = Both	Categorical	Demographic: Frequency Univariate analysis = Chi Square. Binary logistic regression
PA program location number	The PA program attended was in Indiana or outside of state. If in Indiana, the program was either Butler or Saint Francis.	Indirectly, from IPLA application form and name of PA program	1 = Butler University 2 = University of Saint Francis 3 = Out of State	Categorical	Demographic: Frequency Univariate analysis = Chi Square. Binary logistic regression
Program's mission rural medicine	PA program's mission to educate providers to work in rural areas or not	Indirectly, from PA program, IPLA application form, and program website	0 = No 1 = Yes	Categorical	Demographic: Frequency Univariate analysis = Chi Square. Binary logistic regression
Program's mission primary care	PA program's mission to educate providers to work in primary care or not	Indirectly, from PA program, IPLA application form, and program website	0 = No 1 = Yes	Categorical	Demographic: Frequency Univariate analysis = Chi Square. Binary logistic regression
Specialty	Current specialty based on supervising physician's listed specialty	Directly, from IPLA website in.gov/pla/download.htm.	3 = Allergy Immunology 6 = Cardiology 7 = Critical Care Medicine 8 = Dermatology 9 = Emergency Medicine 10 = Endocrinology 12 = Family Medicine 13 = Gastrointestinal 14 = Internal Medicine	Categorical	Demographic: Frequency Univariate analysis = Chi Square. Binary logistic regression

			18 = Hematology 19 = Hematology/Oncology 23 = Infectious Disease 24 = Internal Medicine/Pediatrics 27 = Nephrology 28 = Neurology 29 = Obstetrics/Gynecology 30 = Occupational Medicine 31 = Oncology 33= Orthopedic Surgery 35 = Pain Management 37 = Pediatrics 38 = Physical Medicine & Rehabilitation 39 = Psychiatry 41 = Pulmonary 43 = Radiology 47 = Cardiovascular Surgery 51 = General Surgery 52 = Hand Surgery 54 = Neurological Surgery 56 = Ear Nose Throat Surgery 58 = Plastic Surgery 60 = Thoracic Surgery 61 = Trauma Surgery 63 = Urgent Care Medicine 64 = Urology 65 = Other		
Specialty Code Primary Specialty	Specialty Code Primary Care, Medical Specialty, Surgical Specialty based on supervising physician	Directly, from IPLA website in.gov/pla/download.htm.	1 = primary care 2 = medical specialty 3= surgical specialty	Categorical	Demographic: Frequency Univariate analysis = Chi Square. Binary logistic regression
Active Practice Rural-Urban Continuum	2013 Rural-Urban Continuum Code of PA program	Indirectly, by knowing the PA's current state and county. Those codes	1 = metro 2 = non-metro	Categorical	Univariate analysis = Chi Square. Binary logistic regression

Code	between 1-3 are considered metro areas; 6-9 are nonmetro. ers.usda.gov/data-products/rural-urban-continuum-codes.aspx

Survey of Recent Graduates

The second approach of this project utilized a cross-sectional survey of recent PA graduates and Indiana initial employment. Participant information was obtained from the IPLA as described above in the secondary analysis of data section (Table 5). Indiana practicing PAs who graduated from January 1, 2000 to December 31, 2010 were emailed and invited to participate in an online survey administered via SurveyMonkey.

Table 5

Physician assistant records used in this study

Records remaining	Explanation of exclusions
989	Total PA license renewals and initial licensures to Indiana Professional Licensing Agency (IPLA) completed during the 2012 – 2014 licensure period
483	PAs in Indiana graduating between January 1, 2000 and December 31, 2010
420	PAs with an email address on file
371	PAs for whom email messages were not returned as undeliverable and whose responses were used in the 2014 recruitment and retention study

The 2014 recruitment and retention survey was grounded in the literature to help increase the validity of the outcomes of this study. The survey instrument was developed to fit the goals

of the study focused on Indiana PAs. The instrument was pilot-tested by Indiana PAs who provided feedback on questions, wording, and layout. For this analysis, only PAs working in Indiana and who identified activity in direct patient care were included. Responses were analyzed and reported in aggregate.

1. A Microsoft Excel 2010 spreadsheet that contained all retrieved data was stored on a password-protected computer.
2. Information on each PA was placed within the spreadsheet.
3. The independent variables are included in Table 6.
4. A dummy coding system was used to convert categorical variables into a usable format to complete the analysis. This coding system is found in Table 6.
5. SPSS 19 was used to analyze the data.
6. Descriptive statistics analyses were performed, and demographic information included measure of central tendency, dispersion, and frequency/percentages, as appropriate.
7. Chi Square analyses were performed to determine whether any significant relationships existed between practice specialty, location, and the independent variables.
    a. No more than 20% of cells in the Chi Square table were allowed to contain expected frequencies of < 5.
        i. If expected frequencies were too small, a Chi Square correction test was performed (Fisher Exact Test).
    b. The alpha level was set at .05.

8. Binary logistic regression analysis was performed using SPSS 19 to assess the relationship of the predictive (or independent) variables to the dependent variables of primary-care practice or not, rural location or not, and medically underserved areas or not.

Table 6

Variables for 2014 recruitment and retention study: Survey of actively licensed Indiana PAs graduating between January 1, 2000 and December 31, 2010

Independent variable	Description	Dummy code	Variable type	Statistical test
Gender	Gender of the physician assistant	0 = Male 1 = Female	Categorical	Demographic: Frequency Univariate analysis = Chi Square. Binary logistic regression
Ethnicity/race	Ethnicity or race of the physician assistant	1 = Black 2 = American Indian 3 = Asian 4 = White 5 = Alaskan 6 = Hawaiian 7 = Hispanic 8 = Multi-ethnic	Categorical	Demographic: Frequency Univariate analysis = Chi Square. Binary logistic regression
Current age	Age as of March 10, 2014, derived from Date of Birth from IPLA application sheet		Continuous—years	Demographic: Median binary logistic regression
Age at graduation	Age of the physician assistant at the time of graduation from PA program		Continuous—years	Demographic: Median binary logistic regression
Birth Rural-Urban Continuum Code	2013 Rural-Urban Continuum Code of the PA's location of birth	1 = metro: Counties in metro areas of 1 million population or more 2 = metro: Counties in metro areas of 250,000 to 1 million population 3 = metro: Counties in metro areas of fewer than 250,000 population 4 = nonmetro: Urban population of 20,000 or more, adjacent to a metro area 5 = nonmetro: Urban population of 20,000 or more, not adjacent to a metro area 6 = nonmetro: Urban population of	Categorical	Univariate analysis = Chi Square. Binary logistic regression

		2,500 to 19,999, adjacent to a metro area 7 = nonmetro: Urban population of 2,500 to 19,999, not adjacent to a metro area 8 = nonmetro: Completely rural or less than 2,500 urban population, adjacent to a metro area 9 = nonmetro: Completely rural or less than 2,500 urban population, not adjacent to a metro area		
Program Rural-Urban Continuum Code at age 12	2013 Rural-Urban Continuum Code of the PA's location lived at age 12	See above	Categorical	Univariate analysis = Chi Square. Binary logistic regression
Program Rural-Urban Continuum Code at high school graduation	2013 Rural-Urban Continuum Code of the PA at location lived at high school graduation	See above	Categorical	Univariate analysis = Chi Square. Binary logistic regression
PA had a rural upbringing or not	Rural was defined as spending all of one's childhood in a rural location, more than 10 years in a rural location, or calling a rural place one's childhood home.	0 = No 1 = Yes	Categorical	Demographic: Frequency Univariate analysis = Chi Square. Binary logistic regression
Public or private PA program	Attendance at a public or private PA education program	0 = Public 1 = Private 2 = Both	Categorical	Demographic: Frequency Univariate analysis = Chi Square. Binary logistic regression
PA program location number	Within Indiana or outside of state. If Indiana, the program was either Butler University or University of Saint Francis.	1 = Butler University 2 = University of Saint Francis 3 = Out of state	Categorical	Demographic: Frequency Univariate analysis = Chi Square. Binary logistic regression
Program's mission rural medicine	PA program's mission to educate providers to work in rural areas or not	0 = No 1 = Yes	Categorical	Demographic: Frequency Univariate analysis = Chi Square. Binary logistic regression

Rural area rotation	Completed a rotation in a rural area in PA program	0 = No 1 = Yes	Categorical	Demographic: Frequency Univariate analysis = Chi Square. Binary logistic regression
Program's mission primary care	PA program's mission to educate providers to work in primary care or not	0 = No 1 = Yes	Categorical	Demographic: Frequency Univariate analysis = Chi Square. Binary logistic regression
Program's mission medically underserved area	PA program's mission to educate providers to work in underserved medical areas or not	0 = No 1 = Yes	Categorical	Univariate analysis = Chi Square. Binary logistic regression
Mentorship primary care	PA's perceived level of mentorship to go into primary care while at the PA institution	1 – Yes 2 = No 3 = I do not know	Categorical	Univariate analysis = Chi Square. Binary logistic regression
Starting education desire to practice in primary care	PA's perception when starting education to practice in primary care	1 = Strongly disagree 2 = Disagree 3 = No opinion or uncertain 4 = Agree 5 = Strongly agree	Categorical	Univariate analysis = Chi Square. Binary logistic regression
After-education desire to practice in primary care	PA's perception after education to practice in primary care	See above	Categorical	Univariate analysis = Chi Square. Binary logistic regression
Starting-education desire to practice in rural medicine	PA's perception starting education to practice in rural medicine	See above	Categorical	Univariate analysis = Chi Square. Binary logistic regression
After-education desire to practice in rural medicine	PA's perception after education to practice in rural medicine	See above	Categorical	Univariate analysis = Chi Square. Binary logistic regression
Starting-education desire to live in rural community	PA's perception starting education to live in rural community	See above	Categorical	Univariate analysis = Chi Square. Binary logistic regression

After-education desire to live in rural community	PA's perception after education to live in rural community	See above	Categorical	Univariate analysis = Chi Square. Binary logistic regression
Starting-education desire to practice in MUA	PA's perception starting education to practice in medically underserved area	See above	Categorical	Univariate analysis = Chi Square. Binary logistic regression
After-education desire to practice in MUA	PA's perception after education to practice in medically underserved area	See above	Categorical	Univariate analysis = Chi Square. Binary logistic regression
Starting-education desire to practice in Indiana	PA's perception starting education to practice in Indiana	See above	Categorical	Univariate analysis = Chi Square. Binary logistic regression
After-education desire to practice in Indiana	PA's perception after education to practice in Indiana	See above	Categorical	Univariate analysis = Chi Square. Binary logistic regression
Previous military experience	Prior to beginning PA training, the PA had previous military experience. Sensitivity but not specificity	0 = No 1 = Yes	Categorical	Demographic: Frequency Univariate analysis = Chi Square. Binary logistic regression
Household income growing up	Perceived household income level when growing up	1 = Very much below average 2 = Below average 3 = Average 4 = Above average 5 = Very much above average	Categorical	Univariate analysis = Chi Square. Binary logistic regression
Effect of educational debt on initial specialty choice	PA's perception of educational debt influence on first specialty choice of employment after graduation from PA program	0= Not at all 1=A little 2=Quite a bit 3=Completely	Categorical	Univariate analysis = Chi Square. Binary logistic regression
Effect of educational debt on initial location choice	PA's perception of educational debt influence on first location of employment after graduation from PA program	See above	Categorical	Univariate analysis = Chi Square. Binary logistic regression

Perception of debt level following graduation	PA's perception of educational debt relative to others	0 = None 1 = Less than most 2 = Average 3 = More than most	Categorical	Univariate analysis = Chi Square. Binary logistic regression
Effect of educational debt on current specialty choice	PA's perception of educational debt influence on current specialty choice	0= Not at all 1=A little 2=Quite a bit 3=Completely	Categorical	Univariate analysis = Chi Square. Binary logistic regression
Effect of educational debt on current location choice	PA's perception of educational debt influence on current location of employment	See above	Categorical	Univariate analysis = Chi Square. Binary logistic regression
Initial urban reconsidered to urban if forgiveness of educational debt	If initially went into an urban area to practice after graduation, would PA have reconsidered the choice to practice in a rural area if they received federal/state loan forgiveness of educational debt	1 = Yes 2 = No 3 = Maybe 9 = Initial rural practice	Categorical	Univariate analysis = Chi Square. Binary logistic regression
International rotation	Participation with international rotation or not	0 = No 1 = Yes	Categorical	Demographic: Frequency Univariate analysis = Chi Square. Binary logistic regression
Time in underdeveloped country	Before beginning practice as a PA, had spent time in a country that was considered socioeconomically underdeveloped (not to include rotations)	0 = No 1 = Yes	Categorical	Univariate analysis = Chi Square. Binary logistic regression
Initial urban work	Primary reason chose urban work site immediately following graduation	1 = It was my only job offer 2 = I tried to find a rural job; however, none were available 3 = Comfort of city life (personal) 4 = Sense of place in an urban practice (professional) 5 = Opportunities for family	Categorical	Univariate analysis = Chi Square. Binary logistic regression

		6 = Friends and family are in urban areas 7 = Medical services available to refer patients, if needed 8 = Debt forced me to take a job in an urban location 9 = I wanted to practice in a medical specialty or subspecialty 10 = Other (please specify) 11 = Initial rural		
Initial rural work	Primary reason chose rural work site immediately following graduation	1 = Freedom in daily practice 2 = It was the only job offer I received 3 = Comfort in small town living 4 = Patient population served 5 = Opportunities for family life 6 = Chose an urban site 9 = Other	Categorical	Univariate analysis = Chi Square. Binary logistic regression
Earliest desire to be a PA	Earliest time period knew wanted to be a PA	1 = Before or during high school 2 = While enrolled as a first time undergraduate student 3 = After high school; however, I did not initially go to college. I went back later to become a PA 4 = After I finished a college degree in another health-care field 5 = After I finished a degree in a non-health-care related field 6 = None of the above	Categorical	Univariate analysis = Chi Square. Binary logistic regression
NHSC Scholarship	Apply or receive a National Health Service Corps scholarship or not	0 = No 1 = Yes	Categorical	Univariate analysis = Chi Square. Binary logistic regression
Factor most influenced choice of initial practice	Factor that had the most influence on the choice of initial practice	1 = Specialty 2 = Personal reasons 3 = Spouse/significant other preference 4 = Supervising physician 5 = Affordability 6 = Compensation	Categorical	Demographic: Frequency Univariate analysis = Chi Square. Binary logistic regression

		7 = This is the only offer I received 8 = Patient population 10 = Loan repayment		
Influenced choice of current practice	Factor that had the most influence on the choice of current practice	See above	Categorical	Univariate analysis = Chi Square. Binary logistic regression
Received first job offer to work as a PA	Period received first job offer as PA relative to graduation	0 = Before the start of school 1 = After the start of school but > 6 mos. prior to graduation 2 = 3 to 6 mos. prior to grad. 3 = 1 mo. to < 3 mos. prior to grad. 4 = < 1 mo. prior to grad. 5 = < 1 mo. after grad. 6 = 1 mo. to < 3 mos. after grad. 7 = 3 to 6 mos. after grad. 8 = > 6 mos. after grad.	Categorical	Demographic: Frequency Univariate analysis = Chi Square. Binary logistic regression
Recruited to initial job	Period recruited to initial job as PA relative to graduation	See above	Categorical	Demographic: Frequency Univariate analysis = Chi Square. Binary logistic regression
Initial job result of rotation	Initial job offer accepted, directly or indirectly, a result of having completed a clinical rotation with the preceptor or at that site	1 = Yes 2 = No	Categorical	Demographic: Frequency Univariate analysis = Chi Square. Binary logistic regression

Retention

Recruiting PAs to practice in rural and primary care is important, and retaining PAs within rural and primary-care areas is equally important. Similar methodologies to those used by Daniels, VanLeit, Skipper, Sanders, & Rhyne (2007) were used to evaluate retention.

1. A Microsoft Excel 2010 spreadsheet that contained all retrieved data was stored on a password-protected computer.
2. Information on each PA was placed within the spreadsheet.
3. Survey responses were divided into four dependent groups, including those whose initial and most recent work sites were rural (remained rural), those whose initial and most recent work sites were urban (remained urban), and those who moved from rural to urban or from urban to rural locations.
4. A dummy coding system was used to convert categorical variables into a usable format to complete the analyses and is found in Table 6.
5. SPSS 19 was used to analyze the data.
6. Chi Square analyses were performed to determine significant relationships that may exist between practice location and the independent variables.
    a. No more than 20% of cells in the Chi Square table were allowed to contain expected frequencies of < 5.
        i. If expected frequencies were too small, a Chi Square correction test was performed (Fisher Exact Test).
    b. The alpha level was set at .05.
7. Logistic regression analysis was performed using SPSS to assess an association of the independent variable to the dependent variables.

Resource Requirement

In part, this was a secondary analysis of publicly accessible archival data through the IPLA. The data included information on 483 actively licensed PAs in Indiana. Data from PAs who graduated from 2000-2010 were obtained and evaluated. Other resources that were needed included:

2013 Rural-Urban Continuum Codes (RUCC):

Categorical variables were transformed into a usable format to complete a regression analysis using the 2013 Rural-Urban Continuum Codes (Table 7). The 2013 Rural-Urban Continuum Codes were accessed through the USDA webpage. The codes identified urban counties by size and rural counties by the degree of growth and development, as well as the counties' proximity to an urban area. The urban and rural counties were further broken down into three urban and six rural divisions, resulting in a total of nine levels of rurality ranging from 1 (most urban) to 9 (most rural). This organization allowed county data to be analyzed by trends in rural areas that are related to population and the potential influence of an urban area. Additionally, this coding system has been used in a number of studies to standardize rurality in Indiana (Bellinger, 2009; Wade et al., 2007; McKeag et al., 2007). The categories were further collapsed into Urban (Codes 1-3) and Rural (Codes 4-8) areas. Indiana does not have a county classified as Code 9.

Table 7

2013 Rural-Urban Continuum Codes [a]

Code	Description
Metro/urban counties:	
1	Counties in metro areas of 1 million population or more
2	Counties in metro areas of 250,000 to 1 million population
3	Counties in metro areas of fewer than 250,000 population
Nonmetro/rural counties:	
4	Urban population of 20,000 or more, adjacent to a metro area
5	Urban population of 20,000 or more, not adjacent to a metro area
6	Urban population of 2,500 to 19,999, adjacent to a metro area
7	Urban population of 2,500 to 19,999, not adjacent to a metro area
8	Completely rural or less than 2,500 urban population, adjacent to a metro area
9	Completely rural or less than 2,500 urban population, not adjacent to a metro area

[a] Reproduced from U.S. Department of Agriculture website: ers.usda.gov/data-products/rural-urban-continuum-codes/documentation.aspx

Medically Underserved Area Codes:

The U.S. Department of Health and Human Services Health Resources and Services Administration defines Medically Underserved Areas/Populations as having: "too few primary care providers, high infant mortality, high poverty and/or high elderly population" (accessed online at muafind.hrsa.gov). The areas were designated as either underserved or not and are based on the participant's primary-practice zip code.

Reliability and Validity

Inclusion and Exclusion Criteria

This research study used inclusion and exclusion criteria in defining the study cohort. PAs were included in the study if they held an active license to practice in Indiana, had a supervising physician, and participated in patient care. PAs were excluded from the study if they held a temporary license, did not have a supervising physician registered with the IPLA, held an expired license, practiced at a military base, did not clinically practice, or practiced in a location exclusively outside of Indiana. If a PA was born outside of the U.S., he or she was excluded from specifically any analyses that coded items relevant only to the U.S. (e.g., birth Rural-Urban Continuum Codes).

Chapter 4: Results

Introduction

This study critically analyzed characteristics of PAs in Indiana working in primary-care, rural, and medically underserved areas. The study identified the predictors of recruitment and retention as well as relationships between Indiana PAs and hometown size, the PA education program, age, gender, and other factors identified as significant in previous studies. Chi Square and binary logistic regression analyses assessed the characteristics of PAs working in rural, primary-care, or medically underserved areas.

Data Analysis

Secondary Analysis of Data and Survey Responses

The variables listed in Tables 4 and 6 represent the independent variables used in this study. The dependent variables included whether or not a given physician assistant's practice was primary care and whether it comprised a medically underserved or rural area. Because variables in this study were categorical, the Chi Square tests for independence and multiple logistic regression models were used to analyze the data.

The Chi Square Test for Independence was used to determine whether a statistical relationship exists between a given independent variable and a dependent variable. Those variables with p-values less than 0.05 were considered statistically significant. The data were arranged in a contingency table with each category of the independent variable in rows and each

category of the dependent variable in columns. The Chi Square test required that no more than 20% of cells in the table contain expected frequencies of < 5. If expected frequencies were too small, a Chi Square correction test was performed using the Fisher Exact Test.

Binary logistic regression was used to determine the impact of the independent variables on the study outcomes (dependent variables), using odds ratios with 95% confidence intervals (CIs). P-values less than 0.05 were considered statistically significant. Results from the Chi Square and logistic regression analyses were used to identify which independent variables increased the probability that a PA practiced in an underserved or rural area or in primary care. All statistical analyses were performed using SPSS 19.0 software.

Retention

Logistic regression analyses were calculated using three dependent variables: those PAs whose first practice location was rural versus urban; of those whose first practice location was rural, those who stayed rural compared to those who moved to an urban location; and of those whose first practice location was urban, those who moved to a rural location compared to those who remained urban. Additional variables were selected from demographic criteria (gender and ethnicity) and 2014 recruitment and retention survey questions regarding the importance of specific factors in choosing a first-practice location. Variables that were significant at $p < .05$ remained in the final models.

Findings

Secondary Analysis of IPLA Dataset

Descriptive Statistics

There were 483 active physician assistants licensed by the Indiana Professional Licensing Agency with a registered supervising physician who graduated between January 1, 2000 and December 31, 2010. The median age was 35 years, and there were more females than males. Table 8 identifies the age and gender characteristics of this cohort of the IPLA dataset.

Table 8

Secondary analysis of IPLA dataset: Age and gender of actively licensed Indiana physician assistants who graduated between 2000 and 2010

Age	Median	35	
	Mean	37	
	Range	24-64	
		n =	%
	Males	147	30
	Females	336	70

Most actively licensed PAs practicing in Indiana who graduated between 2000 and 2010 were born in Indiana (62%) (Table 9). Fifty-nine percent graduated from an Indiana program (Table 10). The PAs graduated predominantly from private (83%) vs. public (17%) institutions.

Table 9

Secondary analysis of IPLA dataset: State of birth of actively licensed Indiana physician assistants who graduated between 2000 and 2010

State of Birth	Frequency N=	Percent (%)
Indiana	300	62
Out of Indiana but in the U.S.	167	35
Out of the U.S.	15	3
Total	482	100

Missing: 1

Table 10

Secondary analysis of IPLA dataset: PA education institution of PAs practicing in Indiana who graduated between 2000 and 2010

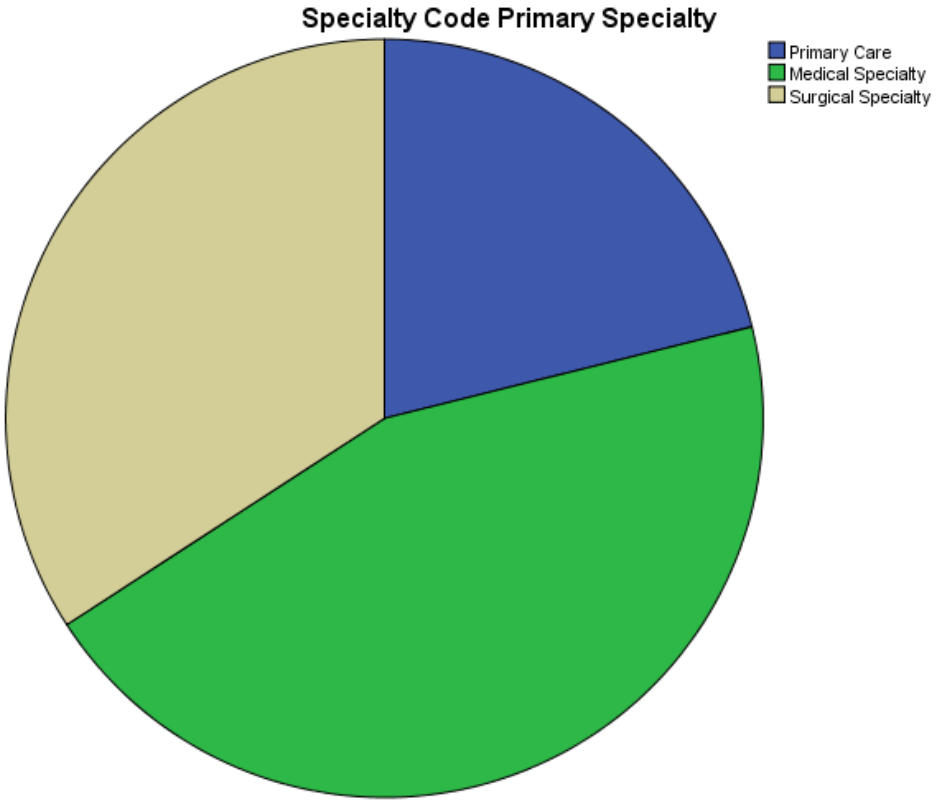
Name of Program	Frequency n =	Percent %
<u>Indiana Programs</u>		
Butler University	199	41
University of Saint Francis	88	18
Total	287	59
<u>Out of State</u>		
Contiguous to Indiana	94	20
Non-Contiguous to Indiana	102	21
Total	196	41

Specific out-of-state programs whose contribution was greater than 2%		
Midwestern Downers Grove	27	6
University of Kentucky	18	4
Rosalind Franklin	9	2
Cook County	8	2

Twenty-one percent of PAs in Indiana who graduated from 2000-2010 currently work in primary care (n = 102), compared to specialty care (79%, n = 381). Forty-five percent are in medical specialties (n = 216), and 34% are in surgical specialties (n = 165) (Figure 6).

Figure 6

Secondary analysis of IPLA dataset: Current specialties of actively licensed Indiana physician assistants who graduated between 2000 and 2010



The most common specialties of actively licensed Indiana physician assistants who graduated between 2000 and 2010 are found in descending order in Table 11.

Table 11

Secondary analysis of IPLA dataset: Most common specialties of actively licensed Indiana physician assistants who graduated between 2000 and 2010

Specialty	Frequency n =	Percent %
Orthopedic Surgery	105	21.7
Emergency Medicine	90	18.6
Family Medicine	62	12.8
General Internal Medicine	24	5.0

PAs in Indiana who graduated between 2000 and 2010 are currently employed predominantly in counties that are designated by the U.S. Department of Agriculture as metro (91%) and largely in areas designated as Code 1, the highest level of urbanicity (Table 12).

Table 12

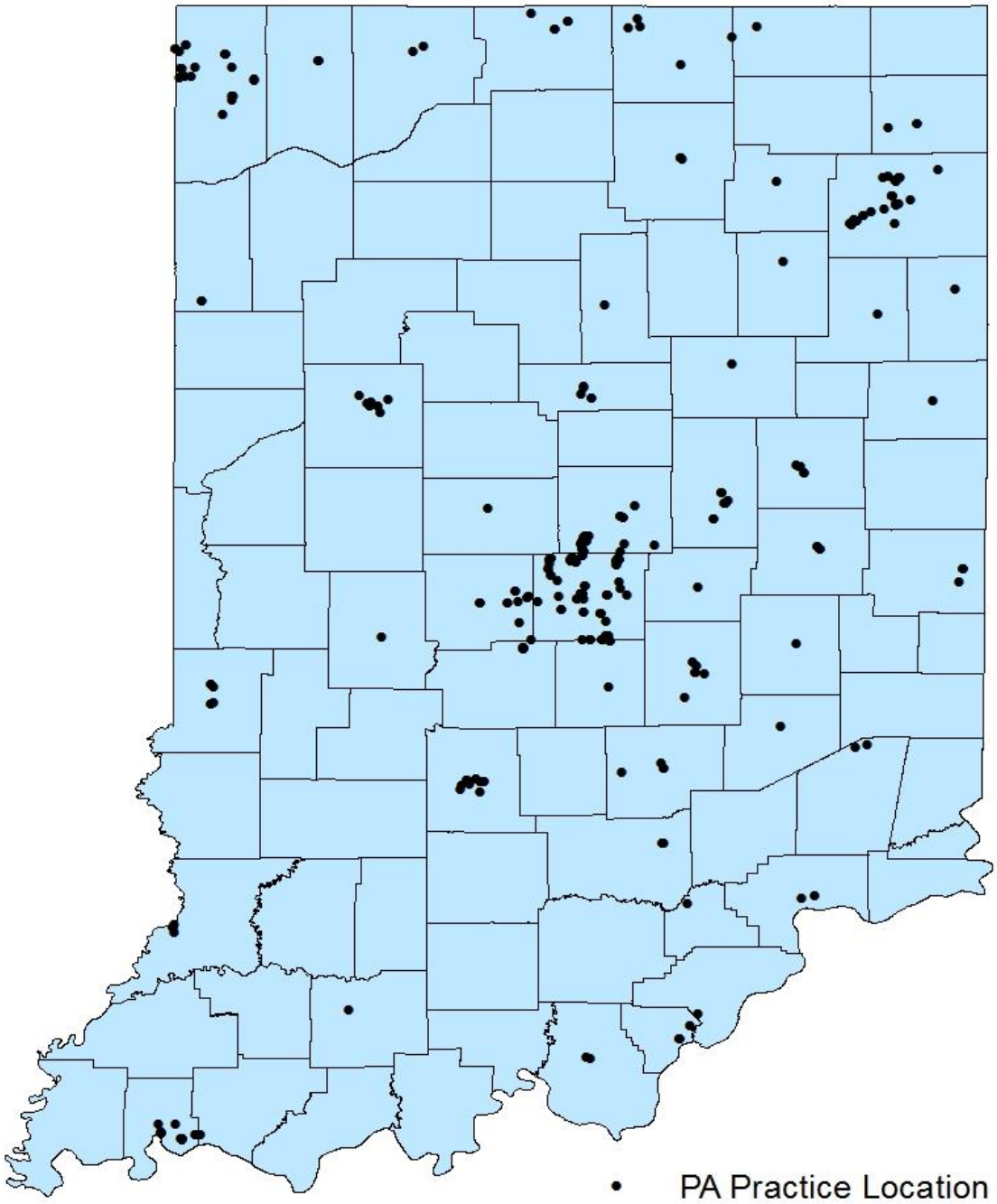
Secondary analysis of IPLA dataset: 2013 Rural-Urban Continuum Code of current practice locations of actively licensed Indiana physician assistants who graduated between 2000 and 2010

2013 Rural-Urban Continuum Code	Code Number	Frequency n =	Percent %
Metro: Counties in metro areas of 1 million population or more	1	300	62.1
Metro: Counties in metro areas of 250,000 to 1 million population	2	87	18.0
Metro: Counties in metro areas of fewer than 250,000 population	3	54	11.2
Nonmetro: Urban population of 20,000 or more, adjacent to a metro area	4	18	3.7
Nonmetro: Urban population of 20,000 or more, not adjacent to a metro area	5	11	2.3
Nonmetro: Urban population of 2,500 to 19,999, adjacent to a metro area	6	13	2.7

The practice location of physician assistants who graduated between 2000 and 2010 and clinically practice in Indiana are depicted by 2013 Rural-Urban Continuum Code and medical specialty in Figure 7.

Figure 7

Secondary analysis of IPLA dataset: Practice locations of active Indiana physician assistants who graduated between January 2000 and December 2010



Based on primary-practice zip codes, there were 165 PAs employed in medically underserved areas (34%) and 318 PAs who were not. Most actively licensed Indiana PAs who graduated between 2000 and 2010 were alumni from programs that have current stated missions focusing on primary care but not necessarily on serving in rural or underserved areas (Table 13).

Table 13

Secondary analysis of IPLA dataset: Current stated mission of PA programs of actively licensed Indiana physician assistants who graduated between 2000 and 2010

Mission [a]	Yes n =	Percent %	No n =	Percent %
Primary care	386	81	90	19
Underserved populations	134	28	342	72
Rural care	19	4	457	96

[a] PA programs must make available their stated mission per ARC-PA Standards. All programmatic missions were obtained from respective graduate's PA program website (missing data, n = 7)

Chi Square Test

The results of the Chi Square test comparing independent variables with primary care, rural, and underserved practice locations are shown in Tables 14, 15, and 16, respectively. Of the 483 physician assistants analyzed in this secondary analysis study, 21% (n = 102) were practicing in a primary-care specialty, 34% (n = 165) were in areas classified as medically underserved, and 9% (n = 42) practiced in nonmetro or rural areas.

Primary Care

Table 14

Secondary analysis of IPLA dataset: Chi Square test results for current practice in primary care

Independent Variables		Primary Care				
		Yes n =	Percent %	No n =	Percent %	Total n =
Gender						
	Male	128	34	19	19	147
	Female	253	67	83	81	336
	Total	381		102		483
Birth RUCC						
	Metro	300	65	84	18	384
	Nonmetro	62	13	15	3	77
	Total	362		99		461
Mission Primary Care						
	Yes	300	63	86	18	386
	No	75	16	15	3	90
	Total	375		101		476
Institution Type						
	Public	57	12	13	3	80
	Private	316	66	88	19	404

Total	375		101		476
Birth Location					
Indiana	232	48	68	14	300
Another State	136	28	31	7	167
Outside US	12	3	3	1	15
Total	380		102		482
Program Location					
Butler	154	32	45	10	199
Saint Francis	67	14	21	4	88
Outside State	154	32	35	7	189
Total	375		101		476

RUCC = Rural-Urban Continuum Code

The relation between primary care and gender variables was significant, $\chi^2(1, n = 483) = 8.52$, $p < .05$. Female PAs were more likely than males to practice in primary care. The percentage of PAs choosing to practice in primary care did not differ between those born in a nonmetro area vs. metro area, $\chi^2(1, n = 461) = 0.22$, $p > .05$. The percentage of PAs choosing to practice in primary care did not differ between those graduating from a public or private institution, $\chi^2(2, n = 476) = 0.91$, $p > .05$. There was no relationship between the percentage of PAs who chose to practice in primary care and those who graduated from programs with a mission to focus on primary care, $\chi^2(1, n = 476) = 0.89$, $p > .05$. There was no relationship between the percentage of those born in Indiana, another state, or outside the United States and a

current practice in primary care, $\chi^2(2, n = 482) = 1.10, p > .05$. There was no relationship between the percentage of PAs educated at specific Indiana PA institutions (Butler University or University of Saint Francis), or educated outside the state of Indiana, and a current practice in primary care, $\chi^2(2, n = 476) = 1.42, p > .05$.

Medically Underserved Practice

Table 15

Secondary analysis of IPLA dataset: Chi Square test results for current practice in medically underserved areas

Independent Variables		Underserved Area				
		Yes n =	Percent %	No n =	Percent %	Total n =
Gender						
	Male	54	11	93	19	147
	Female	111	23	225	47	336
	Total	165		318		483
Birth RUCC						
	Metro	131	28	253	55	384
	Nonmetro	26	6	51	11	77
	Total	304		157		461
Program Mission Medically Underserved						
	Yes	38	1	96	3	134
	No	161	33	219	63	342
	Total	161		315		476
Institution Type						
	Public	32	7	38	8	70
	Private	128	27	276	58	404

	Total	315		161		476
Birth Location						
	Indiana	97	21	203	42	300
	Another State	63	13	104	22	167
	Outside U.S.	5	1	10	2	15
	Total	317		165		482
Program Location						
	Butler	66	14	133	28	199
	Saint Francis	18	4	70	15	88
	Outside State	77	16	112	24	189
	Total	161		315		476

RUCC = Rural-Urban Continuum Code

There was no relation between medically underserved practice and gender variables, $\chi^2(1, n = 483) = 0.62$, $p > .05$. The percentage of PAs choosing to work in medically underserved practice did not differ between those PAs born in a nonmetro area vs. metro area, $\chi^2(1, n = 461) = 0.00$, $p > .05$. The percentage of PAs choosing to work in medically underserved practice did not differ between those graduating from a public or private institution area, $\chi^2(2, n = 476) = 5.48$, $p > .05$. There was no relationship between the percentage of PAs who chose to work in medically underserved practices and those who graduated from programs with a mission focusing on medically underserved, $\chi^2(1, n = 476) = 2.49$, $p > .05$. There was no relationship between the percentage of those born in Indiana, another state, or outside the U.S., and current

employment in medically underserved practices, $\chi^2(2, n = 482) = 1.39, p > .05$. There was a relationship between the percentage of PAs educated at Butler University, University of Saint Francis, and educated outside the state of Indiana and current work in medically underserved practices, $\chi^2(2, n = 476) = 11.1, p < .05$. Those PAs who were educated outside of Indiana were more likely to practice in medically underserved practices than those educated within the state.

Rural Practice Area

Table 16

Secondary analysis of IPLA dataset: Chi Square test results for current practice in rural areas

Independent Variables		Rural Practice Yes n =	Percent %	No n =	Percent %	Total n =
Gender						
	Male	14	3	133	28	147
	Female	28	6	308	64	336
	Total	42		441		483
Birth RUCC						
	Metro	24	5	360	78	384
	Nonmetro	16	4	61	13	77
	Total	40		421		461
Mission Rural Care						
	Yes	3	0	16	3	19
	No	38	8	419	8	457
	Total	41		435		476
Institution Type						
	Public	5	1	65	14	70
	Private	36	8	368	78	404
	Total	41		433		474

Birth Location					
Indiana	26	5	274	57	300
Another State	15	3	152	32	167
Outside U.S.	1	0	14	3	15
Total	42		440		482
Program Location					
Butler	17	4	182	38	199
Saint Francis	7	2	81	17	88
Outside State	17	4	172	36	189
Total	41		435		476

RUCC = Rural-Urban Continuum Code

There was no relationship between rural practice and gender variables, $X2$ (1, n = 483) = 0.18, p > .05. The percentage of PAs choosing to work in rural practice differed between those born in a nonmetro area vs. metro area, χ^2(1, n = 461) = 17.1, p < .05. PAs born in nonmetro areas were more likely to practice in nonmetro areas. The percentage of PAs choosing to work in rural practice did not differ between those graduating from a public or private institution, χ^2(2, n = 476) = 0.43, p > .05. There was no relationship between the percentage of PAs who chose to work in rural practices and those who graduated from programs with a mission focusing on rural practice, χ^2(1, n = 476) = 1.30, p > .05. There was no relationship between the percentage of PAs born in Indiana, another state, or outside the U.S. and current employment in rural practice, χ^2(2, n = 482) = 0.10, p > .05. There was no relationship between the percentage of PAs educated at

Butler University, University of Saint Francis, or outside the state of Indiana and current employment in rural practice, $X2(2, n = 476) = 0.09$, $p > .05$.

Logistic Regression Results

Primary-Care Practice

Binary logistic regression was used to determine the impact of the independent variables on the study outcome of primary-care practice, using odds ratios with 95% confidence intervals (CIs). P-values less than 0.05 were considered statistically significant. Almost all independent variables were dummy-coded and treated as categorical (except age). The regression model was performed by SPSS 19 software. Included in Table 17 are the logistic regression coefficient (B), standard error (S.E.), significance (p), and 95% confidence intervals for the odds ratio for primary-care practice.

Table 17

Secondary analysis of IPLA dataset: Binary logistic regression for primary-care practice with 95% confidence intervals

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Gender	.809	.294	7.605	1	.006	2.247	1.264	3.994
Current Age	.000	.017	.000	1	.994	1.000	.967	1.034
Born in Indiana	-.225	.261	.744	1	.389	.798	.478	1.332
Birth Metro	-.192	.320	.360	1	.549	.826	.441	1.545
PA Program Butler			.184	2	.912			
PA Program Saint Francis	.136	.318	.182	1	.670	1.145	.614	2.135
PA Program Outside of Indiana	.028	.368	.006	1	.939	1.029	.500	2.115
PA Program in Med Und Area	.132	.420	.099	1	.753	1.141	.501	2.600
Program Mission in Primary Care	.188	.398	.222	1	.637	1.206	.553	2.632
Private PA Institution			.017	2	.992			
Public PA Institution	-.054	.416	.017	1	.897	.947	.419	2.141
Constant	-1.936	.884	4.791	1	.029	.144		

Model fit statistics: Pseudo R-square = 3.9%

-2 Log Likelihood = 460.05; $\chi^2 = 2.25$, $p > .05$

Hosmer and Lemeshow's goodness of fit: $\chi^2 = 8.15$; $p > 0.05$

Employing a 0.05 criterion of statistical significance, gender was the only characteristic that was predictive of practice in primary care. The regression formula is Y = -1.9 + (0.81 * Gender), where Y is the prevalence of PAs practicing in primary care. None of the other characteristics — age, birth in Indiana or out of state, birth in a metro or nonmetro area, or type of PA program (e.g., public vs. private; mission) — were significant predictors of primary-care practice.

Medically Underserved

Binary logistic regression was used to determine the impact of the independent variables on the study outcome of practicing in a medically underserved area, using odds ratios with 95% confidence intervals (CIs). P-values less than 0.05 were considered statistically significant. Almost all independent variables were dummy-coded and treated as categorical (except age). The regression model was performed by SPSS software. Included in Table 18 are the logistic regression coefficient (B), standard error (S.E.), significance (p), and 95% confidence intervals for the odds ratio for practicing in a medically underserved area.

Table 18

Secondary analysis of IPLA dataset: Binary logistic regression for practicing in a medically underserved area with 95% confidence intervals

							95% C.I.for EXP(B)	
	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Gender	-.116	.230	.254	1	.614	.891	.568	1.397
Current Age	.009	.015	.392	1	.531	1.009	.980	1.039
Born in Indiana	.075	.220	.115	1	.735	1.078	.699	1.660
Birth Metro	-.002	.270	.000	1	.993	.998	.587	1.695
PA Program Butler			2.203	2	.332			
PA Program Saint Francis	-.697	.472	2.179	1	.140	.498	.198	1.256
PA Program Outside Indiana	-.098	.288	.116	1	.733	.906	.515	1.595
PA Program located in MUA	.631	.344	3.376	1	.066	1.880	.959	3.686
Public PA Institution			1.061	2	.588			
Private PA Institution	-.347	.342	1.029	1	.310	.707	.362	1.382
Stated Mission Underserved Population	-.040	.365	.012	1	.913	.961	.470	1.965
Constant	-.566	.716	.625	1	.429	.568		

Model fit statistics: Pseudo R-square = 4.9%

-2 Log Likelihood = 560.64; $\chi^2 = 16.28$, $p > .05$

Hosmer and Lemeshow's goodness of fit: $\chi^2 = 7.32$; $p > 0.05$

Employing a 0.05 criterion of statistical significance, there were no statistically significant predictors of currently working in a medically underserved area. None of the

characteristics — age, gender, birth within Indiana or out of state, birth in a metro or nonmetro area, or type of PA program (e.g., public vs. private, mission to serve underserved) — were significant predictors of currently working in a medically underserved area.

Rural Practice

Binary logistic regression was used to determine the impact of the independent variables on the study outcome of practicing in a rural area, using odds ratios with 95% confidence intervals (CIs). P-values less than 0.05 were considered statistically significant. Almost all independent variables were dummy-coded and treated as categorical (except age). The regression model was performed by SPSS 19 software. Included in Table 19 are the logistic regression coefficient (B), standard error (S.E.), significance (p), and 95% confidence intervals for the odds ratio for practicing in a rural area.

Table 19

Secondary analysis of IPLA dataset: Binary logistic regression for practicing in a rural area with 95% confidence intervals

							95% C.I.for EXP(B)	
	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Gender	.047	.389	.015	1	.904	1.048	.489	2.246
Current Age	.037	.023	2.703	1	.100	1.038	.993	1.085
Born in Indiana	-.032	.382	.007	1	.932	.968	.458	2.047
Birth Nonmetro	1.345	.361	13.872	1	.000	3.836	1.891	7.784
Butler PA Program			1.466	2	.481			
Saint Francis PA Program	-.045	.492	.009	1	.926	.956	.364	2.508
Outside Indiana PA Program	.501	.450	1.240	1	.266	1.650	.683	3.987
PA Program in MUA	-.933	.792	1.389	1	.239	.393	.083	1.856
Public PA Institution			1.241	2	.538			
Private PA Institution	.706	.633	1.241	1	.265	2.025	.585	7.007
Constant	-4.848	1.201	16.306	1	.000	.008		

Model fit statistics: Pseudo R-square = 9.5%
-2 Log Likelihood = 460.05; X^2 = 19.5, p <.05
Hosmer and Lemeshow's goodness of fit: X^2 = 8.2; p > 0.05

Employing a 0.05 criterion of statistical significance, birth in a rural area was the only characteristic that was predictive of current practice in a rural area. The regression formula is Y = -4.85 + (1.35* Birth NonMetro), where Y is the prevalence of PAs practicing in rural areas. None of the other characteristics — age, gender, birth in Indiana or out of state, PA program

mission to serve rural areas, location in a medically underserved area, or type of program (e.g., public vs. private) — were significant predictors of current rural practice.

Power Analysis

Power was calculated with G*Power software using eight independent variables, a 0.05 probability of making a Type I error a priori, and a total sample size of 483 PAs. The regression model reached 100% power. The results of the power analysis for the logistic regression model are shown in Table 20.

Table 20

Power calculation for binary logistic regression of current practice in primary care

F tests - Linear multiple regression: Fixed model, R^2 deviation from zero

Analysis: Post hoc: Compute achieved power

Input:

Effect size f^2	= 0.35
α err prob =	0.05
Total sample size	= 483
Number of predictors	= 8

Output:

Noncentrality parameter λ	= 169.05
Critical F =	1.9579315
Numerator df	= 8
Denominator df	= 474
Power (1-β err prob)	= 1.0000000

Calculations from: Faul F., Erdfelder E., Lang A.G., Buchner A. (2007). G=Power3: A flexible statistical power analysis program for the social, behavior, and biomedical sciences. *Behavior Research Methods*, 39: 175-191.

Six predictors were used instead of eight when evaluating practice in medically underserved areas. The power was 100% and shown in Table 21.

Table 21

Power calculation for logistic regression and current practice in medically underserved areas

F tests - Linear multiple regression: Fixed model, R^2 deviation from zero

Analysis: Post hoc: Compute achieved power

Input:

Effect size f^2	= 0.35
α err prob =	0.05
Total sample size	= 483
Number of predictors	= 6

Output:

Noncentrality parameter λ	= 169.05
Critical F =	2.1176179
Numerator df	= 6
Denominator df	= 476
Power (1-β err prob)	= 1.0000000

Calculations from: Faul F., Erdfelder E., Lang A.G., Buchner A. (2007). G=Power3: A flexible statistical power analysis program for the social, behavior, and biomedical sciences. *Behavior Research Methods*, 39: 175-191.

The statistical power for the predictive model of current rural practice using six variables was 100% (Table 22).

Table 22

Power calculation for binary logistic regression and current practice in rural areas

F tests - Linear multiple regression: Fixed model, R^2 deviation from zero

Analysis: Post hoc: Compute achieved power

Input:

Effect size f^2	= 0.35
α err prob =	0.05
Total sample size	= 483
Number of predictors	= 6

Output:

Noncentrality parameter λ	= 169.05
Critical F =	2.1176179
Numerator df	= 6
Denominator df	= 476
Power (1-β err prob)	= 1.0000000

Calculations from: Faul F., Erdfelder E., Lang A.G., Buchner A. (2007). G=Power3: A flexible statistical power analysis program for the social, behavior, and biomedical sciences. *Behavior Research Methods*, 39: 175-191.

All regression models had a power at or near 100% to detect significant differences between groups.

Survey of Recent Graduates and Retention

Of the 371 electronically mailed invitations to participate, 170 PAs responded via SurveyMonkey, generating a response rate of 46%. Of those 170 PAs, 13 were not actively practicing or not practicing in the state of Indiana, and five discontinued the survey too early to gain viable data; therefore, 152 responses were considered in the final analyses. The 2014 recruitment and retention study sample represented 31% of the total population of PAs (n = 483) who were actively practicing in the state of Indiana and graduated between 2000 and 2010.

The demographic composition of this cohort was consistent with the demographic composition of the entire population of PAs who graduated between 2000 and 2010 (Table 23). Therefore, it was likely that the sample was representative of the population. One variable that appears different to PAs who participated in the survey was the proportion who were educated outside of Indiana relative to the total population who graduated between 2000 and 2010.

Table 23

Comparison of demographics of survey respondents to total population

Variable	2014 recruitment and retention study	Total graduates between 2000 and 2010
Response rate (%)	31	N/A
Female (%)	73	70
Currently urban (%)	88	91
Median age (years)	34	35
Educated in Indiana (%)	82	60

The median age of respondents to the 2014 recruitment and retention study was 35 years; the median age at time of graduation from a PA program was 25 years. Seventy-three percent were female and 97% were white, not Hispanic. Table 24 compares race and ethnicity of PA providers.

Most of the PAs responding to the survey were educated in the state of Indiana (82%), and most graduated from Butler University (69%), the longest running and largest PA program in the state.

Table 24

Race/ethnicity of Indiana's population, PAs practicing in 2012, and 2014 recruitment and retention study

	Indiana general population %	2012 PAs license and re-licensure study %	2014 recruitment and retention study %
White	84	93	97
African-American/Black	9	2.2	1
Asian	2	2	2
Hispanic/Latino	6	2.2	0

Eighty percent of respondents perceived their household income while growing up as average or above average (Table 25).

Table 25

2014 recruitment and retention study: Growing up, the respondent PA's perception of household income was…

Household income	Frequency n =	Percent %
Very much below average	7	5
Below average	22	15
Average	**71**	**47**
Above average	46	30
Very much above average	4	3

Educational debt did not initially appear to affect the choice of specialty or practice location (initial or current job) (Table 26).

Table 26

2014 recruitment and retention study: Perceived effect of educational debt and influence on specialty and location choice

Educational debt's influence on…	Not at all n =	A little n =	Quite a bit n =	Completely n =	Total response n =
…location of initial job	**108**	21	15	5	149
…location of current job	**64**	13	22	1	100
…specialty of initial job	**99**	26	17	6	148
…specialty of current job	**69**	12	10	5	96

However, when gender was isolated, males were significantly more likely to perceive that debt influenced both their specialty and their initial practice location (Table 27).

Table 27

2014 recruitment and retention study: Chi Square distribution perceived debt's influence on initial job location and specialty and gender

Independent Variables		Gender				
		Male n =	Percent %	Female n =	Percent %	Total n =
Initial Location						
	Not at all	25	17	83	56	108
	A little	5	3	16	11	21
	Quite a bit / Completely	11	7	9	6	20
	Total	41		108		149
Initial specialty						
	Not at All	23	16	72	51	95
	A little	6	4	18	13	24
	Quite a bit / Completely	12	8	11	8	23
	Total	41		101		142

A Chi Square test was run after combining "quite a bit" and "completely" into a single category to determine if there was a relationship between gender and debt's perceived influence on initial location and specialty. This was done because it met minimum response requirements to run the Chi Square test analysis. The analysis indicated a relation between initial job location and gender to be statistically significant, $\chi 2$ (2, n = 149) = 8.75, $p < .05$. Chi Square test analysis indicated a relation between initial job specialty and gender to be statistically significant, $\chi 2$ (2, n = 142) = 7.26, $p < .05$. Males were more likely than females to be influenced by debt in choosing their specialty and the location of their initial job.

Before beginning practice as a PA, most respondents had not spent time in a country that they considered socioeconomically underdeveloped (74%), and only a small percentage (9%)

had participated in an international rotation during their PA training. Few respondents had military experience (9%) prior to entering their PA program.

Most respondents reported that they had not been encouraged to choose a particular practice specialty or location; the responses were 53% regarding primary care, 64% for rural medicine, and 59% for underserved areas. Despite this, 43% of respondents reported spending some time in a rural area as well as a medically underserved area during their experiential year, with a median length of time of 60 weeks and 9 weeks, respectively.

The majority of respondents knew they wanted to become a PA while enrolled as a first-time undergraduate student or before (55%) (Table 28).

Table 28

2014 recruitment and retention study: Earliest known time period respondent indicated they first knew they wanted to be a PA

Time periods	Frequency n =	Percent %
Before or during high school	34	22
While enrolled as a first-time undergraduate student	**50**	**33**
After high school; however, I did not initially go to college. I went back later to become a PA	7	5
After I finished a college degree in another health-care field	35	23
After I finished a degree in a non-health-care related field	17	11

Table 29 presents respondents' perceptions at the start and completion of their training program regarding specialty and location of practice. Respondent PAs appeared to have less of an interest (strongly disagree and disagree) in serving in a primary-care specialty at the

completion of the PA training program versus the start (33% vs. 47%). However, bivariate analysis revealed a very strong positive correlation between a desire to work in primary care at the beginning and end of the respondents' PA education program, $r(146) = .61$, $p < .001$.

Forty percent of respondents believed that they had more educational debt than most graduates following PA school. Very few responding PAs had applied for or received a National Health Service Corps scholarship to serve in a rural or underserved location (4%). Of those who entered urban practice after graduation, 34% reported that they would have practiced in a rural area if they had received federal and/or state loan forgiveness for educational debt, and another 30% reported that they would have reconsidered the choice.

Table 29

2014 recruitment and retention study: Effects of program training on location and specialty of practice

	Strongly Disagree n =	Disagree n =	No Opinion or Uncertain n =	Agree n =	Strongly Agree n =	Bivariate Analysis
Start of PA training program, interest in work in a primary-care specialty	9	24	**27**	26	12	
Completion of PA training program, interest in work in a primary-care specialty	11	**36**	13	29	9	r(146) = .61, p < .001
Start of PA training program, interest in work in a rural medical practice	9	19	**50**	17	5	
Completion of PA training program, interest in work in a rural medical practice	7	25	**47**	15	4	r(145) = .68, p < .001
Start of PA training program, interest in work in a MUA practice	6	26	**47**	13	6	
Completion of PA training program, interest in work in a MUA practice	4	27	**47**	15	5	r(146) = .68, p < .001
Start of PA training program, interest in working in Indiana	3	6	26	23	**40**	
Completion of PA training program, interest in working in Indiana	2	5	20	28	**44**	r(147) = .84, p < .001

MUA = medically underserved area

Issues of Recruitment

A majority of responding PAs indicated that initial job offers were received prior to graduation (56%) (Table 30). However, a large number of respondents received the initial job offer after graduation (42%). It should be noted that more than 15% received and accepted their first job more than six months after graduation.

Table 30

2014 recruitment and retention study: Recruitment experience to work as a PA

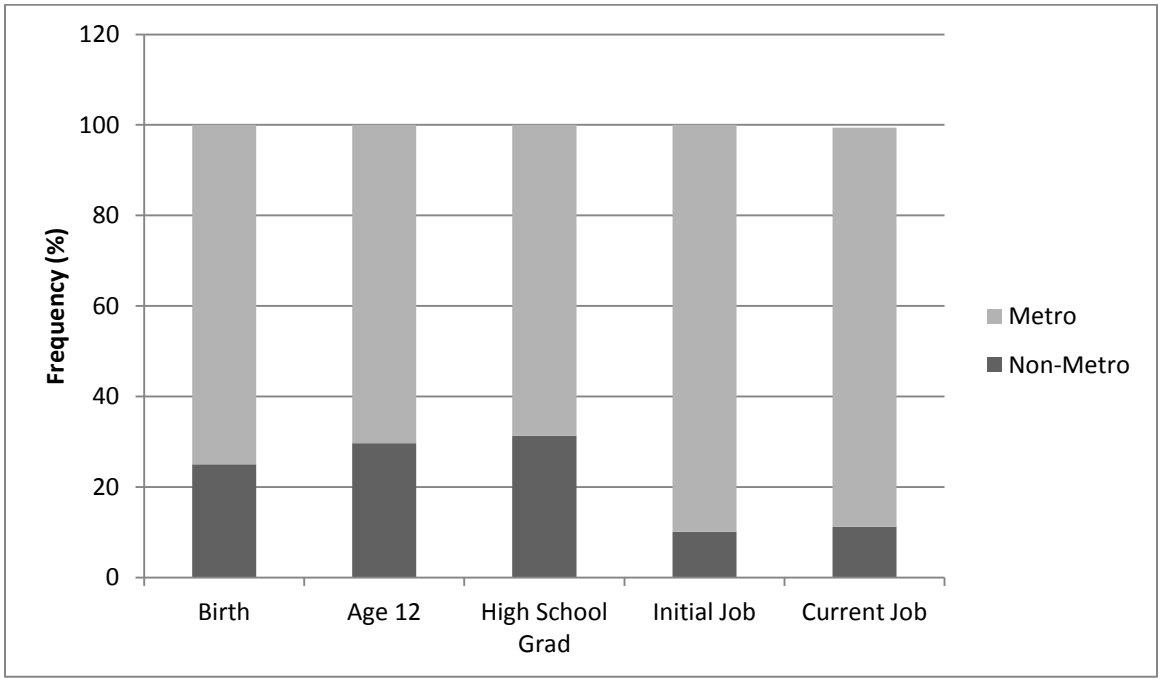
	First job offer received		Accepted offer initial job	
	Frequency n =	Percent %	Frequency n =	Percent %
Before the start of school	2	1	2	1
After the start of school but > 6 months prior to graduation	7	5	7	5
3 to 6 months prior to graduation	25	16	23	15
1 month to 3 months prior to graduation	**35**	**23**	**29**	**19**
< 1 month prior to graduation	15	10	16	11
1 month to 3 months after graduation	26	17	26	17
3 to 6 months after graduation	14	9	15	10
> 6 months after graduation	24	16	23	15

A large majority of the respondents to the survey (70%) believed that the job offer they accepted was neither directly nor indirectly a result of having completed a clinical rotation at that particular site during their experiential training.

Figure 8 shows a distribution, among PA respondents who graduated between January 2000 and December 2010 and practice in Indiana, of those who were born, raised, and chose a practice location in a metro vs. nonmetro area.

Figure 8

2014 recruitment and retention study: Percentage of respondent PA life experiences reflecting a metro or nonmetro area



PAs who chose rural work sites immediately following graduation did so for a variety of reasons (Table 31). The most common reason was comfort in small town living (33%), followed by freedom in daily practice (26%) and patient population served (22%).

Table 31

2014 recruitment and retention study: Primary reason work location was chosen by those electing rural practice initially

	Frequency n =	Percent %
Freedom in daily practice	7	26
It was the only job offer I received	1	4
Comfort in small town living	**9**	**33**
Patient population served	6	22
Opportunities for family life	2	7
PA program prepared me for opportunity	1	4
Outdoor opportunities	1	4

Of those PAs who left rural practice to go into an urban practice (n = 9), four responded that they left rural medicine because of the restrictive practice conditions, while three left to change to a new specialty. The median time working in a rural practice before moving to an urban practice was 24 months, standard deviation of 32 months, and range of 4-104 months.

PAs who chose urban work sites immediately following graduation did so for a variety of reasons (Table 32). The most common reason for choosing an urban practice location was a

sense of place in an urban practice environment (33%), followed by the comfort of city life (21%).

Table 32

2014 recruitment and retention study: Primary reason for initial urban practice choice

	Frequency n =	Percent %
It was the only job offer I received	18	14
I tried to find a rural job; however, none were available	10	8
Comfort of city life (personal)	26	21
Sense of place in an urban practice (professional)	**41**	**33**
Opportunities for family life	14	11
Friends and family are in urban areas	9	7
Medical services available to refer patients, if needed	3	2
Debt forced me to take a job in an urban location	4	3

The majority of respondents' initial job locations were most influenced by specialty choice (28%) and personal reasons (29%). With the respondents' current job, personal reasons remained as the most influential determinant in location choice (34%), whereas in comparison with initial job location, specialty choice decreased (28% to 20%) and the influence of a supervising physician increased (7% to 16%) (Table 33).

Table 33

2014 recruitment and retention study: Factor that most influenced respondent PAs to a particular practice location

	Initial practice location		Current practice location	
	Frequency n =	Percent %	Frequency n =	Percent %
Specialty	42	28	31	20
Personal reasons (proximity to family, lifestyle, etc.)	**44**	**29**	**51**	**34**
Spouse/significant other preference	10	7	9	6
Supervising physician	10	7	24	16
Affordability	6	4	5	3
Compensation	16	11	19	12
Only offer received	21	14	5	3
Patient population served (underserved, rural, urban, etc.)	0	0	5	3

Issues of Retention

Univariate Results

To explore issues of retention as well as recruitment, the respondents were divided into three independent variable groups as represented in Table 34: first practice location was rural versus urban, first practice location was rural and stayed rural versus moved to an urban location, and first practice location was urban and moved to a rural location or stayed urban.

Table 34

2014 recruitment and retention study: Distribution of respondents' first and current job locations

	Grouping	Frequency n =	Percent %
1	First practice location was rural versus urban	27	18
2	First practice location was rural		
	…stayed rural	18	12
	…moved to an urban location	9	6
3	First practice location was urban	125	82
	…stayed urban	115	76
	…moved to a rural location	10	6

Metro = Urban; Nonmetro = Rural

Chi Square Analysis

The distribution of the independent variables (first practice location rural versus urban; first practice location rural and stayed rural or moved to an urban location; first practice location urban and stayed urban or moved to rural location) is shown in Tables 35, 36, and 37, respectively.

Table 35

2014 recruitment and retention study: Distribution of respondents for first practice location, rural versus urban

Independent Variables		Initial Practice				
		Rural n =	Percent %	Urban n =	Percent %	Total n =
Military Service						
	Yes	0	0	14	10	14
	No	15	10	117	80	132
	Total	15		131		146
Rural Rotation						
	Yes	11	8	54	37	65
	No	4	3	78	53	82
	Total	15		132		147
Age 12 RUCC						
	Metro	39	27	92	63	131
	Nonmetro	5	3	9	6	14
	Total	44		101		145
High School Graduation RUCC						
	Metro	6	4	8	6	14
	Nonmetro	40	28	90	63	130
	Total	46		98		144

RUCC = Rural-Urban Continuum Code; Metro = Urban; Nonmetro = Rural

Generally, there were a small number of PAs practicing in nonmetro areas responding to this survey. Therefore, if assumptions were not met for a Chi Square analysis, a Fisher's exact 2 x 2 contingency table two-tailed test was run. The association between initial job location at a metro location and military service was considered to be not statistically significant, P value = 0.3622, by Fisher's exact test. Chi Square test analysis indicated a relation between initial job in a nonmetro location and serving in a rural rotation to be statistically significant, χ^2 (1, n = 147) = 5.74, $p < .05$. Those individuals participating in a rural rotation were likely to initially practice in a rural location. Fisher's exact test determined that the association between initial metro location of practice and living at a metro location at age 12 was not statistically significant, P value = 0.7607. The association between initial metro location of practice and metro location at high school graduation was considered to be not statistically significant by Fisher's exact test, P value = 0.3760.

Table 36

2014 recruitment and retention study: Distribution of respondents for first practice location, rural and stayed rural versus moved to an urban location

Independent Variables		Initial Practice Rural				
		Stayed Rural n =	Percent %	Moved Urban n =	Percent %	Total n =
Gender						
	Male	4	15	3	12	7
	Female	13	50	6	23	19
	Total	17		9		26
Birth RUCC						
	Metro	2	8	7	27	9
	Nonmetro	3	12	14	54	17
	Total	5		21		26
Age 12 RUCC						
	Metro	3	12	6	23	9
	Nonmetro	4	15	13	50	17
	Total	7		19		26
High School Graduation RUCC						
	Metro	4	15	13	50	17
	Nonmetro	3	12	6	23	9
	Total	7		19		26

PA Program Location					
Butler	12	44	5	19	17
Saint Francis	2	7	3	11	5
Outside State	4	15	1	4	5
Total	18		9		27

RUCC = Rural-Urban Continuum Code; Metro = Urban; Nonmetro = Rural

There was an insufficient number of PAs practicing in nonmetro (rural) areas responding to this survey. Therefore, a Fisher's exact 2 x 2 contingency table two-tailed test was run, as criteria were not met for a Chi Square analysis. The association between the respondents' initial job location being rural and staying rural or moving to an urban practice location (rural stay/move) and gender was considered to be not statistically significant, P value = 0.6613. The association between rural stay/move and living at a metro location at birth was considered to be not statistically significant, P value = 1.0000. The association between rural stay/move and living at a metro location at age of 12 was considered to be not statistically significant, P value = 0.6613. The association between rural stay/move and living at a metro location at high school graduation was considered to be not statistically significant, P value = 0.6613. The association between the PA program location and rural stay/move was evaluated using a Fisher's exact 2 x 3 contingency table two-tailed test. It was considered to be not statistically significant, P value = 0.5002.

Table 37

2014 recruitment and retention study: Distribution of respondents for first practice location, urban and stayed urban versus moved to rural location

	Initial Practice Urban				
Independent Variable	Stayed urban n =	Percent %	Moved rural n =	Percent %	Total n =
Gender					
Male	32	26	2	2	34
Female	81	66	8	7	89
Total	113		10		123
Birth RUCC					
Metro	83	67	5	4	88
Nonmetro	29	23	4	3	33
Total	115		9		124
Age 12 RUCC					
Metro	80	66	33	27	113
Nonmetro	5	4	4	3	9
Total	85		37		122
High School Graduation RUCC					
Metro	79	65	33	27	112
Nonmetro	3	3	6	5	9

Total	82		39		121
Program Location					
Butler	79	64	8	7	87
Saint Francis	14	11	0	0	14
Outside State	21	17	2	2	23
Total	114		10		124

RUCC = Rural-Urban Continuum Code; Metro = Urban; Nonmetro = Rural

There was an insufficient number of PAs practicing in nonmetro (rural) areas responding to this survey, and criteria were not met for a Chi Square analysis test. Therefore, a Fisher's exact 2 x 2 contingency table two-tailed test was run to determine if a relationship existed between the dependent and independent variables. The association between the respondents' initial job location being urban and staying urban or moving to a rural practice location (urban stay/move) and gender was considered to be not statistically significant, P value = 0.7252.

The association between urban stay/move and living at a metro location at birth was considered to be not statistically significant, P value = 0.2538. The association between urban stay/move and living at a metro location at age of 12 was considered to be not statistically significant, P value = 0.4519. The association between urban stay/move and living at a metro location at high school graduation was considered to be statistically significant, P value = 0.0306. Those PAs who lived in nonmetro locations at high school graduation were more likely to practice in nonmetro locations at their initial PA job. The association between the PA program location and urban stay/move was evaluated using a Fisher's exact using a 2 x 3 contingency table two-tailed test. It was considered to be not statistically significant, P value = 0. 7579.

Power Analysis

Power was calculated with G*Power software for first practice location rural versus urban (Table 35) using four independent variables, a 0.05 probability of making a Type I error a priori, and a total sample size of 146 PAs. The model reached an appropriate level, 95% power. The results of the power calculation for the Chi Square analysis are presented in Table 38.

Table 38

2014 recruitment and retention study: Power calculation for first practice location, rural versus urban

χ^2 tests - Goodness-of-fit tests: Contingency tables			
Analysis:	Post hoc: Compute achieved power		
Input:	Effect size w	=	0.3
	α err prob	=	0.05
	Total sample size	=	146
	Df	=	1
Output:	Noncentrality parameter λ	=	13.14
	Critical χ^2	=	3.841
	Power (1-β err prob)	=	0.9520

Calculations from: Faul F., Erdfelder E., Lang A.G., Buchner A. (2007). G=Power3: A flexible statistical power analysis program for the social, behavior, and biomedical sciences. *Behavior Research Methods*, 39: 175-191.

Power was calculated with G*Power software for first practice location rural and stayed rural or moved to an urban location (Table R) using five independent variables, a 0.05 probability of making a Type I error a priori, and a total sample size of 26 PAs. The model did not reach 80% power. The results of the power calculation for the Chi Square analysis are shown in Table 39.

Table 39

2014 recruitment and retention study: Power calculation for first practice location, rural and stayed rural versus moved to an urban location

χ^2 tests - Goodness-of-fit tests: Contingency tables		
Analysis:	Post hoc: Compute achieved power	
Input:	Effect size w	= 0.3
	α err prob	= 0.05
	Total sample size	= 26
	Df	= 1
Output:	Noncentrality parameter λ	= 2.340
	Critical χ^2	= 3.8414
	Power (1-β err prob)	= 0.3337

Calculations from: Faul F., Erdfelder E., Lang A., Buchner A. (2007). G=Power3: A flexible statistical power analysis program for the social, behavior, and biomedical sciences. *Behavior Research Methods*, 39: 175-191.

Power was calculated with G*Power software for first practice location urban and stayed urban or moved to rural location (Table Q) using five independent variables, a 0.05 probability of making a Type I error a priori, and a total sample size of 121 PAs. The model reached an appropriate level, 90% power. The results of the power calculation for the Chi Square analysis are included in Table 40.

Table 40

2014 recruitment and retention study: Power calculation for first practice location, rural versus urban

χ^2 tests - Goodness-of-fit tests: Contingency tables			
Analysis:	Post hoc: Compute achieved power		
Input:	Effect size w	=	0.3
	α err prob	=	0.05
	Total sample size	=	121
	Df	=	1
Output:	Noncentrality parameter λ	=	10.8900000
	Critical χ^2	=	3.8414588
	Power (1-β err prob)	=	0.9098833

Calculations from: Faul F., Erdfelder E., Lang A.G., Buchner A. (2007). G=Power3: A flexible statistical power analysis program for the social, behavior, and biomedical sciences. *Behavior Research Methods*, 39: 175-191.

Logistic Regression Results

Binary logistic regression was used to determine the impact of the independent variables on the study outcome of first practice location rural versus urban, using odds ratios with 95% confidence intervals (CIs). P-values less than 0.05 were considered statistically significant. Almost all independent variables were dummy-coded and treated as categorical (except age). The regression model was performed by SPSS 19 software. Included (Table 41) is the logistic regression coefficient (B), standard error (S.E.), significance (p), and 95% confidence intervals for the odds ratio for practicing in a rural area.

Table 41

2014 recruitment and retention study: Binary logistic regression predicting first practice location in a rural versus urban area

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
PA rotation in a rural area	1.362	.640	4.524	1	.033	3.903	1.113	13.686
Interest of rural medicine at the completion of education	.676	.435	2.413	1	.120	1.967	.838	4.617
Interest in rural practice at the start of education	-.367	.390	.887	1	.346	.693	.323	1.487
Prior to PA education visited a low socioeconomic area	-.238	.710	.112	1	.738	.788	.196	3.172
International rotation as PA student	-18.968	10455.95	.000	1	.999	.000	.000	.
Constant	-3.742	1.110	11.3	1	.001	.024		

Model fit statistics: Pseudo R-square = 27.5%
-2 Log Likelihood = 75.4; X^2 = 20.6, p <.05
Hosmer and Lemeshow's goodness of fit: X^2 = 1.96; p > 0.05

When considering together all five predictor variables — serving in a rural rotation while in PA school, interest in rural medicine at the start and completion of PA education, prior experience visiting a low socioeconomic prior to PA education, and serving in an international rotation — the model will predict whether or not a PA initially practiced in primary care, ($\chi 2$ = 11.76, df = 5, n = 152, p <0.05).

Employing a 0.05 criterion of statistical significance, a PA rotation in a rural area was predictive of practice in rural medicine. The regression formula is Y = -3.74 + (1.36 * PA rotation in a rural area), where Y is the prevalence of PAs practicing in rural medicine.

Summary of Results

Secondary Analysis of IPLA Database

The secondary analysis of IPLA data of those PAs who are actively practicing and who graduated between 2000 and 2010 revealed several factors. The median age was 35 years and the majority were female. The most common specialty was orthopedics, followed closely by emergency medicine. Physician assistants were currently employed predominantly in counties that are designated by the U.S. Department of Agriculture as metro (91%).

Chi Square analyses revealed several statistically significant relationships.

1. Female PAs were more likely to practice in primary care than were males. Based on the number of females entering the profession, this should be beneficial to addressing the shortage of providers in rural areas of Indiana.
2. Those PAs who were educated outside of Indiana were more likely to practice in medically underserved areas than were those educated within the state.
3. Physician assistants born in rural areas were more likely to practice in rural areas.

Employing a 0.05 criterion, logistic regression analyses revealed several statistically significant relationships.

1. Gender was predictive of practice in primary care. Women were more likely to practice in primary care.

2. Birth in a rural area was predictive of current practice in a rural area.

Survey of Recent Graduates and Retention

The 2014 recruitment and retention study sample represented 31% of the total population of PAs (n = 483) who were actively practicing in the state of Indiana and who graduated between 2000 and 2010. The perception of the responding PAs was that as they were growing up, their household income was average relative to others. According to this study, 40% of respondents believed that they had more educational debt than most graduates following PA school. This initially appeared to have little impact, however, as 64% indicated that debt had little bearing on choice of initial specialty, and 72% indicated that it had little to do with the location of their initial job. Further evaluation, however, indicated that male PAs considered debt's influence on specialty choice of the initial job to a greater degree than did females. Males also considered debt's influence on initial location more than did females. Debt appeared to have little impact for females. The most common reason for choosing an urban practice location was a sense of place in an urban practice environment (33%), followed by the comfort of city life (21%).

A majority of responding PAs indicated that initial job offers were received prior to graduation (56%); however, a number did not accept a position until after graduation. PAs responding to the survey initially appeared to have less interest (strongly disagree and disagree) in serving in a primary-care specialty at the completion of their training program versus the start (33% vs. 47%). However, bivariate analysis revealed a very strong positive correlation between having an interest in primary care at the beginning of their PA education, and again at the end of their training.

Chapter 5: Discussion

Introduction

Evidence suggests that the number of primary-care providers in underserved and rural communities in Indiana is inadequate and must be increased. There are opportunities to improve disparate access to primary care in rural or underserved areas, and this study identifies factors that show certain PAs to be more likely to pursue primary care and service in rural and underserved areas.

Discussion

Prior to 2007, PAs did not have prescription writing authority in Indiana. It is conceivable that despite possible sources of Indiana employment, PAs chose not to practice in Indiana because of the lack of prescriptive authority rights. In 2007, when PAs were given a limited ability to prescribe, Indiana PAs were also subject to restrictions associated with the location of a supervising physician. Between 2007 and 2013, PAs were restricted to working with a physician in the same or contiguous county. Due to the small size and configurations of some of the counties, there were several underserved and rural areas where if a physician worked with a PA but was away, the office would have to close down for the day and patients could have gone without care. This of course limited the benefits of hiring a PA to work in these areas. Both of these laws have now changed, and the regulatory environment is now more favorable to PAs practicing in rural areas. With the increase in the number of students graduating and an increase in the number of training programs, PAs may partially help solve the problem of health-care provision in rural areas. It has been important to identify characteristics associated with PA

providers who have chosen to work in rural areas as well as those who have been retained in these communities. These identified characteristics may serve as the framework for strategy development. These strategies should be used by educational programs, policymakers, and communities looking to increase the number of health-care providers in certain specialties or areas in Indiana.

Cawley and Jones (2013) illustrated the trend within PA education of increasing program sponsorship by private institutions. Because the majority of Indiana PA graduates have attended private institutions, they likely carry a greater educational debt burden than PAs in other states. Cawley and Jones indicated that it is unknown if this may affect students' choice of practice after graduation, and this question needs further study.

For male PAs graduating between 2000 and 2010, this study has identified as statistically significant that debt influenced the decision on initial job specialty and location. One review indicated that males are generally attracted to technical specialties, such as surgery, that generally pay higher and women choose lower-paying but more holistic care specialties (Essary & Coplan, 2014). However, limited studies exist to support this, and therefore, how gender accounts for decisions to practice in certain specialties and locations deserves a greater level of study.

A large majority of the respondents to the 2014 recruitment and retention survey (70%) believed that the job offer they accepted was neither directly nor indirectly a result of having completed a clinical rotation at that site or with a particular preceptor. This was consistent with a study published in the Journal of Physician Assistant Education in 2013, where only one-fourth of preceptor respondents considered student placement as a way of "recruiting new staff members" (Gonzalez-Colaso, Moloney-Johns, & Sivahop, 2013). The majority of preceptors

recruited by clinical coordinators should be partners in the education process. Preceptors should be educated in positive teaching methods to optimize the learning experience for students.

In the present study, bivariate analysis revealed a very strong positive correlation between an expressed interest in primary care when PAs started their education and upon completion. The students who express an interest in primary care and rural medicine at the start of their education should be mentored and placed in learning situations (e.g., rotations) that enhance the possibility of this interest becoming a reality.

Recommendations

Based on the results of survey responses and this study, there are feasible ways to increase the numbers of PAs in clinical practice in rural or primary-care areas in Indiana. They include:

- Increasing the interest of high school or undergraduate students, especially those who represent rural areas, in considering a career in health care. Awareness and motivation programs would encourage students to consider pursuing careers as physician assistants by providing detailed information about the profession and its opportunities. These programs could also provide advice on the type of coursework and preparation that are needed to enter and succeed in the profession, such as taking appropriate prerequisite courses, shadowing PA professionals during patient interaction, conducting research, or other types of professional activities.

- Educating rural physicians and the communities they serve as to the benefits of employing a physician assistant for use in rural areas.

- Providing incentives or funding to key preceptors who train PAs in rural areas so that PA students' interest may be stimulated in practicing in a rural area upon graduation.

- Encouraging more experiences within rural areas in both the didactic and experiential portions of PA programs. Early engagement of students in rural-practice areas would provide an orientation to this type of practice, allow for advising about balancing work and personal life, provide hands-on clinical experience, and introduce students to colleagues who may also offer activities and advice for rural practice.

- Offering adjunct-faculty positions to rural-practice PAs, who could provide insight on their experiences in rural practice.

- Expanding the limits of unsubsidized Stafford Loans to be more reflective of the cost of PA education. The student loan limits for those in PA programs were not expanded with amendments to the Higher Education Act of 1965. Therefore, PA students are only eligible for 53% of the average total tuition of their educational program (PAEA, 2014). This limit potentially forces matriculants to apply for loans with higher interest rates and creates barriers for entrance into PA programs, especially for those with economically and educationally disadvantaged backgrounds, who may be more likely to practice in underserved or rural areas.

- Working with Area Health Education Centers (AHEC) within the state to promote and expand underserved and rural experiential sites for PA students. While the mission of Indiana's AHEC Network is "to improve health by recruiting, educating and retaining healthcare professionals for underserved communities in Indiana," the network does not currently provide financial support for either PAs or for PA educational programs in the state. Further, for the first time in four years, the federal budget for 2015 proposed by the Obama administration does not continue allocation for PAs utilizing AHEC under Title VII federal funding (Health Professions Nursing Education Coalitions, 2014). This is a net reduction of more than $30 million from previous years. Therefore, in Indiana, it will be imperative to encourage AHEC to take a positive stance and advocate for financial support at the federal level while making connections between PAs and needy communities. These could be key efforts in developing Indiana's rural and underserved health-care workforce.

- Increasing the capacity for Critical Access Hospitals (CAHs) to create and expand training programs that could improve access to care in rural communities and strengthen rural training (Xierali, I., Sweeney, S, Phillips, R., Bazemore, A., & Petterson, S., 2012). CAHs are small rural hospitals, at least 35 miles away from any other hospital, which are typically the sole source of care for their community. CAHs provide not only acute care but a broad spectrum of basic health services. The state of Indiana has 35 hospitals identified as CAHs (Indiana State Rural Health Plan, 2011). With assistance, these hospitals could provide training sites and could positively influence those students who have a desire to work in rural areas.

- Establishing financial assistance programs to cover training costs for students who commit to providing care to underserved or primary-care populations after graduation. Of those surveyed in the 2014 recruitment and retention study who entered into urban practice after graduation, one-third would have practiced in a rural area if they had received federal and/or state loan forgiveness for educational debt. The possibility of establishing these types of programs needs further exploration.

- Providing stipends to students who attend programs intended to boost recruitment and retention to rural and underserved areas. This may offset the debt incurred while training to be a PA and perhaps lessen the influence of debt over choice of specialty and location of the initial job. This may be especially effective for male physician assistants.

- Providing incentives such as tax breaks, differential reimbursement, loan repayment either through federal or state programs, or promoting the use of return-of-service agreements between PAs and communities/practices, targeting specifically those who serve in rural or primary-care areas after their educational training. Again, these types of programs could lessen the impact of educational debt.

- Informing PA training programs that a majority of graduates do not report having received programmatic encouragement to practice in primary-care specialties despite educational missions indicating this as a focus.

- Encouraging PA programs to adopt preferential admissions policies for candidates who express interest in working in primary-care specialties, especially where doing so would be consistent with the PA programs' stated missions.

- Because almost one-third of those responding to the 2014 recruitment and retention survey indicated that personal reasons (proximity to family, lifestyle, etc.) were the most important factors when considering their initial employment, developing preferential recruiting policies for students from rural areas may increase retaining these individuals to practice in rural areas upon completion of their training.

- Encouraging the expanded utilization of PAs within federally qualified health centers or rural health clinics in Indiana that employ PAs, and encouraging better reimbursement rates under health-care plans in these settings.

- Promoting the positive aspects of living and working in rural areas to students during their training may entice more clinicians to these areas.

- Improving PA training programs by helping students to acquire skills in relating to rural populations as well as emphasizing the unique health-care challenges of rural and other special populations.

- Implementing retention strategies for new PAs once they begin practice in the community. These strategies should include: welcoming and orienting the new PA and significant other to the health-care community and general area; establishing a mentor in addition to the supervising physician; and satisfying compensation, education, and benefit needs to the extent possible.

- Facilitating changes to state law. As of July 2013, Indiana has met four of the American Academy of Physician Assistants' six key elements of a good PA state practice act (AAPA, 2014). Easing the requirements of case review and eliminating the physician PA ratio restriction might help to improve the Indiana PA practice act, especially for those working in rural and underserved areas. In so doing, more physician assistants would likely practice in the state of Indiana, and this would likely increase the number of rural or primary-care providers in the state.

Implications of Research

This study contributes to the literature in several ways. There have been no previous studies of recruitment and retention of PAs in the state of Indiana. The study evaluated the perceptions of physician assistants and their choices of initial and subsequent clinical practice. It further has made recommendations regarding recruitment and retention of PAs to areas of rural medicine. With the number of physicians declining in rural and primary-care areas in Indiana, it is important to understand the impact of providers like physician assistants in Indiana.

Future studies might concentrate more specifically on the variables that were found to be significant. For instance, what is the threshold of exposure of serving in a rural rotation that

predicts rural practice at completion? This research question might be addressed by performing a qualitative study and limiting the survey to those individuals who have practiced in rural medicine. A study could be done on the timing of that exposure to understand if there was a greater influence on earlier opportunities in rural or primary-care areas. Does exposure during didactic education or the timing of the experiential rotation affect the choice of initial practice location? Further, how gender accounts for PAs' decisions to practice in certain specialties and locations deserves a greater level of study.

Limitations and Delimitations

There were known issues of limitation identified in this study, including managing large populations and those associated with survey studies in general. These barriers included outcomes being dependent on response rates to allow for generalization to other populations. Limitations may exist and may affect the internal validity of the study. The study's analysis included only a sample of the Indiana PA workforce and may not be representative of the entire workforce because of factors such as self-selection, self-report, and nonresponse bias of survey participants. Recall bias exists when dealing with responses to questions about respondents' interest in rural and primary-care medicine and the effect of factors on the choice of practicing in these areas of medicine. This potential bias, however, was lessened in the present study by limiting the survey to those who have graduated more recently. Further, Chi Square tests are quite sensitive to sample size (as the sample size decreases, the Chi Square value decreases), risking an increase in Type II ("miss") errors.

Delimitations, which are choices made by the researcher, affect external validity or generalizability of the study. The 2013 Rural-Urban Continuum Code was used as a reference for

locations where the PA lived at birth, age 12, and high school. The code has changed to reflect population growth over time; however, this was not considered in the study. Methodology used in developing the 2000 metropolitan areas or the 2013 version of the RUCC is not directly comparable with prior codes (USDA, 2014). Therefore, participants may have actually "grown up" in or entered initial practice as a PA in rural areas that are now metro, or vice versa. Currently published PA programmatic missions, which are required by the ARC-PA to be published on program websites, may be different than those that were promulgated when the practicing PA graduated from the institution. This mission difference may have changed the effects on the PAs' choice of practice location and specialty. By restricting the analysis to PAs who graduated between 2000 and 2010, the study may have unintentionally limited the sample size of those practicing in rural or primary care, and thus inadvertently increased the chance of committing a Type II error.

Appendices

A. Invitation to participate in survey letter

Email addresses are going to be obtained from the Indiana Professional Licensing Agency.

Subjects will be invited to participate via e-mail. The e-mail invitation will contain the following information.

Dear Physician Assistant Colleague,

The following survey was developed to evaluate the perceptions of physician assistants (PAs) regarding clinical practice. The results will be beneficial for Indiana workforce development and planning, as well as recruitment and retention of PAs. Your responses will greatly help. The outcomes will be used to develop recruitment tools, and / or recruitment resources to assist future providers in these areas. Please indicate your confidential responses using the survey.

Please complete all of the questions and submit your survey by February 17, 2014 through the online portal. Individual responses will not be reported, and only aggregate results will be published. This should eliminate risk to you, protect your privacy, and prevent discrimination. You should not incur any personal loss, other than time, in connection with participation in this research project. All electronic data will be kept secure and password protected. This survey has been approved by Nova Southeastern's and Butler University's Institutional Review Boards. Participation is voluntary, and consent to use your responses in aggregate is given if you submit the survey.

Thank you for your essential participation in this research project.

You may access the survey online at the following link: https://www.surveymonkey.com/s/Indiana_workforce. Approximate time to complete the survey is 5 to 10 minutes.

This survey will assist me in the fulfillment of the requirements for a Degree of Doctor of Health Sciences (Ph.D.). Should you have any questions or concerns, please contact Jennifer A. Snyder, at jholycro@butler.edu or Dr. Guy Nehrenz at gnehrenz@nsu.edu, chair of the dissertation committee for this project.

With gratitude,

Jennifer A. Snyder, MPAS, PA-C

B. Survey

1. I currently work as a physician assistant in Indiana and provide patient care.

Yes *If yes, go to Q2*
No *If no, go to end of survey (thank you)*

Please note: If you work as a PA in more than one location caring for patients, for the purposes of this survey, your primary job is where you spend most of your time.

2. What was your initial primary job's zip code after graduation from your PA program?

Zip Code: _____

3. Did educational debts influence your INITIAL job after graduation from PA school?

	Not at All	A little	Quite a bit	Completely
Debt influenced initial location				
Debt influenced initial specialty				

4. My initial job out of PA school and my current job are one and the same.

Yes *Yes, go to Question 7*
No *No, go to Question 5*

5. Please provide your current primary job's zip code _____

Zip Code:

6. Did educational debts influence your CURRENT job choice after graduation from PA school?

	Not at All	A little	Quite a bit	Completely
Debt influenced current location				
Debt influenced current specialty				

7. Select the statement that best describes your primary job site.

My initial job after PA graduation and my current job are rural *If selected go to Q8*
My initial job after PA graduation and my current job are urban *If selected go to Q12*
My initial job after PA graduation was rural but my current job is urban *If selected go to Q9*
My initial job after PA graduation was urban but my current job is rural *If selected go to Q14*

8. What is the primary reason you chose a rural job site immediately following graduation?

It was the only job offer I received
Comfort in small town living
Opportunities for family life
Outdoor opportunities
PA program prepared me for rural opportunity
Patient population served
Freedom in daily practice
Other: _____

Go to Q17

9. What is the primary reason you chose a rural job site immediately following graduation?
Combine answers from Q8 and Q9 in analysis of rural job site

It was the only job offer I received
Comfort in small town living
Opportunities for family life
Outdoor opportunities
PA program prepared me for rural opportunity
Patient population served
Freedom in daily practice
Other: _____

10. How many total months did you stay in a rural practice before changing to an urban practice?

Enter the total number of months (round up to a whole number): _____

11. If you initially chose a rural job site after graduation and you currently no longer practice in a rural area, what is the primary reason you left?

Compensation not great enough
Different medical specialty sought (career change)
Dissatisfaction with rural specialty
Restrictive practice conditions
Malpractice risk too high
Supervision not appropriate
Lack of medical services available in which to refer patients
Lack of social network for myself or family
Personal reasons not related to practice of medicine or reason not stated above
Other: _____

Go to Q17

12. If you chose to practice in an urban area after graduation, what was the primary reason?

It was my only job offer
I tried to find a rural job; however, none were available
Comfort of city life (personal)
Sense of place in an urban practice (professional)
Opportunities for family
Friends and family are in urban areas
Medical services available to refer patients, if needed
Debt forced me to take a job in an urban location
I wanted to practice in a medical specialty or subspecialty
Other: _____

13. If you initially went into an urban area to practice after graduation, would you have reconsidered the choice to practice in a rural area if you received federal / state loan forgiveness for your educational debt?

Yes
Maybe
No

Go to Q17

14. If you chose to practice in an urban area after graduation, what was the primary reason?

Combine answers from Q12 and Q14 in analysis of urban job site

It was my only job offer
I tried to find a rural job; however, none were available
Comfort of city life (personal)
Sense of place in an urban practice (professional)
Opportunities for family
Friends and family are in urban areas
Medical services available to refer patients, if needed
Debt forced me to take a job in an urban location
I wanted to practice in a medical specialty or subspecialty
Other: _____

15. How many months did you stay in an urban practice before changing to a rural practice?

Enter the total number of months (round up to a whole number): _____

16. If you initially went into an urban area to practice after graduation, would you have reconsidered the choice to practice in a rural area if you received federal / state loan forgiveness for your educational debt? *Combine answers from Q13 and Q16 in analysis of urban job site*

Yes
Maybe
No

17. What are the city, state and zip code of the location where you were born?

City/Town:
State:
ZIP:

18. Did you live at the same location at birth, age 12, and graduation from high school?

Yes *If yes, go to Q21*
No *If no, go to Q19*

19. What are the city, state and zip code of the location where you were living at the age of 12?

City/Town:
State:
ZIP:

20. What are the city, state and zip code of the location where you were living at high school graduation?

City/Town:
State:
ZIP:

21. Rural upbringing is defined as spending all of one's childhood in a rural location, more than ten years in a rural location, or calling a rural place one's childhood home.

	Yes	No	Not Applicable
Do you define yourself as having a rural upbringing?			
If involved in the decision making process of your job location(s), does your significant other or spouse have a rural upbringing?			

22. I served in the military before entering PA school.

Yes
No

23. Growing up, my household income was…

Very much below average
Below average
Average
Above average
Very much above average

24. Before beginning practice as a PA, had you spent time in a country that was considered socioeconomically underdeveloped? (Do not include international PA rotations).

Yes *If yes, go to Q25*
No *If no, go to Q26*

25. What was the name of the country? _____

26. Provide the name and state of the PA program from which you graduated:

Name:
State:

27. What was the year of your graduation from your PA program?

Enter the Year (YYYY)

28. During PA school, did you live in a rural community?

Yes
No

29. Answer the following regarding your experience in PA school

I was encouraged to practice in primary care.	Yes	No	I do not know
I was encouraged to practice in medically underserved areas	Yes	No	I do not know
I was encouraged to serve in rural health areas	Yes	No	I do not know

30. When in PA school, were any of your rotations in a rural area?

Yes *If yes, go to Q31*
No *If no, go to Q32*

31. If yes, please answer the following regarding that experience—name of clinic(s) and town(s) of the clinic's location. Please provide the total number of weeks of rotations in a rural area.

Name of Clinic:
Town:
Name of Clinic:
Town
Include Others Here:
Total Weeks (whole number)

32. When in PA school, were any of your rotations in a medically underserved area?

Yes *If yes, go to Q33*
No *If no, go to Q34*

33. If yes, please answer the following regarding that experience—name of clinic(s) and town(s) of the clinic's location. Please provide the total number of weeks of rotations in a medically underserved area.

Name of Clinic:
Town:
Name of Clinic:
Town:
Include Others Here:
Total Weeks (whole number)

34. Did you participate in an international elective while in your PA education program?

Yes *If yes, go to Q35*
No *If no, go to Q36*

35. What was the name of the country? _____

36. Which of the following time periods did you know you wanted to be a PA?

Before or during high school
While enrolled as a first time undergraduate student
After I finished a college degree in another health care field
After I finished a degree in a non-health care related field
After high school; however, I did not initially go to college. I went back later to become a PA
None of the above

37. When STARTING your PA training program, did you have an interest in choosing to…

	Strongly Disagree	Disagree	No opinion or uncertain	Agree	Strongly Agree
Work in a primary care specialty					
Work in rural medical practice					
Live in a rural community					
Practice in a medically underserved area					
Practice in Indiana					

38. At the COMPLETION of your PA training program, did you have an interest in choosing to…

	Strongly Disagree	Disagree	No opinion or uncertain	Agree	Strongly Agree
Work in a primary care specialty					
Work in rural medical practice					
Live in a rural community					
Practice in a medically underserved area					
Practice in Indiana					

39. Did you apply or receive a National Health Service Corps Scholarship?

Yes
No

40. Which of the following best describes your educational debt following PA school?

None
Less than most
Average
More than most

41. Which factor had the most influence on your choice of your …

INITIAL Practice Location
CURRENT practice Location

Affordability
Availability of medical liability coverage
Compensation
Specialty
Patient population
Personal reasons
Spouse / Significant other preference
Supervising physician
This is the only offer I received

42. Regarding your recruitment experience:

When did you receive your first job offer to work as a PA?
When were you recruited to what was to become your initial job as a PA?

Before the start of PA school
After the start of school but more than 6 months prior to graduation
3 to 6 months prior to graduation
1 to less than 3 months prior to graduation
Less than 1 month prior to graduation
Less than 1 month after graduation
1 to less than 3 months after graduation
3 to 6 months after graduation
More than 6 months after graduation

43. Was the offer you accepted for your initial job, directly or indirectly, a result of having completed a clinical rotation with the preceptor or at that site?

Yes
No

44. Sex:

Female
Male

45. Year of Birth

YYYY

46. I was _____ years old at the time of my graduation from my PA program.

47. I describe myself as: (Please select one)

Black
American Indian
Asian
White
Alaskan
Hawaiian
Hispanic
Multi-ethnic

References

Accreditation Review Commission on the Education for the Physician Assistant. (2010, September 1). Accreditation Standards for Physician Assistant Education, 4th ed. Retrieved from arc-pa.org.

American Academy of Family Physicians. (n.d.). Choosing family medicine. Retrieved from aafp.org/medical-school-residency/choosing-fm/value-scope.html.

American Academy of Pediatrics. (n.d.). Home page. Retrieved from aap.org.

American Academy of Physician Assistants (2011). State law issues: the six key elements of a modern PA practice act. Retrieved from aapa.org/workarea/downloadasset.aspx?id=628.

American Academy of Physician Assistants (2014). Chart: key elements of state PA laws. Retrieved from aapa.org/the_pa_profession/federal_and_state_affairs/resources/item.aspx?id=760.

American Academy of Physician Assistants. (n.d.). Frequently asked questions. Retrieved from aapa.org.

American Association of Colleges of Osteopathic Medicine. (n.d.). Frequently asked questions. Retrieved from aacom.org.

American Board of Obstetricians/Gynecologists. (n.d.). Home page. Retrieved from acog.org.

American College of Medicine. (n.d.). Medical career paths. Retrieved from acponline.org/medical_students/career_paths.

Bennett, K., & Phillips, J. (2010). Finding, recruiting, and sustaining the future primary care physician workforce: a new theoretical model of specialty choice process. *Academic Medicine*, 85: S81-S88.

Bellinger, N. (2009). Predictors of primary care physicians practicing in medically underserved and rural areas of Indiana. (Unpublished master's thesis). Indianapolis, IN: Indiana University.

Brock, D., Wick, K., Evans, T., & Gianola, F. (2011). The physician assistant profession and military veterans. *Mil Med*, 176: 197-203.

Cawley, J., & Jones, P. (2013). Institutional sponsorship, student debt, and specialty choice in physician assistant education. *J Physician Assist Educ*, 24(4): 4-8.

Centers for Disease Control and Prevention (2012). Behavioral Risk Factor Surveillance System Prevalence and Trends Data All States-2012. Retrieved from apps.nccd.cdc.gov/brfss/page.asp?yr=2012&state=All.

Chan, B., Degani, N., Crichton, T., Pong, R., Rourke, J., Goertzen, J., & McCready, B. (2005). Factors influencing family physicians to enter rural practice. *Can Fam Physician*, 51: 1246-1247.

Coombs, J., Morgan, P., Pedersen, D., & Alder S. (2011). Factors associated with physician assistant practice in rural and primary care in Utah. *Int J Family Med*, Article ID 879036, doi:10.1155/2011/879036.

Coplan, B., Cawley, J., & Stoeher J. (2013). Physician assistant in primary care: trends and characteristics. *Ann Fam Med*, 11(1): 75-79.

Curran, V., & Rourke, J. (2004). The role of medical education in the recruitment and retention of rural physicians. *Med Teach*, 26(3): 265-272.

Daniels, Z., VanLeit, B., Skipper, B., Sanders, M., & Rhyne, R. (2007). Factors in recruiting and retaining health professionals for rural practice. *Nat Rur Hlth Assoc*, 23(1): 62-71.

Dehn, R. (2006). The distribution of physicians, advanced practice nurses and physician assistants in Iowa. *J Physician Assist Educ*, 17(1): 36-38.

Diemer, D., Nehrenz, G., & Larson H. (2012). Factors that influence physician assistant program graduates to choose rural medicine practice. *J Physician Assist Educ*, 23(1): 28-32.

Dill, J., Pankow, S., Erikson, C., & Shipman, S. (2013). Survey shows consumers open to a greater role for physician assistants and nurse practitioners. *Health Aff*, 32(6): 1135-1142.

Doescher, M.P., Fordyce, M.A., & Skillman, S.M. (2009). The aging of the primary care physician workforce: are rural locations vulnerable? WWAMI Rural Health Research Center, University of Washington, Department of Family Medicine. Seattle, WA: University of Washington (in press).

Duryea, W., & Hooker, R. (2000). Elder physician assistants and their practices. *JAAPA*, 13(4): 67-85.

Easterbrook, M., Godwin, M., Wilson, R., Hodgetts, G., Brown, G., Pong, R., & Najgebauer, E. (1999). Rural background and clinical rural rotations during medical training: effect on practice location. *CMAJ*, 160: 1159-1163.

Essary, A., & Coplan, B. (2014). Ethics, equity, and economics: a primer on women in medicine. *JAAPA*, 27(5): 35-38.

Fagan, E., Finnegan, M., Bazemore, A., Gibbons, C., & Petterson, S. (2013). Migration after family medicine residency: 56% of graduates practice within 100 miles of training. *American Family Physician*, 88(10): 704.

Glicken, A. (2014) Physician assistant profile tool provides comprehensive new source of PA workforce data. *JAAPA,* 27(2): 47-49.

Gonzalez-Colaso, R., Moloney-Johns, A., & Sivahop, J. (2013) To teach or not to teach: 2011 national survey of physician assistants and preceptor experiences. *J Physician Assist Educ*, 24(2); 12-19.

Grumbach, K., & Bodenheimer, T. (2004). Can health care teams improve primary care practice? *JAMA*, 291(10): 1246-1251.

Grumbach, K., Hart, G., Mertz, E., Coffman, J., & Palazzo, L. (2003). Who is caring for the underserved? A comparison of primary care physicians and nonphysician clinicians in California and Washington. *Ann Fam Med,* 1(2): 97-104.

Hart, G., Muus, K., & Pan, S. (1996). Predicting the degree of rurality of physician assistant practice location. *Hospital & Health Services Administration. Business Insights: Essentials*. Retrieved from bi.galegroup.com/essentials/article/GALE%7CA18021809/00875922994d33b0dfb137937d8d053b.

Health Professions Nursing Education Coalitions (2014). Title VII and Title VIII health professions programs fiscal year 2015 funding. Retrieved from aamc.org/advocacy/hpnec/fy15pres.pdf.

Health Resources and Services Administration. (n.d.). Medically underserved areas. Retrieved from muafind.hrsa.gov.

Healthy People 2020. (2013, April 10). Access to Health Services. Retrieved from healthypeople.gov/2020/topicsobjectives2020/overview.aspx?topicid=1.

Hyer J., Bazemore, A., Bowman, R., Zhang, X., Petterson S., & Phillips, R. (2007). Rural origins and choosing family medicine predict future rural practice. Robert Graham Center: Policy Studies in Family Medicine and Primary Care. Washington, DC: Robert Graham Center.

Indiana Academy of Physician Assistants. Chronology of Indiana physician assistant legislative and regulatory action. Retrieved from www.indianapas.org/Resources/Documents/INPAHistory0808.pdf.

Indiana Area Health Education Center. (2014). About Indiana AHEC. Retrieved from ahec.iupui.edu/about-us-what-the-heck-is-ahec.

Indiana Office of Community and Rural Affairs. (2005). Breaking the boundaries: Strategic plan for rural Indiana. Retrieved from in.gov/ocra/files/Breaking_the_Boundaries.pdf.

Indiana Professional Licensing Association. (n.d.). Home page. Retrieved from in.gov/pla.

Indiana State Department of Health. (2011). Primary care health professional shortage areas. Retrieved from in.gov/isdh/files/hpsa_0311.pdf.

Indiana State Department of Health. (2013). Medically underserved areas. Retrieved from in.gov/isdh/files/mua_0712.pdf.

Indiana State Rural Health Plan. (2011). Affiliated Service Providers of Indiana. Retrieved from in.gov/isdh/files/IndianaStateRuralHealthPlan2011final.pdf.

Institute of Medicine. (2012). Living well with chronic disease: a call for public health action. Retrieved from iom.edu/Reports/2012/Living-Well-with-Chronic-Illness.aspx.

Indiana University School of Medicine. (2014). History. Retrieved from medicine.iu.edu/about.

Jones, P. (2008). Doctor and physician assistant distribution in rural and remote Texas counties. *Australian Journal of Rural Health, 16*(6), 389.

Kaiser Family Foundation. State Health Facts. Retrieved from kff.org/other/state-indicator/infant-death-rate/?state=in.

Knickman, J., & Snell, E. (2002). The 2030 problem: caring for aging baby boomers. *Health Serv Res*, 37(4): 849-884.

Larson, E., & Hart, L. (2007). Growth and change in the physician assistant workforce in the United States, 1967-2007. *J. Allied Health*, 36(3): 121-130.

Larson, E., Hart, G., Goodwin, M., Geller, J., & Andrilla, C. (1999). Dimensions of Retention: A National Study of the Locational Histories of Physician Assistants. *J Rural Health*, 15(4): 391-402.

Laven, G., & Wilkinson, D. (2003). Rural doctors and rural backgrounds: how strong is the evidence? A systematic review. *Aust J Rural Health*, 11(6): 277-84.

Lewis, C., Scheff, Z., Zollinger, T., & Allen, D. (2012) 2012 Indiana primary care clinician workforce report. The Indiana Center for Health Workforce Studies, Indiana University

School of Medicine, Department of Family Medicine Bowen Research Center. Indianapolis, IN: Indiana University.

Lewis, C., Scheff, Z., Allen, D., & Zollinger, T. (2013). 2011 Indiana Physician Licensure Survey Report. The Indiana Center for Health Workforce Studies, Indiana University School of Medicine, Department of Family Medicine, Bowen Research Center. Indianapolis, IN: Indiana University.

Marian University (2013). Osteopathic Medical School. Retrieved from marian.edu/osteopathic-medical-school.

Martin, K. (2000). A rural-urban comparison of patterns of physician assistant practice. *JAAPA*, 13(7): 49-58.

McKeag, D., Zollinger, T., Allen, D., Przybylski, M., Holloway, A., & Kochhar, K. (2007) [Issue Brief] Indiana's health professions workforce shortages and mal-distribution. Workforce and Workforce Development Subcommittee of the Indiana University Health Care Reform Study Group. Indiana University School of Medicine, Department of Family Medicine, Bowen Research Center. Indianapolis, IN: Indiana University.

Medical Licensing Board of Indiana, Title 822, Article 2.2 (2014).

Merritt Hawkins. (2011). 2011 survey of final-year medical residents. Irving, TX: AMN Healthcare.

Morgan, P., & Hooker, R. (2010). Choice of specialties among physician assistants in the United States. *Health Affair,* 29(5): 887-897.

Muma, R., Kelley, J., & Lies, S. (2010). Relationships of demographic background and practice setting among practicing physician assistants in the United States. *J Physician Assist Educ*, 21(2): 15-21.

National Commission on Certification of Physician Assistants. (2014). 2014 NCCPA survey: consumer attitudes on health care. Johns Creek, GA: NCCPA.

National Health Services Corps. (n.d.). Home page. Retrieved from nhsc.hrsa.gov/corpsexperience.

Petterson, S., Liaw, W., Phillips, R., Rabin, D., Meyers, D., & Bazemore, A. (2012). Projecting US primary care physician workforce needs: 2010-2025. *Ann Fam Med* 10: 503-509.

Pew Hispanic Center. (2011). Unauthorized immigrant population: national and state trends, 2010. Retrieved from pewhispanic.org/files/reports/133.pdf#page=24.

Physician Assistant Education Association. (n.d.). Home page. Retrieved from paeaonline.org.

Physician Assistant Education Association. (2014). Twenty-eighth annual report on physician assistant educational programs in the United States, 2011-2012. PAEA Alexandria, VA.

Rabinowitz H., Diamond, J., Markham, F., & Paynter, N. (2001). Critical factors for designing programs to increase the supply and retention of rural primary care physicians. *JAMA*, 286(9): 1041-1048.

Rabinowitz, H., Diamond, J., Markham, F., & Santana, A. (2013). Retention of rural family physicians after 20-25 years: outcomes of a comprehensive medical school rural program. *JABFM*, 26(1): 24-27.

Ricketts, T., & Randolph, R. (2009). The diffusion of physicians. *Health Affairs*, 27(5): 1409-1415.

Robert Graham Center, The. (2013). Primary care physician mapper. Retrieved from medschoolmapper.org.

Royston, P., Mathieson, K., Leafman, J., & Ojan-Sheehan, O. (2012). Medical student characteristics predictive of intent for rural practice. *Rural and Remote Health,* 12(2107), 1-20.

Ruff, C., Gray, J., Arthur, M., & Merenstein, G. (2006). Development and outcomes of a rural track within a primary care physician assistant program. *J Phys Ass Edu*, 17(4): 37-41.

Sargen, M., Hooker, R., & Cooper R. (2011). Gaps in the supply of physicians, advance practice nurses, and physician assistants. *J Am Coll Surg*, 212(6): 991-999.

Scheff, Z., Zollinger, T., Barclay, J., Allen, D., & Banti, S. (2014). 2012 Indiana physician assistant licensure survey report. The Indiana Center for Health Workforce Studies, Indiana University School of Medicine, Department of Family Medicine, Bowen Research Center. Indianapolis, IN: Indiana University.

Shannon, C., & Jackson, J. (2011). A study of predictive validity of physician assistant students' reported practice site intent. *J Physician Assist Educ*, 22(3): 29-32.

Smith, B., Muma, R., Burks, L., & Muck Lavoie M. (2012). Factors that influence physician assistant choice of practice location. *JAAPA*, 25(3): 46-51.

Snyder, J., Zorn, J., Gjerde, T., Burkhart, J., & Rosebrock, L. (2011). The physician assistant workforce in Indiana: preparing to meet future health care needs. *JAAPA*, 24(12): 50-57.

Staton, F., Bhosle, M., Camacho, F., Feldman, S., & Balkrishnan, R. (2007). How PAs improve access to care for the underserved. *JAAPA*, 20(6): 32-40.

Thompson, M., Huntington, M., Hunt, D., Pinsky, L., & Brodie, J. (2003). Educational effects of international health electives on U.S. and Canadian medical students and residents: a literature review. *Acad Med*, 78(3): 342-347.

United States Census Bureau, 2010. Census interactive population search. Retrieved from census.gov/2010census/popmap/ipmtext.php?fl=18.

United States Census Bureau. State and county quickfacts. Information retrieved from quickfacts.census.gov/qfd/states/18000.html.

United States Department of Agriculture. (n.d.). Rural Urban Continuum Code. Retrieved from ers.usda.gov/data-products/rural-urban-continuum-codes.aspx.

United States Department of Agriculture. (n.d.). "What is rural?" Retrieved from ers.usda.gov/topics/rural-economy-population/rural-classifications/what-is-rural.aspx.

Van Dis, J. (2002). Where we live: Health care in rural vs urban America. *JAMA*, 287: 108.

Wade, M., Brokaw, J., Zollinger, T., Wilson, J., Springer, J., Deal, D., White, G., Barclay, J., & Holloway, A. (2007). Influence of hometown on family physicians' choice to practice in rural settings. *Family Med*, 39(4): 248-254.

Whitcomb M., & Cohen, J. (2004). The future of primary care medicine. *N Engl J Med*, 351: 710-712.

Xierali, I., Sweeney, S., Phillips, R., Bazemore, A., & Petterson, S. (2012). Enhancing physician recruitment for rural hospitals. *J Am Board Fam Med*, 25(1): 7-8.

Youngclaus, J., Koehler, P., Kotlikoff, L., & Wlecha, J. (2013). Can medical students afford to choose primary care? An economic analysis of physician education debt repayment. *Acad Med*, 88; 16-25.

Youtsey J., & Bock W. (1975). Utilization of the physician's assistant in Indiana. *J Indiana State Med Assoc*, 68(7): 639-641.

Zinberg, J. (2011). When Patients Call, Will Physicians Respond? *JAMA*, 305(19): 2011-2012.