A LONGITUDINAL STUDY OF PRE-PHYSICIAN ASSISTANT LIFE EXPERIENCES AS PREDICTORS OF WORKING IN PRIMARY CARE

by

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ABSTRACT OF THE DISSERTATION

A Longitudinal Study of Pre-Physician Assistant
Life Experiences as Predictors of Working in Primary Care

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There is a shortage of primary care physicians (PCPs) in the United States, disproportionately affecting urban and rural communities. Access to primary care services can improve individual health outcomes and reduce healthcare spending. Physician assistants (PAs) and nurse practitioners (NPs) are identified as potential solutions to this shortage; however, the number of PAs working in primary care is decreasing. PA workforce literature suggests that there are certain characteristics that may influence a PA's desire to work in primary care including a sense of mission and desire to work with a community long-term, attributes the literature suggests that for some are likely formed in the pre-PA school period. An exploratory longitudinal study design of secondary data was used in this study to identify which pre-PA school experiences, as reported on the Central Application for Physician Assistants (CASPA), influence the PA's initial specialty. Specific indicators include social, environmental, economic, academic, and work history, exposure to primary care, and health related volunteer work in underserved communities. Multinomial logistic regression models were used to test each hypothesis. The results demonstrate that the pre-PA school lived

experience, such as those influenced by race, gender, identifying as economically or educationally disadvantaged, growing up in health professional shortage area/ medically underserved area, and being from the first generation to attend college, are most influential on initial specialty selection. Chosen experience, such as those represented by the PA's academic course of study, grade point average, work experience, exposure to primary care, and volunteer work do not appear to have a significant association with initial specialty. The results of this study can help PA programs identify which applicants are most likely to work in primary care in order to help close the primary care clinician gap.

Acknowledgment

"As each has received a gift, use it to serve one another, as good stewards of God's varied grace" (1 Peter 4:10, ESV).

From my earliest encounter with the Urban Systems, Urban Health faculty, it was made clear to that the goal of the program was to train scholar-advocates and that upon graduation, we were expected to use our newly acquired knowledge and skills to advocate for evidence-based solutions that reduce health disparities faced by the most vulnerable populations. I am grateful for the opportunity to work with scholars who have thoughtfully molded me into the person I am today. I am now prepared to take on my new role as a scholar-advocate.

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Dedication

To Jenna, Leo, and Rose. Thank you for your love, support, kindness, and patience. The journey was made whole because you were a part of it.

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Glossary of Terms

AAPA	American Academy of Physician Assistants
ACA	Affordable Care Act
APP	Advanced Practice Provider
ARC-PA	Accreditation Review Commission on Education for the PA
CASPA	Central Application System for Physician Assistants
HRSA	Health Resources and Services Administration
MPH	Master of Public Health
MSS	Matriculated Student Survey
NCCPA	National Commission on Certification of Physician Assistants
NHSC	National Health Service Corps
NP	Nurse Practitioner
NPI	National Provider Identifier
OTP	Optimal Team Practice
PA	Physician Assistant
PAEA	Physician Assistant Education Association
PANCE	Physician Assistant National Certification Exam
RUPAP	Rutgers Physician Assistant Program

Chapter 1: Introduction

Research Problem

A primary care physician (PCP) shortage exists in the United States, and with the expansion of health insurance coverage under the Affordable Care Act (ACA), the shortage is expected to grow. Furthermore, underserved communities are disproportionately affected by the physician shortage, and recruitment and retention of PCPs is a challenge (Department of Health and Human Services [DHHS], 2016). Physician assistants (PAs) are often identified as a potential solution to the PCP shortage; however, workforce trends show that PAs, like their physician counterparts, are increasingly working in medical and surgical specialties (Smith, 2017). Therefore, it is crucial to identify the determinants that influence the selection of primary care as a specialty for PAs. By identifying these factors, a profile of applicants most likely to work in primary care can be developed. Furthermore, students with a high likelihood of working in primary care can be recruited and educational strategies can be implemented to support those students who are most likely to pursue a career in primary care and reduce the primary care clinician shortage.

Overview of the PCP Shortage

Primary care is the field of medicine that addresses health promotion, disease prevention, patient education, and the management of acute and chronic diseases. Primary care providers are the first point of entry into the healthcare system for many patients and may serve as a patient's "medical home." Primary care services have been traditionally provided by physicians, PAs, and NPs who practice family medicine, outpatient internal medicine, and general pediatrics (American Academy of Family

Physicians, n.d.). Other organizations, such as the Health Resources and Services Administration (HRSA), include outpatient obstetrics and gynecology and outpatient psychiatry as clinicians who provide primary care services. Regular access to primary healthcare services, particularly for those who require ongoing chronic disease management, can contribute to improved health outcomes as well as lower overall healthcare costs by decreasing preventable emergency room visits as well as reducing hospital admissions (Bazemore et al., 2015; Starfield et al., 2005).

The PCP shortage in the United States was initially recognized in the 1960s as physicians began to migrate out of primary care and into medical specialties (Hooker, Cawley, Asprey, 2010). Shi and Singh (2019) suggested that the hyper-specialization of clinicians within the United States healthcare system has led to the devaluation of the role of the primary care provider (PCP) in the United States and increased emphasis on specialized care in large tertiary academic centers. The fee for service model of clinician reimbursement for services further incentivizes specialization with greater reimbursement payments and prestige given to specialists and interventionalists rather than prevention and primary care (Gold & Park, 2016).

In a landmark study, the DHHS (2016) projected that by 2025 there will be a 23,000 PCP shortage. This shortage can be attributed not only to a decreasing supply of PCPs, but increased demand for primary care services as well. Increased demand is created by both an aging United States population as well as the full implementation of the ACA that, included provisions to expand coverage for primary care services. As a result of expanded access, HRSA projects the PCP shortage will disproportionally impact already underserved communities. One proposed solution to the PCP problem is the

expanded use of PAs and NPs in primary care settings to help mitigate the shortage. While NPs have maintained a steady presence in primary care specialties, PAs are increasingly working in medical and surgical specialties at a rate comparable with their physician counterparts (Smith, 2017).

Overview of the PA Profession

A PA is a healthcare professional that practices medicine in collaboration with a physician. A PA may: (a) obtain medical histories; (b) conduct physical exams; (c) order, and interpret lab work, imaging, and other diagnostic studies; (d) develop treatments plans; (e) prescribe medication; and (f) assist in surgery. PAs practice in all fields of medicine and are licensed to practice in all 50 states (American Academy of Physician Assistants [AAPA], n.d.). The PA profession was established in 1965 to help address the emerging PCP shortage. The first PAs were returning Navy corpsmen from the Vietnam War. The rationale and justification of developing the PA profession was the need for highly skilled professionals to deliver generalist care, especially in rural and underserved areas. The first PAs worked closely with physicians and other members of the healthcare team to provide high quality primary care; however, the role of PAs soon expanded to work in many fields of medicine when demand for specialty services exceeded supply of clinicians (Hooker, Cawley, Asprey, 2010).

Overview of PA Education

The entry level degree for a PA is a master's degree. The length of PA programs ranges from 24–33 months, with an average of 27 months. There are two phases of training, the didactic phase and the clinical phase. Upon completion of PA school, PAs must pass a national certifying exam, the PA National Certifying Exam administered by

the National Commission on Certification of Physician Assistants (NCCPA; AAPA, n.d.).

PAs are trained in a generalist medical model. The medical model of clinician education is the same as the physician educational model that places a heavy emphasis on the biological sciences in preparation for clinical practice. Generalist training means that PAs are trained to work in any field of medicine without formal graduate medical specialty training requirements prior to clinical practice. There is an expectation that PAs will learn specialty specific skills on the job. The generalist medical model allows PAs to obtain further skills with experience and freely change specialties without additional formal training (AAPA, n.d.).

Specialty flexibility, sometimes referred to as "lateral mobility," contrasts with the framework of practice in which physicians and NPs work. Physicians and NPs are only able to practice in the specialty in which they were formally trained. Recently, PA residencies and fellowships have been developed for those seeking additional postgraduate training, but these are not required for practice (Association of Post Graduate PA Programs, 2018). Certificates of additional qualifications are now optional certifications that PAs can receive in certain specialties recognizing "expertise" in these fields, but they are not required for practice (NCCPA, n.d.). The PA model of lateral mobility is intended to allow PAs to be flexible to meet evolving demands of the healthcare system.

Legal Framework for PA Practice

Laws governing PA practice are established on the state level by either the state's medical board or in some states, a separate PA board. As a result, the scope of practice of

a PA varies by state. The language that is used to describe PA practice has evolved over the last several years. Depending on the language used in state legislation, PAs practice medicine "under the supervision of" or "in collaboration with" a physician. In many states, PAs and physicians enter into a practice agreement by which the PA has their scope of practice delegated by the physician within the limits of state law. A PA's scope of practice is limited to tasks that their supervising physician has been trained to do (AAPA, n.d.). As a hypothetical example, if state law did not allow a PA to write prescriptions for opioids, a physician could not delegate this responsibility even if this were something they had been trained to do. On the other hand, a physician could limit a PA's scope to a narrower scope than prescribed by state law if they choose to do so. Again, if state law allows PAs to write prescriptions for opioids, but a physician did not want the PA to carry out this task, the scope of practice could be limited on a local level.

In 2017, the AAPA established a framework to guide the modernization of the PA profession known as Optimal Team Practice (OTP). The OTP framework has been a catalyst for many recent changes in state scope of practice laws reducing the administrative barriers to PA practice. The OTP framework advocates for laws that permit PAs to establish a collaborative relationship with a physician and develop a scope of practice at the practice level that is based upon the PAs experience and training rather than having to work within a general scope of practice outlined on a state level (AAPA, 2017). The concept of OTP is operationalized through the 6 Key Elements to a Modern PA Act (AAPA, 2016). The key elements state that states should:

1. Accept licensure as the regulatory term for PAs, not simply certified or registered;
2. issue full prescriptive authority to PAs;

3. allow for scope of practice determinations for PAs to occur at the practice level and not the state level;
4. allow for adaptable collaboration requirements;
5. allow chart co-signature requirements to be determined at the practice levels;
6. allow for the number of PAs with whom a physician can collaborate to be determined at the practice level.

According to AAPA (2020), as of September 2020, there are only eight states that have incorporated all six elements into their PA statutes.

Reimbursement for Clinical Services Provided by PAs

Reimbursement of services provided by PAs vary by state and by insurer. It is difficult to summarize reimbursement guidelines for private insurers as each is different. What can be summarized are the regulations regarding reimbursement of PA services by Medicare and Medicaid that often serves as a framework for private insurers (AAPA, 2018).

National provider numbers (NPI) are unique identifiers for clinicians and are used to track services provided. PAs billing Medicare for services using their own NPI receive 85% of the rate a physician would receive for the same service. Services provided by a PA may be reimbursed at 100% of the physician rate if certain conditions, known as the "incidence to" conditions, are met. The first requirement is that the bill is submitted under the physician's, and not the PA's, NPI number. The second condition requires a physician to be the first person to see the patient for a given problem and be physically present in the same location as the PA when the PA conducts all follow-up visits for that condition. The third condition is that when managing chronic diseases, such as diabetes, a physician

must periodically see the patient. The restrictions imposed by the “incidence to” rules often result in either the PA billing for services using their own NPI number, and the practice receiving a lower reimbursement rate, or billing for services using the physician’s NPI, making it challenging for practices to see the economic value of PA services because the revenue is credited to the physician. The “incidence to” regulation also creates more administrative work for physicians who must directly supervise the work of the PA to receive full reimbursement for the PA’s visit.

Primary care practices generally have large geriatric populations, the largest population insured by Medicare. Because PAs are reimbursed at a lower rate than physicians conducting the same visit, or physicians are credited for the revenue generated by PAs, this could be an issue for how employable PAs are in primary care practices that have a large Medicare population. Recommendations by the Medicare Payment Advisory Commission in 2019 sought to remove the “incident to” regulations preventing PAs from billing at the full rate for services they provided under their own NPI number. The recommendation sought to remove the administrative burden for physicians to meet the administrative requirements needed for a practice to receive full reimbursement for services provided. By eliminating the “incident to” administrative requirements, there may be a greater incentive to higher PAs in the primary care setting further improving access to primary care services (Medicare Payment Advisory Commission, 2019).

Medicaid by contrast is a state-based program and reimbursement policies are set at the state level. All states reimburse services provided by PAs to patients enrolled in a managed Medicaid plan. In classic Medicaid programs, reimbursement for PA services varies by state. Some states require PAs to bill using their own NPI number and some

require the PA to bill using the physician's NPI. Reimbursement for PA services in some states is at the physician rate and some are at a lower rate. This again may be a barrier for practices with large Medicaid populations, particularly in rural and urban areas where the physician shortage is highest, to hire PAs.

PA Primary Care Workforce

The percentage of PAs working in primary care has been on the decline. According to the 2017 AAPA census data, in 1995 almost 50% of PAs practiced in primary care; however, in 2016 only 24.6% of PAs worked in primary care (Smith, 2017). This data supports the conclusion that PAs are increasingly working in medical and surgical specialties, and less in primary care, as is the case with physicians. Additionally, primary care is the specialty with the highest attrition rate. Hooker, Cawley, and Leinweber (2010) found that nearly 50% of PAs changed specialties at least once in their career, and that the specialty with the highest attrition rate was primary care.

In an attempt to understand predictors of those working in primary care, a landmark PA primary care workforce study was conducted by Muma et al. (2010) who found a significant correlation between identifying as a minority and working in primary care as well as growing up in a home with an income of less than $50,000 and working in primary care. In a follow-up study, Coplan et al. (2013) demonstrated more specifically that demographic factors such as identifying as female, Hispanic, and being married were associated with working in primary care. These studies are important because they were among the first in the PA literature to demonstrate the impact of the pre-PA school experience on specialty selection. Additionally, the results of these studies showed similar trends to those in the physician workforce literature which also suggests that

identifying as a minority and being from a low SES is associated with working in primary care, specifically in minority communities (Keith et al., 1985; Komaromy et al., 1996).

Based on these findings, one may conclude that there simply needs to be more minorities, women, and individuals from a lower SES if there is to be a robust primary care workforce. However, not all women, minorities, and those from underserved areas go into primary care. Therefore, it is important to explore other factors that influence specialty selection to gain a better understanding of who is most likely to work in primary care.

While the literature that describes the choice process for PAs working in PC is limited, the physician literature is more robust. In their qualitative analysis of the literature describing physician specialty selection, Bennett and Phillips (2010) described the themes that emerged as most influential during the specialty selection process for medical students. These include demographics/ predisposition, the medical school curriculum, student interest in a specialty, personal identity, the healthcare environment, and lifestyle/ financial considerations. The authors suggested that for those medical students who are either primary care committed or have a positive perspective of primary care may be predisposed to this interest secondary to their pre-medical school experiences.

Justification of Approach

Most of the studies that explored the association between independent variables and practice specialty have been either retrospective and based on survey data of practicing PAs asked to recall their mindset and factors influencing their initial job selection process or surveys of PA students asked about factors influencing their future

intention to work in a specialty. Secondary data analyses have also been conducted; however, many of the samples used to obtain the data are likely not representative of the PA profession secondary to sampling biases.

In this study, I sought to construct a comprehensive record of the pre-PA school experience without the limitation of recall bias. The Central Application Service for Physician Assistants (CASPA) is the common application used by most PA programs for admission. The CASPA application consists of several sections that contain an in-depth record of a PA's pre-PA school experience. The record includes personal demographics, socioeconomic demographics, and family demographics (income and parent's profession), etc. Additionally, the application includes the PA's academic history, prior work experience, healthcare related work, patient care experience (PCE), PA shadowing history, and volunteer work; many of the pre-PA school experiences left unaddressed in the literature that may predict initial specialty selection. The use of CASPA data to study pre-PA school predictors of working in primary care eliminates bias associated with recall as the practicing PA does not need to recall details of experiences that happened many years prior to accepting their first job. By identifying the pre-PA school experiences reported through CASPA that may be most predictive of working in primary care, PA programs can better identify who is most likely to work in PC and support them through their PA school experience and best prepare them for primary care practice.

Theoretical Model

The primary care pipeline consists of those who are committed to working in primary care, have a positive perspective of working in primary care, and those who are undecided, but will eventually work in primary care (Bennett & Phillips, 2010). While

Bennett and Phillips identified several domains that influence specialty selection for physicians, for those who are either committed to working in primary care or have a positive perspective of working in primary care, the pre-medical school curriculum seems to be an influential period for forming this predisposition.

The PA primary care workforce literature also seems to suggest several demographics variables associated with working in primary care including race/ ethnicity (Hispanic), gender (female), and from a low SES (Coplan et al., 2013; Larson & Frogner, 2019; Muma et al., 2010). Furthermore, PAs who work in primary care report a desire to form a connection with their patients, want to make a difference in their community, and desire long-term relationships with their patients which are all characteristics that can be hypothesized to be formed (at least somewhat) prior to PA school (Halasy et al., 2012). Furthermore, certain pre-PA school experiences may predispose those in the primary care pipeline to having the positive perception of the role primary care plays for both individual patients and the role within the healthcare system that primary care has (Wright & Orcutt, 2011).

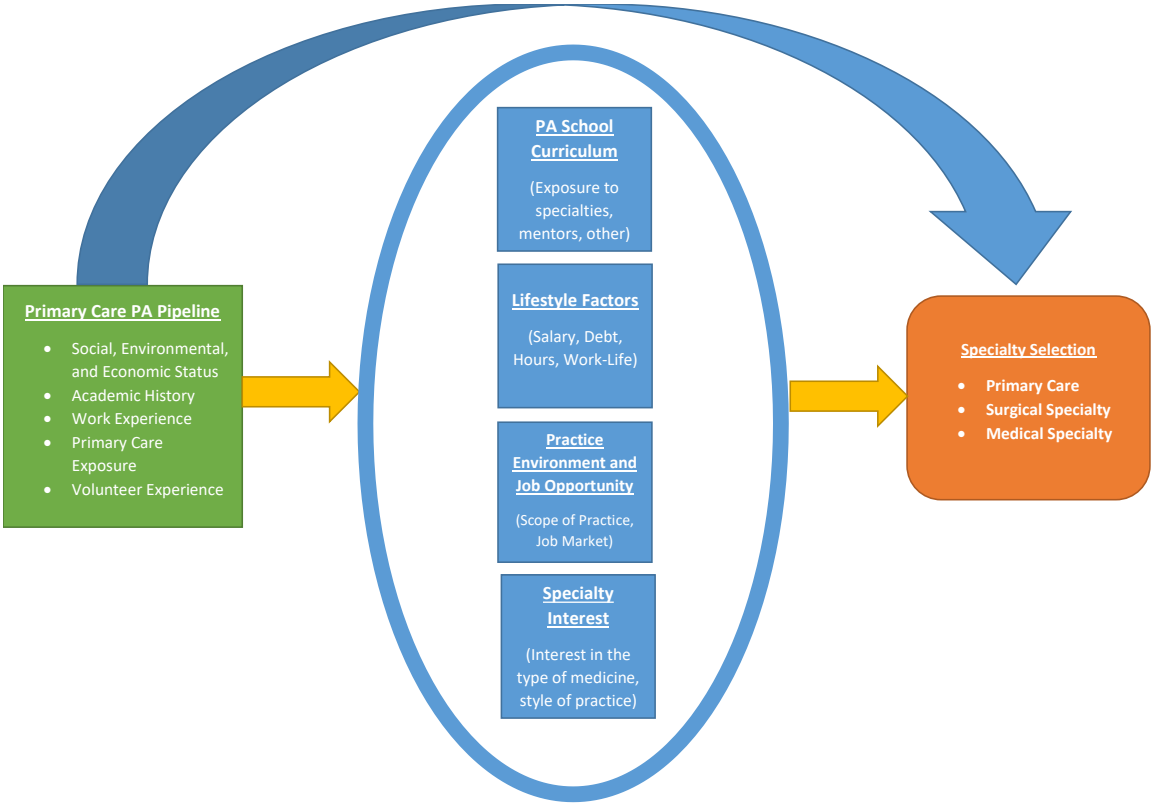
The literature also seems to suggest that the PA school curriculum and salary differential, two other domains in the Bennett and Phillips model, have little to do with initial specialty selection for those who choose to work in primary care and is more influential for those who choose to work in a non-primary care field (Halasy et al., 2012; Snyder, 2014; Twombly et al., 2019). The literature seems to also suggest that scope of practice laws, one measure of the influence of the healthcare system on job opportunities for PAs, may impact the number of job opportunities that are available in primary care

for PAs, but does not adequately describe why PAs are not filling the primary care opportunities that do exist (Hsing & Hsao, 2015; Morgan et al., 2016; Rana et al., 2020).

The theoretical model used in this study can be found in Figure 1. This model is a modified version of Bennett and Phillip's conceptual model that illustrates the importance of the pre-PA school experience for those in the primary care pipeline. The top arrow represents those who are committed to working in primary care and are uninfluenced by the other domains noted by Bennett and Phillips. The arrow through the middle of the diagram represents those who have a positive perception of primary care but may be influenced by factors noted in the Bennett and Phillips model. Furthermore, the model seeks to construct five domains that represent the pre-PA school experience using variables that can be extracted from the CASPA application.

Figure 1

Theoretical Model



Note. Adapted from Bennett & Phillips, 2010

Purpose Statement

There is a PCP shortage in the United States. PAs have been identified as a potential solution to this problem; however, workforce data show that PAs are increasingly working in medical and surgical specialties like physicians. Most PA workforce studies have used a cross-sectional survey and secondary workforce data to identify factors that influence a PA's specialty selection. For those working in primary care, the pre-PA school experience may be a formative period for developing the characteristics most associated with working in primary care. The purpose of this

exploratory study was to identify which pre-PA school experiences are predictive of working in primary care. Variables were collected from the CASPA application, a detailed record of a PA's pre-PA school experiences, to construct a detailed history of the PA's pre-PA school experience. The results of this study will start to describe the subset of PA applicants that may have a predisposition to work in primary care. PA programs can use this information to try to identify candidates who are most likely to be primary care oriented. By doing so, programs can contribute to developing a more robust primary care workforce to improve access to primary care services, particularly in underserved communities.

Research Questions

1. What demographic variables, representing the PA's socioeconomic status, are most predictive of working in primary care, controlling for known predictors such as race/ethnicity and gender?
2. What undergraduate courses of study and GPA are most predictive of working in primary care?
3. Is prior work experience predictive of working in primary care?
4. Is health related, patient care, and shadowing experiences in primary care predictive of working in primary care?
5. Is health related community service with underserved communities predictive of working in primary care?

Chapter 2: Literature Review

There is a PCP shortage disproportionately impacting underserved communities (DHHS, 2016). PAs are among the proposed solution to this problem; however, fewer PAs are working in primary care similar to physicians. It is not clear why fewer PAs are working in primary care, nor is it clear what factors motivate a PA to work in primary care. There is a robust body of literature attempting to address this issue from the physician workforce perspective, and there is a growing body of literature that has begun to address it from the PA perspective.

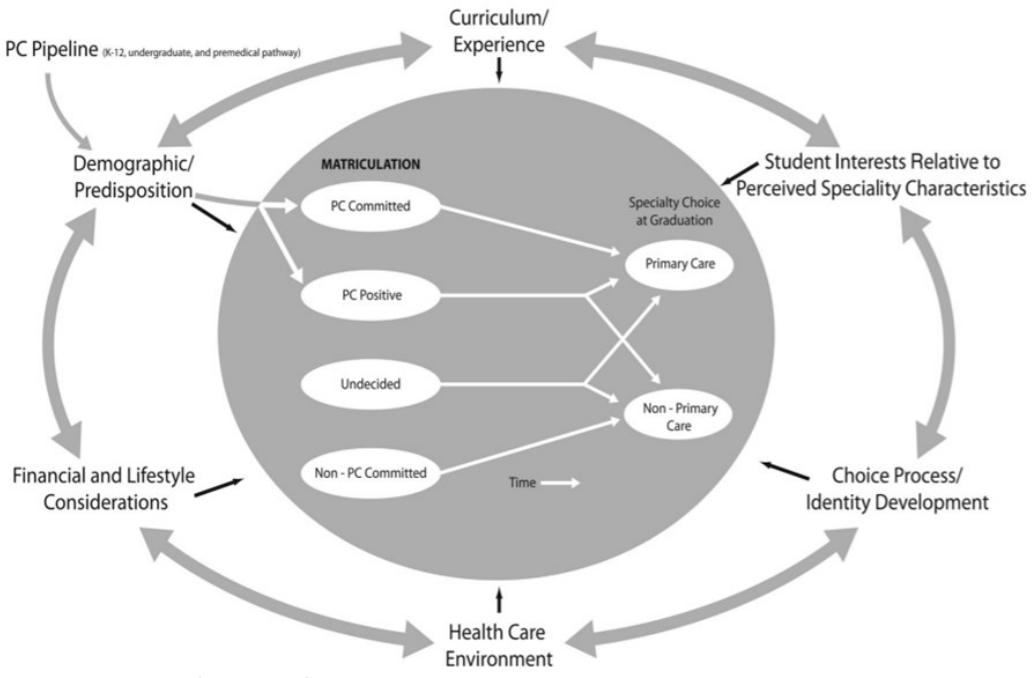
Models for Primary Care Specialty Selection

One of the most comprehensive models that describes the process of physician specialty selection was developed by Bennett and Phillips (2010). Bennett and Phillips conducted a systematic review of physician workforce articles that addressed the factors that influence the medical student specialty selection process, and through a qualitative analysis of the literature, developed their model. The model describes four groups of medical students when they first enter medical school: (a) those who are primary care committed, (b) those who have a positive perspective of primary care, (c) the undecided, and (d) those who are non-primary care committed. Those that are primary care committed enter medical school committed to working in primary care and are not likely to be influenced by the other factors that influence specialty selection. This group differs from the primary care positive students who are open to working in primary care and have a positive view of the specialty but may be influenced by other factors that influence specialty selection. The group of students whom Bennett and Phillips described as primary care committed and primary care positive make up the “primary care pipeline.”

Those outside of those who are primary care committed, namely those who have a positive view of primary care as a specialty, are undecided, or are non-primary care committed (came into school interested in fields that were not primary care), have their specialty selection determined by several distinct, yet interrelated, categories of factors including: (a) the pre-medical school experience, (b) the medical school curriculum and experiences, (c) practice-related factors (such as the healthcare environment and interest in the type of medicine practiced), and (d) personal/lifestyle considerations (including work setting, hours, work-life balance, educational debt, and salary). The model developed by Bennett and Phillips model is visually represented in Figure 2.

Figure 2

Conceptual Model of Factors Influencing Specialty Choice in Medical Students



Note. Reproduced from Bennett & Phillips (2010)

The Bennett and Phillips model has also been used as a framework for investigating the PA student specialty decision making process. Snyder (2014) surveyed practicing PAs in Indiana to try and establish the characteristics of PAs who were most likely to work in primary care or as a rural setting. In the study, Snyder sought to establish relationships between independent variables (IV), based on the factors influencing specialty selection as described in the Bennett and Phillips model, and working in primary care or rural setting.

Among demographics (race, sex, birth location, and age at graduation) only identifying as female was predictive of working in primary care. The geographic location the PA grew up in had a greater association with rural or urban practice, not specialty the PA worked in. This finding is consistent with other studies about geographic location of practice suggesting those who grew up in a rural community were most likely to work in a rural setting (Diemer et al., 2012; Smith et al., 2012). The study found most people decided they wanted to be a PA as an undergraduate, emphasizing the role of the pre-PA experience on career trajectory. Snyder also reported that attending a PA program with a primary care mission and the location of the program (rural versus urban, in a medically underserved area or not) was not associated with working in primary care. Furthermore, most respondents did not feel there was a specific rotation or preceptor that influenced their specialty selection nor practice location (urban/ rural). With regards to finances/ lifestyle, educational debt was found to only influence specialty selection for males, who were more likely to work in higher paying, non-primary care specialties.

Additionally, Snyder used linear modeling to study the predictive relationship between the following IVs and practicing in a rural setting. The IVs included: (a) PA

school rotations in a rural area (PA school experience), (b) interest in rural medicine at completion of rotations (PA school experience), (c) interest in rural practice at start of education (pre-PA school experience), (d) prior PA visits to a low SES area (pre-PA school experience), and (e) international clinical rotation (PA school experience). As mentioned, the only significant variable in the model that predicted rural practice was having a clinical rotation in a rural area; however, this outcome was not specialty specific. In conclusion, Snyder's study suggests that the domains constructed by Bennett and Phillips many not adequately explain location of practice; however, they need further exploration on how they influence specialty selection on a PA's career and suggests that factors such as the PA school curriculum are less influential on those choosing to work in primary care.

Hypotheses for specialization trends in PAs

There is a growing body of literature that sought to identify factors that influence a PA's decision to work in primary care. A review of the literature was completed, and results of existing studies were organized thematically according to the factors identified as influential for medical student specialty selection by Bennett and Phillips (2010). These factors include demographics/pre-PA school experience, lifestyle/financial considerations, student interest in a specialty, the PA school curriculum/experience, healthcare environment, identity, and pre-disposition.

Demographics and the Pre-PA School Experience

Most research investigating the factors that influence initial specialty selection for PAs focused on demographic variables (such as gender, race/ethnicity, and marital status), socioeconomic status (such as childhood family income and geographic area the

PA grew up in), and other Pre-PA school experiences (such as academics and community service). The studies that explored these variables are mostly quantitative with data gathered either by Likert-scale based survey instruments or by secondary data analysis of survey data collected professional organizations such as AAPA and NCCPA.

There are several PA and physician workforce studies that have demonstrated that demographic characteristics such as race/ethnicity (specifically Hispanic and other underrepresented minority (URM) groups), gender (female), age (older than 40 years old), childhood family income (less than $50,000) and marital status (married) are associated with PAs working in primary care (Coplan et al., 2013; Muma, et al., 2010; Snyder, 2014). The results from these studies include both survey data (Muma et al., 2010; Snyder, 2014) and secondary data analysis of the AAPA census (Coplan et al., 2013). While each made substantial contributions to the PA primary care workforce literature, there are some methodological limitations of each. The studies by Muma and Copland each had a low response rate (21% and 27% respectively). Additionally, there are important observations about the survey sample to discuss. Muma et al. surveyed a random sample of PAs from the AAPA database. AAPA membership is elective, and members pay dues to be a part of the organization; therefore, this may limit generalizability of the results. By contrast the AAPA census, as used by Coplan et al., is sent to all PAs and not just AAPA members; however, the response rate is generally low, with only a 27% response rate in 2009. As in all survey data, results are affected by recall bias, especially since some subjects were years removed from graduation.

A later study done by Larson and Frogner (2019) similarly sought to identify a relationship between demographic, educational background, and community service

characteristics of PA students and intention to work in primary care. This study was a secondary data analysis of the PAEA End of Curriculum Survey distributed to all graduating PA students. With a response rate of 64%, data represent a sizable portion of the graduating classes in the years analyzed. This work contributed further to the body of knowledge by noting similar findings to other workforce studies finding that being married as well as Hispanic or Asian were associated with intending to work in primary care. Furthermore, an additional predictor, participating in any community service, whether health related or not, prior to PA school was associated with intending to work in primary care. This finding regarding pre-PA school community service further suggests that there may be experiential factors before someone enters PA school that may explain their interest in primary care. One limitation of the study is that the dependent variable was "intention to practice in primary care." which is not a reliable predictor of actual practice (Shannon & Jackson, 2011).

Lifestyle and Financial

One of the most frequently hypothesized reasons for the observed trend of PAs and physicians increasingly working in medical and surgical specialties is a higher average salary. According to the AAPA Salary Report (2019), the median salary for a PA in primary care is $100,000 (90,000 [25th percentile] – $114,000 [75th percentile]) and for a surgical specialty, it is $110,000 (98,000 [25th percentile] – 125,000 [75th percentile]). Therefore, it is hypothesized that fewer people want to work in primary care because of the pay disparity. To further explore this hypothesis, Halasy et al. (2012) conducted a study to establish the extent that financial compensation impacts specialty selection for PAs. The study was a cross sectional survey of a random sample of

practicing PAs using the NCCPA database. In addition to acquiring demographic information, the survey asked participants to rank, using a Likert scale, how likely each of the items presented influenced their specialty selection. The authors found that for PAs working in medical and surgical specialties, salary was the most influential factor on their decision. Furthermore, PAs working in medical and surgical specialties were also likely to not see primary care as challenging or rewarding. By contrast, PAs working in primary care saw the opportunity to make a difference and the opportunity to establish a long-term relationship with patients as being most influential on their decision. For both groups, a job with a reasonable work-life balance was found to be a significant influence, emphasizing the role of lifestyle in specialty selection regardless of the specialty. This finding is important because while pay was not a top reason for people who chose to go into primary care, it was found that those PAs who work in a medical or surgical specialty felt pay was one of the reasons they did not want to go into primary care.

Closely related to average salary for a given specialty is the possible impact of educational debt on specialty selection. Because of the rising cost to attend PA school and lower average pay for primary care PAs, many, such as Cawley and Hooker (2010) and Wright and Orcutt (2011) suggested that an important tool to recruit more PAs into primary care would be more educational debt relief programs such as the National Health Service Corps (NHSC) or tax incentives for those in primary care. Snyder et al. (2014) came to a similar conclusion after finding that educational debt was a significant factor in specialty selection for men who were also found to be less likely to work in primary care.

Interest in Primary Care

Bennett and Phillips (2010) described those who are committed to or have a positive perspective toward working in primary care as those students who appreciate holistic medical care, enjoy continuity of care, have a sense of service, value relationships, and have a desire to address psychosocial aspects of care. As suggested by Halasy et al. (2012), PAs who select primary care as a specialty have unique professional priorities when selecting a specialty including the opportunity to make a difference and the opportunity to establish a long-term relationship with patients, rather than salary.

Another study that emphasized the importance of the view that a PA has on the role of the primary care provider in the healthcare system when selecting a career was conducted by Wright and Orcutt (2011). The authors conducted a cross-sectional survey of practicing PAs to understand factors that influenced the PA to work in primary care. Factors that emerged included a previous commitment to primary care (such as a NHSC scholarship), a positive perception of the role of primary care in the healthcare system, and a perception that primary care is intellectually challenging.

Long et al. (2016) conducted a qualitative study of internal medicine resident physicians to understand what factors influence their decision to work in primary care. Some of the junior residents had not yet selected their career path, and the outcome being discussed was simply intention to practice. Semi-structured interviews were conducted at multiple residency locations to reduce the likelihood of bias from a single hospital's residency program. The researchers used grounded theory when analyzing the data. Themes that emerged from residents intending to work in primary care were the presence of a mentor in primary care who was not burnt out and a positive perception of the role

PCPs have in patient care. Themes that emerged from residents intending to work outside of primary care include concerns about burnout and a negative image of primary care portrayed by the attending physicians at the residency program. Although this study surveyed physicians and not PAs, the themes that emerged may still be informative. Internal medicine physicians at the end of their residency can choose to work in primary care, hospital medicine, or further specialize in fields such as cardiology, nephrology, etcetera, so like PAs, there is still a variety of fields these physicians can choose to work in so the themes may be valid for PAs as well.

The Bennett and Phillips model implies that a student's intention to practice (such as the case with the primary care committed) is a factor to consider in the specialty selection decision process. Shannon and Jackson (2011) sought to assess the extent to which a PA student could predict their future practice setting. In this study, the authors conducted a secondary data analysis to see if PAs practicing in a rural healthcare setting in West Virginia were able to predict students that would practice in a rural setting. PAs who train in West Virginia, and complete a clinical rotation in rural setting, are invited to complete the WV Rural Health Education Partnership Evaluation. One of the questions on the survey asks the student to rank using a Likert scale how likely they are to work in a rural setting. Using regression models, the authors found a moderate correlation between the student responding that they were either "likely" or "very likely" to work in a rural setting and working in a rural setting. While one of the strengths of this study was that it was longitudinal, a limitation was that only WV PAs were included in this study making the external validity low. Furthermore, the outcome was practice setting (rural versus urban) and not specialty (primary care versus other specialty). Nevertheless, it

does suggest that there are limitations associated with using “intention to practice” as an outcome variable in workforce studies.

Healthcare Environment

Bennett and Phillips (2010) defined the healthcare environment as the practice environment, perceived level of malpractice risk, job opportunities, types of patients they will see, and the professional regulations of a specialty. With respect to specialty selection, job opportunities must be considered. In a recent study, Rana et al. (2020) found that only 19% of PA jobs posted via online job boards were for primary care positions. Reasons why there are fewer primary care job opportunities, despite the shortage in PCPs, focus on two major themes: (a) scope of practice limitations and (b) limited physician profits from the PA.

In the PA literature, most studies that explore the healthcare environment operationalize this in the ways scope of practice laws influence specialty selection. Some hypothesized that the more autonomy a PA has, in other words, the greater their scope of practice, the less barriers to providing primary care services there will be, making it a more appealing specialty to work in. In their study, Hing and Hsiao (2015) tested this hypothesis by seeking to establish a relationship between PAs and NPs working in primary care and PA scope of practice laws. In this study, the authors conducted a cross-sectional secondary data analysis. Using regression modeling, they established that states with the most permissive scope of practice laws (five or six of the sic AAPA Key Elements for Optimal Team Practice) were associated with the greatest number of primary care practices employing either a PA or NP. The authors hypothesized that this relationship is likely to be a result of PAs and NPs having a greater scope of practice and

therefore a lower administrative and supervisory burden for physicians in the practice. This makes it easier for PAs and NPs to provide a wider range of services as well as bill for those services. One limitation of this study is that the outcome variable, secondary to the data available for analysis, only identified if the practice had either a PA or NP but did not distinguish which was present and the number of advanced practice providers (APPs) in the practice. Furthermore, the AAPA Salary Report (2019) also suggests that the median salaries for a given state are tied to scope of practice laws. The report concluded that PAs working in states that have adopted three specific (of the six) elements of a modern PA practice have higher average salaries than states that have not (in all specialties). The elements include: (a) the PA scope of practice is determined on a local level, (b) the states eliminated physician co-signature requirements, and (c) the states allow for an adaptable collaboration agreement. These findings suggest that with fewer administrative barriers, PAs can provide a broader range of healthcare services, the income generated by these services can be attributed to the PA providing them, allow PAs to bring in greater revenue for their practices, and therefore have an objective justification for having a higher salary.

With respect to practice profits, Morgan et al. (2016) sought to establish a relationship between PA salary, physician salary, and employment trends. The authors conducted a secondary data analysis using the AAPA Salary Report as well as the Medical Group Management Association Physician Compensation and Production Survey to obtain the median salaries for PAs and physicians by specialty. Using regression modeling, the authors demonstrated that specialties with the highest growth for PAs were those that had the highest physician and PA salaries as well as those with the

highest physician PA salary ratios. These finding suggest that medical and surgical specialties, where there are the most financial opportunities for PAs, are also the ones that the physician has the most financial benefit by having a PA. As mentioned in previous chapters, there are many administrative billing limitations for PAs within the Medicaid and Medicare systems, limiting the income the PA can bring into their practice. While this is an important finding when considering if PAs have complete agency when picking a specialty or are limited in job opportunities in which there is the most to be gained financially by the hiring group, there are methodological limitations that must be considered. First, the AAPA census typically has a low response rate (12% in 2017) so the PA salary data are less reliable. By contrast, the data for physician salaries were noted to be more representative of physician compensation and more inclusive of all specialties (some specialties within the PA salary report only had a handful of PAs respond). A second limitation is that the authors did not control for geography. Specialists tend to be in urban areas near large academic centers where cost of living is higher. Finally, the study did not control for state practice statues, such as supervisory requirements, for PAs in different states that can impact the productivity and revenue PAs can generate. The conclusion that can be drawn from these healthcare environment studies is that the more autonomy a PA has to practice and bill appropriately for the services provided, the greater the likelihood that there will be more primary care job opportunities for those PAs who are drawn to working in primary care.

PA School Curriculum and Experience

Another factor in the Bennett and Phillips (2010) model is the medical school curriculum and experience. One proxy for curricular emphasis is the program's mission

statement, reflecting the framework a program uses when crafting curricula. Snyder (2014) explored the relationship between a PA program's mission statement and PAs who work in primary care; however, it was not found that attending a PA program with a primary care mission was a statistically significant predictor of, or even correlated with, the PA working in primary care.

Exposure to strong primary care clinical rotations and a primary care focused curriculum is another way that the PA school experience has been hypothesized to influence specialty selection. In their study, Swanchak et al. (2012) found that curricular exposure to geriatric topics in both the didactic phase and clinical phase on rotations were not associated with an increase in interest in practicing in geriatrics, a primary care specialty. Kayingo et al. (2016) found that students who had their primary care rotation in a primary care office that was certified as a patient center medical home (PCMH) had no stronger intention to practice in primary care than those that did not have their primary care rotation at a PCMH after controlling for other know predictors of working in primary care (race, marital status, and NHSC commitment).

Continuing with the hypothesis that curriculum impacts specialty selection, Hooker and Berlin (2002) wrote commentary discussing the differences between PA and NP education and curriculum. NPs practice in primary care at a higher rate than PAs do, so this comparison was important to see if there are aspects of the training of NPs that influence these workforce differences. The authors suggested that the differences in each profession's educational model may explain some of the workforce differences. NPs, unlike PAs, are trained in specific specialties (for example – family nurse practitioner, pediatric nurse practitioner, etcetera); therefore, nurses enter NP school with the intention

of learning the skills required to work in primary care fields. This contrasts with the PA educational model that follows the template of medical school, a general medical didactic education followed by clinical rotations in all the major fields of medicine. Specialty selection is made at the conclusion of school and PAs may change specialties without formal training thereby attracting applicants who are interested and open to a wide range of specialties.

Another relationship to explore is the impact of advance public health training (educational or experiential) on the decision to work in primary care. Specifically, Cawley et al. (2011) questioned the role of an undergraduate major or minor in public health, as well as the opportunity to earn a dual graduate degree in PA studies and a master of public health (MPH) on the primary care workforce. As of 2011 when the article was written, there were seven PA programs that offered a dual PA-MPH degree (Cawley et al., 2011). In this piece, the author specifically suggested that dual degree programs have the potential of increasing the primary care workforce. Concepts discussed in MPH programs include design and implementation of population health programs, preventative medicine programs, and methods to reduce healthcare costs. From the perspective of the provision of healthcare services, many of the approaches discussed in public health training are applied to patient care in the primary care setting. This may lead one to conclude that those who are interested in public health may have some of the same experiences that lead one to be interested in primary care. However, the additional cost of an extra year of school to earn a MPH, in conjunction with lower salaries in primary care, may be a limiting factor for students pursuing this course of study. There is

also limited evidence of tangible benefits (increased pay, leadership opportunities, etcetera) of having this additional degree.

Predisposition and Identity

The variables that have emerged from the studies thus far as predictive of working in primary care (childhood SES, race/ ethnicity, gender, and marital status) can be broadly described as those that contribute to a person's identity. Furthermore, engaging in certain activities, such as volunteer work, can reflect core components of one's identity that would lead an individual to choose a career seen as service or community oriented. Bennett and Phillips (2010) noted that those who practice primary care are likely to have a "sense of fit through the interpersonal aspects of care" (p.S85). Work done by Kao and Jager (2018) further suggested that those medical students who plan to work in primary care are more likely than others to see their work in medicine as a "calling" which is, again, a reflection of identity.

The concept that one's identity can influence specialty selection is supported by other works in the physician workforce literature. Roseamelia et al. (2014) explored reasons why a cohort of medical students chose to enroll in a rural-tract program at their medical school. The authors identified that having a rural identity and wanting to live/ work in a rural setting after medical school were the two themes that emerged from the interviews. Pathman et al. (2012) found that those clinicians who were most likely to continue to work in primary care in underserved areas after they completed their service in the NHSC were those who worked in a similar setting and with a similar population to themselves, a reflection on the importance of identity in selecting primary care.

The literature suggests that the pre-medical/ PA school experience may be the most influential on identity formation and the experiences had during this period may be most influential on those predisposed to being committed to working in primary care. Therefore, the literature supports the need to conduct a comprehensive study exploring the role that pre-PA experiences have on specialty selection.

Primary Care Pipeline

The pre-PA school experience has emerged as a critical time for forming the identity that may pre-dispose a PA to either working in or having a positive perspective on working in primary care. By identifying experiences that are most influential, PA educators can more accurately recruit and admit applicants who are most likely to work in primary care. Many of the innate characteristics that the studies suggest are associated with primary care including: (a) a sense of mission, (b) desire to have a connection with the community, (c) desire for long term relationships with patients, and (d) viewing work in medicine as a "calling" are likely formed before the student enters their medical training. Therefore, an analysis and description of the PA primary care pipeline is critical to grow the primary care workforce.

The literature discussing the PA pipeline is limited. In a secondary data analysis of information collected from the CASPA, the application system used by most PA programs, Glicken and Miller (2013) described the broad PA pipeline (defined as those applying to PA school in the study years). While no associations were made in the study regarding future practice, they focused on addressing the need for additional PA programs, addressing faculty member shortages, and limits in clinical sites being a major barrier to increasing number of PA training slots in order to graduate more PAs in

general. They also discussed the importance of maintaining a highly qualified diverse applicant pool as being important for the PA profession to meet the diverse healthcare needs of the country; however, what the primary care specific pipeline looks like was not identified. Additionally, Larson and Frogner (2019) noted an association between a PA student who participated in community service activities as an undergraduate and intending to work in primary care. Specific gaps in this study include the lack of an identified association between intention to work in primary care and type of volunteer work (scope and setting), number of volunteer hours, and field of medicine the PA they shadowed in worked.

In addition to demographic and SES variables, volunteer experience, shadowing experience, and prior work experience should also be explored to determine their potential impact on specialty selection. For example, many PAs have worked in non-medical careers prior to changing fields to work in medicine. Brock et al. (2013) wrote commentary about the potential for former military physician assistants playing an important role in the primary care pipeline because of the service-oriented experiences they had in this profession. This concept suggests that studies are needed to explore whether specific pre-PA work experiences, for example, may be predictors of working in primary care.

Summary

In summary, the literature suggests that the experiences prior to PA school such as the PA's gender, race/ ethnicity, and socioeconomic status, are most influential in the formation of a positive perspective of the role of the primary care provider in the healthcare system and development of an identity that seeks the professional roles that

primary care fulfills. The studies further suggest that other domains of specialty selection such as salary may be more important for PAs working in medical or surgical specialties and not as much for PAs choosing primary care. A thematic limitation of the current literature is that the literature does not include a robust analysis of all pre-PA school experiences such as undergraduate major, community service type and location, the number of community service hours, exposure to primary care clinicians, and past employment and their potential to influence working in primary care.

Current methodological limitations include the use of cross-sectional studies, surveys that introduce recall bias, and the use of intention to practice rather than actual employment in primary care as the dependent variable. The identification of the importance of the pre-PA school experience in developing the personal characteristics and view of primary care as an important specialty need to be further explored to better understand which applicants to PA school are most likely to make up the “primary care pipeline.”

Chapter 3: Methods

It is well established that there is a PCP shortage which is expected to worsen over the next decade. PAs are among the proposed solution to this problem; however, fewer PAs are working in primary care, similar to physicians. While the reasons for this workforce change appear to be multifactorial, the literature suggests that a PA's pre-PA life experiences may lead to personal attributes and career aspirations that predispose a subset to work in primary care. Identification of the attributes that describe the "primary care pipeline", can lead to targeted recruitment by PA programs to help expand the primary care clinician workforce and increase access to care.

Unit of Analysis

The study population included all PAs that graduated from the Rutgers, the State University of New Jersey, Physician Assistant Program (RUPAP) from 2013–2019. RUPAP was previously known as the University of Medicine and Dentistry of New Jersey. The Rutgers PA program was established in 1965 as the first PA program in New Jersey. It is a 33-month long program with an entering class size of 50 students annually. The curriculum is divided into two phases: (a) a 15-month didactic phase and (b) a 15-month clinical rotation phase, making it one of the longest programs in the country. The program is in Piscataway, New Jersey, adjacent to New Brunswick, New Jersey, one of the largest, most diverse urban centers in the state. Clinical rotations occur in several settings; however, most hospital-based rotations are in large urban centers such as New Brunswick, New Jersey, Newark, New Jersey, and nearby New York City. The number of PA students included in the study was 309. Students who entered the program but failed to graduate were not included in the final subject pool.

Research Design

The study utilized an exploratory research design and a longitudinal secondary data analysis to identify any associations between pre-PA school experiences and working in primary care. The results of this study will potentially help PA programs recruit and identify candidates who are most likely to work in primary care in an effort to increase the supply of primary care physician assistants.

Data Source

The study data were extracted from two sources maintained by the RUPAP: the CASPA database of applicants and the RUPAP annual new-graduate employment database. All information in the databases is self-reported by the applicant. The only information independently verified is GPA (grade point average) and previous courses taken via the transcript verification process.

All independent variables of this study were manually extracted from the CASPA application database. The CASPA is the common application used by most PA programs for admission. CASPA contains a comprehensive record of the applicant's demographics, socioeconomic variables, family demographics as well as the applicant's academic history, prior work experience, health related experience, PCE, PA shadowing history, and volunteer work. Additionally, personal statements and letters of recommendation are included in the application.

The initial specialty, the dependent variable, each graduate entered upon graduation from PA school was extracted from the RUPAP new-graduate employment survey and matched to the data from the PA's application. Once matched, individuals were de-identified and assigned a random number identifier. There was no further

identification of the individual and only group statistics were reported in the results section.

Measures

The following sections describe the dependent and independent variables included in the study. Each of the specific study variables are listed, operationalized, and coded in Table 1 at the end of this chapter. Figure 3 illustrates the analytical framework for the study, depicting the hypothesized relationship between the dependent variable and each of the independent variables. The five domains illustrated in Figure 3 were developed based on the literature review. Each domain was then constructed by indicators based on the data available for analysis from the CASPA application that represent each of the domains. All study variables were listed in Table 1.

Dependent Variable

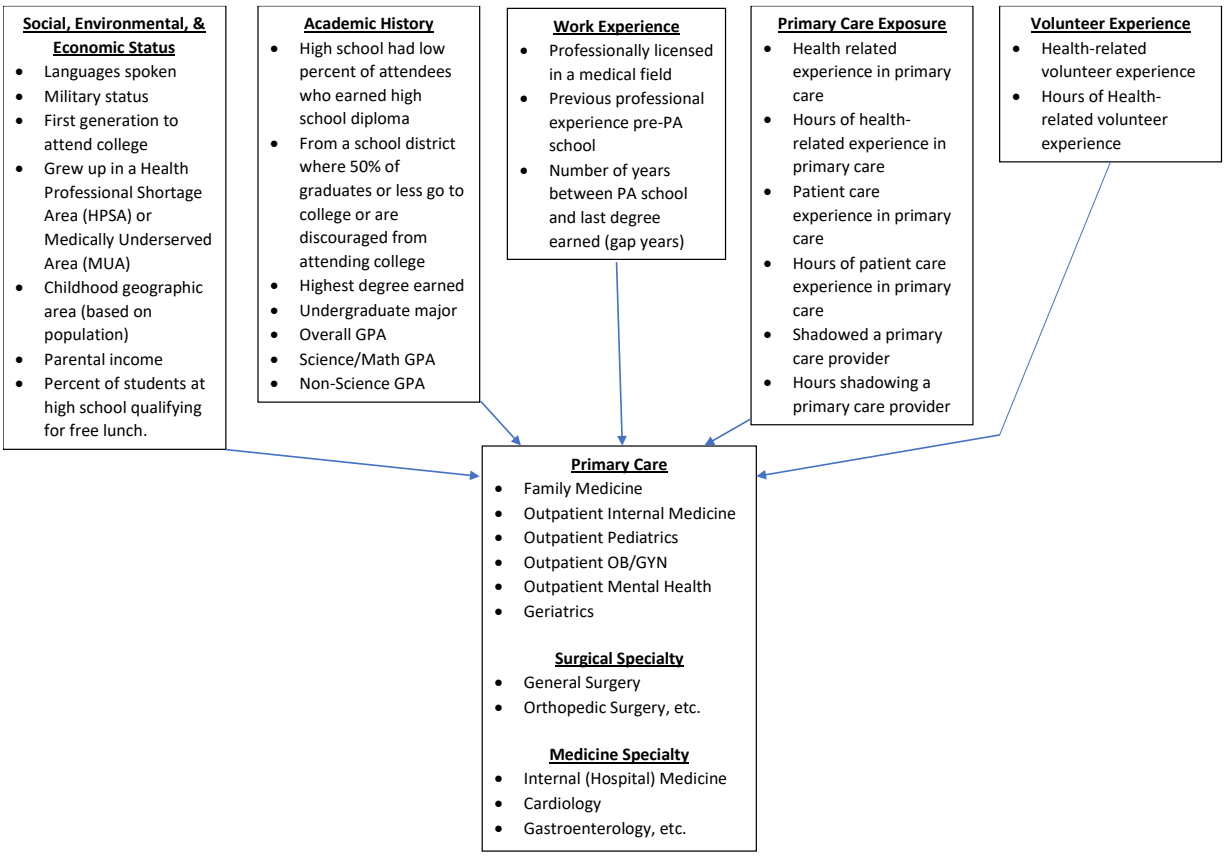
The purpose of this study was to identify which pre-PA school experiences, reported in the CASPA application, are predictive of working in primary care. The dependent variable of this study was the specialty in which the PA first practiced after graduating from PA school. Specialties were coded into the three most broad categorization of specialties: (a) primary care, (b) medical specialty (not primary care), and (c) surgical specialty. Additionally, an "unknown specialty" category was needed as the initial specialty for all PAs in the study sample was not known. For this study, the HRSA classification of primary care specialties, eligible for NHSC, was used. The HRSA classification includes family medicine, outpatient internal medicine, outpatient pediatrics, geriatrics, outpatient OB/GYN, and outpatient mental health (HRSA, 2020). Medical specialties include any non-surgical specialty other than primary care such as

cardiology, gastroenterology, hospitalist medicine, emergency medicine, etcetera

Surgical specialties include any field of surgery such as general surgery, trauma surgery, orthopedic surgery, cardiothoracic surgery, urology, etc.

Figure 3

Analytical Model Describing Hypothesized Characteristics of the PA Pipeline



Independent Variables

The study included both demographic variables (age, gender, race, and ethnicity) and independent variables extracted from the CSAPA database and categorized into five domains hypothesized to be predictive of working in primary care: (a) social/ environmental/ economic status (SEES), (b) academic history, (c) work experience, (d) primary care exposure, and (e) health related volunteer experience. All independent

variables are reported by the applicant and, other than GPA, are not independently verified by CASPA, the Rutgers PA program, nor the research team.

Social, environmental, and economic status (SEES). The PA's SEES was measured by several variables representing the PA's personal and childhood family circumstances. Social indicators extracted from the database include the ability to speak a language in addition to English, identifying as the first generation to attend college, and military service. Environment indicators used to describe if the PA was environmentally disadvantaged include if the PA grew up in a town designated as a health professional shortage area (HPSA) or medically underserved area (MUA) and the geographic area the PA grew up in based on population (e.g., rural, small town, urban, etcetera). PAs were categorized as economically disadvantaged if they self-identified as such (based on their parent's household income) or indicated that they attended a high school where greater than 50% of students qualified for free or reduced priced lunch.

Academic history. Variables from the CASPA application that were chosen to represent the PA's academic history include those that describe both the PA's high school educational environment as well as their higher education achievements and areas of study. PAs were categorized as educationally disadvantaged if they (a) self-identified as such, (b) indicated that their high school had a low percentage of attendees earn a diploma, or (c) they indicated that they are from a school district where 50% of graduates or less go to college or are discouraged from attending college. Additionally, applicants can identify as simply being "educationally disadvantaged." Variables representing the PA's higher education experiences include the highest degree earned by the PA prior to applying to PA school (i.e. – BS, MS, PhD, etcetera), the PA's undergraduate major, as

well as the PA's overall GPA (including all undergraduate, post-baccalaureate, and graduate courses taken), overall combined science and math GPA (including all undergraduate, post-baccalaureate, and graduate courses taken), and overall non-Science/Math GPA (including all undergraduate, post-baccalaureate, and graduate courses taken).

Work experience. Work experience includes variables that describe the professional experiences of the PA prior to enrolling in PA school. The first variable in this domain is if the number of licenses in a medical field including, but not limited to, registered nurse (RN), emergency medical technician (EMT), paramedic, medical assistant (MA), or certified nursing assistant (CNA), among others. Professional work experience was defined as having full time employment in any medical or non-medical position for at least two years after they completed their last degree. The two-year cutoff is intended to define which PAs are "career changers" and those who are not. The final variable representing work experience, gap years, is the number of years between the PA's last earned degree and PA school.

Primary care exposure. The primary care exposure domain is described by indicators that include the health care, patient care, and shadowing experiences in primary care that the PA had prior to PA school. Applicants are instructed to report all experiences, regardless of specialty, as well as the number of hours they spent in each experience. Healthcare related experience is defined as work in a health care setting that does not provide direct patient care. Examples include medical secretary, billing, or other administrative related positions. PCE, by contrast, is defined as an experience in which the applicant provides direct care to a patient. Examples include MA, nursing, or

phlebotomy. Shadowing is defined as simply observing the care given by the clinician. A PA was categorized if as having one of these experiences if the description of their experience specifically noted that the experience was in a primary care setting. Additionally, the number of hours spent in each experience was extracted from the database.

Volunteer experience. Health related volunteer experiences in underserved communities was the final domain studied. A PA was categorized as having health related volunteer experience in an underserved community if they indicated having either a health related or patient care role (as defined in the previous section) in their volunteer position. Similar to primary care exposure, the hours spent volunteering in a health related capacity in underserved communities were extracted from the database.

Methods of Analysis

All statistical analyses were conducted using IBM SPSS Statistics (Version 26). The analysis was conducted in three stages: (a) descriptive analyses to summarize the frequencies and proportions of all study variables; (b) bivariate analyses, using Chi-square and correlation analyses to examine the association between the predictor variables and initial specialty selection; and (c) multinomial logistical regression models to examine the associations between the study predictors and students' specialty selection. In this stage, multiple regression procedures were used to conduct hypothesis testing and build models to predict students' specialty selection. Medical specialty was designated as the reference group for all regression models because nearly 50% of each cohort went into a medical specialty. Gender and race/ ethnicity were controlled for because of the strong evidence of the literature describing the relationship between

gender and race/ ethnicity and working in primary care. All statistical tests were two-sided. A *p*-value of ≤ .05 was considered statistically significant.

Using longitudinal statistics, the percentage of PAs over time from the RUPAP entering primary care and the percentage of PAs nationally working in primary care were compared. Multinomial logistic regression models were used to predict the odds of working in primary care given a set of SEES, academic history, work experiences, primary care exposure, volunteer experience. The following hypothesis were tested to answer the research questions.

Hypothesis 1

H_0: Social, Environmental, and Economic Status (SEES) cannot predict practice in primary care.

H1: Social, Environmental, and Economic Status (SEES) can predict practice in primary care.

$$ln\left(\frac{P(Y)}{1-P(Y)}\right) = \beta_0 + SEES\ X_1 + \varepsilon$$

Hypothesis 2

H_0: Academic history and preparation (AH) cannot predict practice in primary care.

H1: Academic history and preparation (AH) can predict practice in primary care.

$$ln\left(\frac{P(Y)}{1-P(Y)}\right) = \beta_0 + AH\ X_1 + \varepsilon$$

Hypothesis 3

H_0: Work Experience prior to PA School (WE) cannot predict practice in primary care.

H1: Work experience prior to PA School (WE) can predict practice in primary care.

$$ln\left(\frac{P(Y)}{1-P(Y)}\right) = \beta_0 + WE\ X_1 + \varepsilon$$

Hypothesis 4

H_0: Having Pre-PA school exposure to primary care (PCE) cannot predict practice in primary care.

H1: Having Pre-PA school exposure to primary care (PCE) can predict practice in primary care.

$$ln\left(\frac{P(Y)}{1-P(Y)}\right) = \beta_0 + PCE\ X_1 + \varepsilon$$

Hypothesis 5

H_0 : Having Pre-PA school volunteer experience in a health-based role working with underserved populations (VUP) cannot predict practice in primary care.

H1: Having Pre-PA school volunteer experience in a health-based role working with underserved populations (VUP) can predict practice in primary care.

$$ln\left(\frac{P(Y)}{1-P(Y)}\right) = \beta_0 + VUP\ X_1 + \varepsilon$$

Overall, there are several analyses that were conducted for this study. In summary, the characteristics of each variable were explored first. Next, the relationship

between independent variables and the PA's initial specialty selection were investigated. Finally, the predictive regression models were established to explore the potential causal effect on PA specialty selection.

Table 1

Dependent and Independent Variable Definitions and Codes

Variable	Code	Description
Dependent variable		
Initial specialty	1 = primary care 2 = medical specialty 3 = surgical specialty 4 = unknown	The initial specialty that a PA worked in upon graduation. Primary care is defined as family medicine, geriatrics, outpatient internal medicine, outpatient pediatrics, outpatient OB/GYN, or outpatient psychiatry.
Independent variable		
Social, environmental, and economic status		
Military status	1 = yes 2 = no	Denotes if the PA is a current or former member of any branch of the military.
Languages spoken	1 = none 2 = Spanish 3 = Spanish and other 4 = other	The language the PA speaks other than English at a level of advanced or fluent.
First Generation to Attend College	1 = yes 2 = no	Yes/no question quantifying if the PA is the first person in their family to attend college.
Economically disadvantaged	1 = yes 2 = no	A PA was coded as being economically disadvantage if they: 1. Identified as economically disadvantaged based on childhood family income and/or 2. Identified as being from a high school that had a high percentage of students qualifying for free lunch.

Variable	Code	Description
Grew up in an area designated as a HPSA or MUA	1 = yes 2 = no	Yes or no question representing the economic & environmental condition the applicant grew up in, specifically as it relates to access to primary care and other health related services.
Geographic area PA grew up in	1 = rural (less than 2,500) 2= small town (2,500-9,999) 3 = large town (10,000-49,999) 4 =mid-sized city (50,000-99,999) 5 = large city (100,000-999,999) 6 = urban (greater than 1,000,000) 7 = not reported	Categorized by population. This variable is a description of the geographic area the applicant grew up in. Population size and designation (e.g., Rural (less than2,500 people), Urban (greater than1,000,000)) are pre-categorized by CASPA.
Academic history		
Educationally disadvantaged	1 = yes 2 = no	A PA was coded as being educationally disadvantage if they: 1. Identified as educationally disadvantaged based on childhood family income and/or 2. Reported attending a high school that had a low percentage of its graduates earn a high school diploma or not complete high school and/or 3. Reported being from a school district where 50% of graduates or less go to college or are discouraged from attending college.
Highest degree earned	1 = none (3+3) 2 = bachelor	Highest degree earned by the applicant prior to PA school.

Variable	Code	Description
	3 = graduate degree (master or doctorate)	
Undergraduate major	1=Biology/Chemistry/ Biochemistry 2=Psychology 3=Public Health 4=Other Natural Science 5=Other Social Science 6=Other Applied Science 7=Other	The applicant's undergraduate major.
Overall GPA	Continuous	The applicant's overall GPA including all levels of education if applicable (undergraduate, post-bac courses, graduate courses).
Science/ Math GPA	Continuous	The applicant's GPA for all math and science courses including all levels of education if applicable (undergraduate, post-bac courses, graduate courses).
Non-Science/ Math GPA	Continuous	The applicant's GPA for all non-science and non-math courses including all levels of education if applicable (undergraduate, post-bac courses, graduate courses).
Work experience		
Professionally licensed in a medical field	1 = yes 2 = no	This denotes if the applicant is professionally licensed in any other field of medicine. For example: Emergency Medical Technician (EMT), Certified Nursing Assistant (CNA), Medical Assistant (MA).

Variable	Code	Description
Professional experience pre-PA school.	1 = yes 2 = no	This denotes if the applicant had a professional career prior to attending PA school (example – business, teaching, etc.). A professional career will consist of 2 or more years in that field after graduating from college. This is to differentiate the applicant from applicants who took a gap year to work in a health care-related job in preparation for PA school.
Number of years between PA school and last degree.	Continuous	Time (in years) between an applicant's last degree and starting PA school.
Primary care exposure		
Health care related experience in primary care (PC).	1 = yes 2 = no	Denotes if the applicant has any health care related experience in primary care. Health care related experience is defined as working in a health care setting in a role that does not provide direct patient care. Examples include medical secretary, billing, or other administrative related positions.
Hours of health care experience in PC	Continuous	Denotes the total number of hours the applicant worked in a health care related role in a primary care setting.
PCE in PC	1 = yes 2 = no	Denotes if the applicant has any PCE in primary care. PCE is defined as a role in which the applicant provides direct care to a patient. Examples include medical assistant, nursing, or phlebotomy.
Hours of PCE in PC	Continuous	Denotes the total number of hours the applicant provided direct patient care in a primary care setting.

Variable	Code	Description
Shadowed a primary care provider	1 = yes 2 = no	Denotes if the applicant shadowed a primary care provider (MD/DO, PA, NP).
Hours of shadowing a primary care provider	Continuous	Denotes the total number of hours the applicant shadowed a MD/DO, PA, NP providing patient care in a primary care setting.
Volunteer experience		
Health-related volunteer experience	1 = yes 2 = no	Notes if the applicant has had any health-related volunteer experiences in underserved areas. This excludes unpaid shadowing.
Hours of Health-related volunteer experience	Continuous	Total number of hours the applicant spent volunteering in any health-related experiences in underserved areas.

Chapter 4: Descriptive Results

Data were extracted from the student's CASPA application as well as the RUPAP graduate database. Descriptive statistics were used to describe the data and bivariate analysis was used to determine if there was an association between each predictor variable and specialty selection. When data were available to compare the sample to the national student body, this was done to demonstrate external validity. The source of data for national student comparisons was the 2019 Physician Assistant Education Association (PAEA) Matriculated Student Survey (MSS), a survey administered annually to gather demographic data about first year PA students. The 2019 survey had a response rate of 54.2% (PAEA, 2020a).

Study Sample

The study sample consisted of PAs who graduated from the RUPAP in Piscataway, New Jersey between 2013–2019. The total number of PAs eligible for inclusion in the study was 309. The RUPAP student sample was similar to the national sample by gender (74.1% female at RUPAP versus 74.8% national) and average age at the time of matriculation (24.8 years at RUPAP versus 25.6 years nationally); however, the RUPAP sample differed by percentage identifying as non-White (35.3% RUPAP versus 19.4% national) or veterans (1.9% RUPAP versus 5.2% national) (PAEA, 2020a).

A greater percentage of the RUPAP sample spoke a language other than English (29.4%, $N = 91$) compared with the national PA workforce (22%) (NCCPA, 2020). Spanish was the most frequent foreign language spoken by study subjects (11.3%, $N = 35$). While there were a greater number of PAs who spoke Spanish in the national PA workforce (17%), there were more subjects in the study who spoke a foreign language

other than Spanish (18.1%) than the national PA workforce (5.8%). See Table 2 for a detailed summary of the demographic data for the sample PAs with national samples.

Table 2

Frequencies for Sample Demographics (N = 309)

	RUPAP		National sample[a]
	N	%	%
Age (categorized)			
19-29	270	87.4	-
30-39	31	10	-
40-49	6	1.9	-
Greater than 50	1	.3	-
Mean age (SD)	24.8 (4.9)		25.6 (4.7)
Gender			
Male	79	25.6	25.2
Female	229	74.1	74.8
Not reported	1	.3	-
Race/ ethnicity			
White, Non-Hispanic	200	64.7	80.6
Asian	41	13.3	11.3
Hispanic	29	9.4	7.1
Black, Non-Hispanic	18	5.8	3.5
Mixed race/ethnicity	5	1.6	-[b]
Not reported	16	5.2	-
Military veteran			
Yes	6	1.9	5.2
No	303	98.1	94.8
Languages spoken			
English only	218	70.6	77.2[c]
English and Spanish	35	11.3	17
English, Spanish and other	12	3.9	-[d]
English and other	44	14.2	5.8

[a] Source of national data from 2019 Matriculated Student Survey (MSS). [b] Mixed Race is not a category used by the MSS. [c] Source of national data is the 2019 NCCPA PA Profile [d] Spanish and Other is not a category in the NCCPA report.

Initial Specialty

The outcome variable was the initial specialty selection of PAs in the 2013–2019 graduating cohorts from the Rutgers Physician Assistant Program in Piscataway, New Jersey. Specialties were categorized into primary care, medical specialty, surgical specialty and unknown. Primary care specialties were defined using the HRSA eligibility criteria to participate in the NHSC, a program that partners primary care clinicians with communities in need of primary care services. Disciplines include family medicine, outpatient internal medicine, general pediatrics, outpatient obstetrics and gynecology, geriatrics, and outpatient psychiatry (HRSA, 2020). Surgical specialties were coded as such based on the 14 specialties recognized by the American College of Surgeons (n.d.) as being surgical specialties.

The source of the initial specialty was the RUPAP graduate database. Students are asked to report the specialty and name of practice of their first job. In the RUPAP sample, the initial specialty was known for 84.1% ($N = 260$). Of the four categories of initial specialty, medical specialty was the most frequent category chosen (43.7%, $N = 135$), consistent with national PA workforce trends (51.3%) (NCCPA, 2020). The RUPAP sample had a higher percentage of PAs working in surgical specialties (27.5%, $N = 85$) than the national PA workforce (23.7%). Primary care, the specialty of interest for this study, was the initial specialty for 12.9% ($N = 40$) of RUPAP graduates, less than 25% of

the national PA primary care workforce in 2019 (NCCPA, 2020). The frequencies of initial specialty selections are summarized in Table 3.

Table 3

Initial Specialty Selection of Sample PAs and National PA Workforce

	RUPAP		PA workforce[a]
	N	%	%
Primary care	40	12.9	25
Medical specialty	135	43.7	51.3
Surgical specialty	85	27.5	23.7
Unknown	49	15.9	-

[a] Source: NCCPA. (2020). *2019 Statistical profile of certified physician assistants: An annual report of the NCCPA.*

As introduced, the percentage of the PA workforce working in primary care nationwide is decreasing (Smith, 2017). However, the percentage of RUPAP graduates going into primary care each year increased from 7.3% in 2014 to 20.8% in 2019. Consistent with national trends, the percentage of PAs working in surgical specialties has increased each year as well. Medical specialties remained consistent over the study years. Overall, there were no significant changes in specialty trends over the years included in the study [$\chi^2(6, N = 309) = 4.30, p = .64$]. Table 4 depicts a summary of the change in specialty selection over the seven years included in the study.

Table 4

Initial Specialty for RUPAP Graduates from 2013–2019

Cohort	Primary care *N* (%)	Medical specialty *N* (%)	Surgical specialty *N* (%)	Unknown *N* (%)	Total
2019	10 (20.8)	21 (43.8)	16 (33.3)	1 (2.1)	48
2018	7 (17.5)	17 (42.5)	14 (35.)	2 (5)	40
2017	5 (10.9)	27 (58.7)	13 (28.3)	1 (2.2)	46
2016	5 (11.1)	22 (48.9)	14 (31.1)	4 (8.9)	45
2015	3 (6.8)	18 (40.9)	9 (20.5)	14 (31.8)	44
2014	3 (7.3)	12 (29.3)	7 (17.1)	19 (46.3)	41
2013	7 (15.6)	18 (40)	12 (26.7)	8 (17.8)	45
Total	40	135	85	49	309

Social, Economic, and Environmental Indicators

Social, economic, and environmental circumstances that were hypothesized to contribute to a PAs choosing to work in primary care include: (a) the state of residency at time the PA applied to PA school; (b) a geographic categorization of the area the PA was raised based on population; (c) an indicator categorizing if the PA grew up in a region designated by HRSA as either being a MUA or a HPSA; (d) if the applicant was the first generation to attend college; and (e) if the applicant identified as being economically disadvantaged or as attending a high school where greater than 50% of students qualified for free lunch.

Over 50% of PAs included in the study lived in New Jersey at the time they applied to PA school (56.5%, $N = 186$). New York was the second most reported state

(10%, *N* = 31). Most PAs in the sample (46.7%, *N* = 104) grew up in either a small or large town defined as having populations between 2,500–9,999 and 10,000–49,999 respectively. Most PAs were not from either a MUA or HPSA (61.8%, *N* =191). Data identifying population-based geographic region of residence or identifying as an MUA or HPSA were only available for cohort 2015–2019. Additionally, this data were not collected from students entering the PA Program from 3+3 programs, an accelerated admissions program that bypasses the CASPA application. Fewer than 5% of the graduating cohorts were 3+3 applicants. The complete geographic indicator data can be found in Table 5.

Table 5

Frequencies for Environmental Indicators (N = 309)

	N	%
State of Residency		
New Jersey	186	60.2
New York	31	10
Pennsylvania	11	3.6
Connecticut	10	3.2
Massachusetts	7	2.3
Other	64	20.7
Classification of childhood home (population)[a]		
Rural (less than 2,500)	4	1.3
Small town (2,500–9,999)	39	12.9
Large town (10,000–49,999)	65	21
Mid-sized city (50,000-99,999)	25	7.8
Large city (100,000–999,999)	13	4.2
Urban (greater than1,000,000)	11	3.6
Not reported	152	49.2
Grew up in MUA or HPSA[a]		
Yes	11	3.6
No	191	61.8
Not reported	107	34.6
First generation. to attend college[a]		
Yes	44	14.4
No	156	50.2
Not reported	110	35.6

[a]Data not available for cohort 2013, 2014, and 3+3 applicants.

Like certain environmental descriptors Data used to identify subjects as the first generation to attend college were only available for cohort 2015–2019. Additionally, this data were not collected from students entering the PA Program from 3+3programs. The sample included 44 PAs (14.2%) who identified as being the first generation to attend college. Furthermore, 11% of the RUPAP sample were categorized as economically disadvantaged. and See Table 6 for full list description of economic indicators.

Table 6

Frequencies for Economic Indicators (N= 309)

	N	%
Attended HS with high % of students qualifying for free lunch[a]		
Yes	23	7.4
No	180	58.3
Not reported	106	34.4
Economically disadvantaged [b]		
Yes	34	11
No	248	80.3
Not reported	27	8.7

[a] Data not available for cohort 2013, 2014, and 3+3 applicants. [b] Includes those who identified as being economically disadvantaged or as attending a high school where greater than 50% of students qualified for free lunch.

Academic History

Academic history is the second hypothesized domain that influences a PA's initial specialty. Variables used in this study to describe the PA's academic history included those that describe if the PA was educationally disadvantaged, their highest degree earned prior to PA school, undergraduate major, and overall, science/math, and non-science GPA.

Variables that explicitly described the PAs high school educational experience were included on the CASPA application for those graduating between 2015–2019. On the application for the PAs who graduated in these years, applicants were asked to identify if the high school they attended had a low percentage of students who earned a high school diploma and if the percentage of students who attended college was less than 50% or attending college was discouraged. Like many of the environmental and economic indicators, this question is not asked on 3+3 applications. For applicants who

graduated in either 2013 or 2014, CASPA simply asked applicants to identify if they considered themself to be "educationally disadvantaged." Therefore, PAs were coded as "educationally disadvantaged" if they marked "yes" for any of the three educational indicators. Within the RUPAP sample, 7.1% of PAs were categorized as educationally disadvantaged.

The RUPAP sample had a smaller percentage that earned a bachelor's degree prior to PA school than the national sample (83.8% versus 87%). The most frequent undergraduate major (50.5%, $N = 156$) was biology, chemistry, or biochemistry. Other applied sciences, such as exercise science, nutrition, kinesiology, and engineering, were the second most frequent (24.3%, $N = 75$). The social sciences include majors such as sociology, history, anthropology. Other includes majors such as economics, English, and the arts. Similar to the national sample, the RUPAP sample contained a small percentage of students who majored in public health (2.3% RUPAP versus 2.6%) (PAEA, 2020a). See Table 7 for a summary of the academic history indicators.

Table 7

Descriptive Statistics for Academic History Variables (N = 309)

	RUPA		National PA-S
	N	%	%
Educationally disadvantaged[a]			
Yes	22	7.1	-
No	260	84.1	-
Not reported	27	8.7	-
Highest degree earned			
None (3+3 program)	22	7.1	4.1[b]
Bachelor's	259	83.8	87
Graduate (master's or doctorate)	28	9.1	8.9
Undergraduate major			
Biology/Chemistry/ Biochemistry	155	50.5	45.6[c]
Psychology	22	7.1	5.7
Public Health	7	2.3	2.6
Other Natural Science	11	3.6	.2
Other Social Science	13	4.2	2.3
Other Applied Science	75	24.3	38.2
Other	25	8.1	5.4
GPA	*M (SD)*		*M (SD)*
Overall GPA	3.58 (.26)		3.6 (.27)[d]
Science/Math GPA	3.55 (.29)		-
Non-Science GPA	3.62 (.28)		-

Notes: PA-S: PA Student. Source of national data is the 2019 MSS.

[a] Includes students who identified as being from a high school with either a low percentage of students earning a high school diploma and/or a low percentage of students who went to college or identified as being "educationally disadvantaged". [b] The MSS does not report the number of students in a bridge program such as the 3+3 program; therefore, this is the number of students entering PA school with less than a bachelor's degree as a comparison for the study sample. [c] The majors reported in the MSS were categorized per the criteria in Table 1. [d] Only overall GPA is reported in the MSS.

The overall mean GPA for the RUPAP sample was 3.58 (*SD* = .26), similar to the national sample (3.6 *(SD*=.27). The mean science/ math GPA and non-science GPA for the RUPAP sample was 3.55 (*SD* = .29) and 3.62 *(SD* = .28) respectively. Non-science GPA was not captured on the application for 3+3 students and non-CASPA based paper applications that were still accepted in 2013 so the sample size for non-science GPA this variable is 284. Additionally, the MSS does not report science/ math and non-science GPA for the national cohort (PAEA, 2020a).

Work Experience

The average number of years between the subject's last degree earned and enrolling in PA school was 2.61 years (*SD* = 3.95) similar to the national sample 3 years (*SD* = 3.2) (PAEA, 2020a). Prior to PA school, 24.6% (*N* = 76) of the RUPAP sample had another career and the range of medical licenses held was 0–2 licenses with a mode of 0. Over half of the PAs in the study had no medical licenses (59.9%); however, just over one third had one license (37.9%, *N* = 117). The most common medical licenses held by applicants were emergency medical technician-basic (EMT-B) (19.4%, *N* = 60) and certified nursing assistant (CNA) (6.7%,v*N* = 21). See Table 8 for a complete summary of work history indicators.

Table 8

Descriptive Statistics of Work History Indicators (N = 309)

	N	%
Prior career		
Yes	76	24.6
No	233	75.4
	M (SD)	*Mode (Range)*
Gap years	2.61 (3.83)	-
No. of medical licenses	-	0 (0-2)

Health Care Experience

Most PAs did not have patient care (PCE) (6.8%, *N* = 288) or health related experiences (HRE) (5.5%, *N* = 292) in primary care prior to enrolling in PA school. More PAs spent time shadowing a primary care clinician, with a quarter of PAs having shadowed a PCP, PA, or NP (21.4%, *N* = 243). The average hours spent in each experience was low; however, there was a very large standard deviation indicating a very high range (0–2,440 for HRE, 0–2,800 shadowing) of hours spent in these experiences by PAs. See Table 9 for a complete description of the type and hours spent in pre-PA primary care setting.

Table 9

Descriptive Statistics of Primary Care Experiences Pre-PA School (N = 309)

	N (%)		Hours	
	Yes	No	*M*	*SD*
HRE	17 (5.5)	292 (94.5)	34.7	226.3
PCE	21 (6.8)	288 (93.2)	33.1	208.9
Shadowed a PCP	66 (21.4)	243 (78.6)	20.5	163.9

Community Service with Medically Underserved

Approximately one-quarter (22.7%, $N = 70$) of PAs in the study were categorized as having engaged in health-related community service in an underserved community. The mean time spent doing health related community service in underserved communities was 36.7 hours ($SD = 195.4$) again indicating a wide range (0–3,100) of hours.

Bivariate Analysis

Bivariate analysis was conducted using Chi-squared testing to describe the association between each categorical independent variable and initial specialty selection. For continuous independent variables, Pearson's *r* was used to describe the correlation with initial specialty selection. Table 10 summarizes the findings of the Chi-squared analysis and Table 11 summarizes the results of the Pearson's r correlation analysis.

Table 10

Association between Independent Variables and Specialty Selection

	χ^2	*p*
Demographics		
Age (categorized)	5.84	.76
Gender	16.37	.01
Race/ethnicity	22.8	.08
Military veteran	.39	.94
Languages spoken	8.89	.45
SEES		
State of residency	7.81	.93
Classification of childhood home by population	24.47	.14
Grew up in MUA/HPSA	20.72	<.001
First generation to attend college	25.31	<.001
Economically disadvantaged	15.21	.02
Academic history		
Educationally disadvantaged	18.52	.01
Highest degree earned	8.26	.22
Undergraduate major	20.34	.31
Work history		
Prior career	7.59	.06
Primary care exposure		
HRE	.82	.85
PCE	5.77	.12
Shadowed a primary care provider	3.57	.31
Volunteer work in underserved communities		
Volunteered in a healthcare role in an underserved community	.25	.97

Table 11

Correlation between Independent Variables and Specialty Selection

	r^2	*p*
Academic history		
Overall GPA	-.08	.26
Science/Math GPA	-.03	.6
Non-Science GPA	-.08	.17
Work history		
Gap years	.06	.33
Number of medical licenses	-.05	.38
Primary care experience		
Hours of HRE	.05	.37
Hours of PCE	-.05	.42
Hours shadowing a primary care provider	-.02	.69
Volunteer work in underserved communities		
Hours volunteering in a healthcare role in an underserved community	.12	.04

The PA workforce literature suggests that demographic characteristics such as race/ ethnicity (specifically Hispanic), age (greater than 40 years old), and gender (female) are all associated with working in primary care; therefore, these variables were hypothesized to be associated with specialty selection. Age was categorized by decade because the literature noted an association simply between older PAs (greater than 40 years old) and working in primary care. Chi-squared testing showed that gender was associated with specialty selection [$\chi^2(6, N = 309) = 16.37, p = .01$]; however, neither race [$\chi^2(25, N = 309) = 22.8, p = .08$] nor age [$\chi^2(9, N = 309) = 5.84, p = .76$] were significantly associated with initial specialty selection.

Additional demographic variables that were used to represent the PA's SEES included identifying as a veteran [$\chi^2(3, N = 309) = .39, p = .94$] and speaking a foreign language [$\chi^2(9, N = 309) = 8.89, p = .45$] were each not significantly associated with

initial specialty selection. Environmental indicators such as growing up in a rural area as well as growing up in a MUA/HPSA are described in the literature as possible predictors of working in primary care. Chi-squared analysis demonstrated that while the geographic area the PA grew up in was not found to be significantly associated with initial specialty selection [$\chi^2(18, N = 309) = 24.47, p = .14$], growing up in a MUA or HPSA was significantly associated with initial specialty selection [$\chi^2(6, N = 309) = 20.72, p<.001$]. An additional environmental indicator, the state the PA was from the time they applied to PA school, was not shown to be significantly associated with working in primary care [$\chi^2(15, N = 309) = 7.81, p = .93$]. Both economic indicators in the study, including identifying as the first generation to attend college [$\chi^2(5, N = 309) = 25.31, p <.001$] as well as identifying as economically disadvantaged [$\chi^2(6, N = 309) = 15.21, p = .02$] were found to be significantly associated with initial specialty selection.

Among the variables used to construct the PA's academic history, chi-squared testing showed that only variable to be significantly associated with specialty selection was identifying as educationally disadvantaged [$\chi^2(6, N = 309 = 18.52, p = .01$]. The remaining variables, including the PA's highest degree obtained prior to PA school [χ^2 (6, $N = 309) = 8.26, p = .22$], and the PA's undergraduate major [$\chi^2(18, N = 309) = 2.34, p = .31$] were not significantly associated with specialty selection. Furthermore, overall GPA [r (307) = -.08, $p = .16$], science/math GPA [r (307) = -.03, $p = .6$], and non-science GPA [r (282) = -.08, $p = .17$] were each not significantly correlated with initial specialty selection.

None of the variables used to represent the PA's prior work experiences were either associated with or correlated with initial specialty selection. Chi-squared testing showed that having a career prior to PA school was not significantly associated with specialty selection [$\chi^2(3, N = 309) = 7.59, p = .06$]. Likewise, the number of years between a PA's last degree and starting PA school (gap years) [r (307) = .33, p =.06] and the number of medical licenses that the PA had prior to PA school [r (307) = -.05, p = .38] were not significantly correlated with initial specialty selection.

Similarly, none of the variables used to represent the PA's exposure to primary care prior to PA school showed a significant association with initial specialty selection. Chi-squared testing showed that health related experience [χ^2 (3, N = 309)=.82, p = .85], PCE [χ^2 (3, N = 309)=5.77, p =.12], and shadowing in primary care [χ^2 (3, N = 309)=3.57, p = .31] were not significantly associated with specialty selection. Bivariate analysis further showed that the hours spent working in a health-related position in primary care [r (307) = .05, p =.37], the hours of PCE in primary care [r (307) = -.05, p = .42], and the hours spent shadowing a healthcare provider in primary care [r (307) = -.02, p = .69] were not significantly correlated with initial specialty selection.

In the final domain, volunteering in an underserved community in a health-related capacity was not significantly associated [$\chi^2(2, N = 309) = .25, p = .97$] with specialty selection; however, the time spent doing health related community service in underserved communities was found to be significantly correlated with initial specialty selection [r (307) =.12, p = .04].

Chapter 5: Multinomial Regression Models

Using the conceptual framework and analytical model, multinomial logistic regression was used to assess the predictive relationship between the initial specialty that a physician assistant (PA) worked in based on independent variables representing the PA's pre-PA school social, environmental, and economic status, educational background, work experience, primary care exposure, and volunteer work in primary care. For specialty selection variable, medical specialty was used as reference group. Results of each regression model are reported in the proceeding sections.

Hypothesis 1: Social, Environmental, & Economic Status is predictive of working in primary care

A multinomial logistic regression was performed to model the relationship between the initial specialty (primary care, medical specialty, and surgical specialty) and indicators representing the social, environmental, and economic background of PAs prior to enrolling in PA school. The specific predictor variables representing the social, environmental, and economic environmental circumstances of the PA include if the PA spoke a foreign language, the geographic area they grew up in (urban, large town, rural, etcetera) categorized by population, if they identified being the first generation to attend college, if they grew up in a HPSA or MUA, or if they were categorized as being economically disadvantaged. PAs were categorized as economically disadvantaged if they identified as such or indicated that they attended a high school with a high percentage of students that qualified for free lunch. Military status was theoretically hypothesized to contribute to specialty selection; however, preliminary analysis

demonstrated skewed results; therefore, military status was dropped from the final regression models.

The overall adjusted model was significant (χ^2 (45, N = 309) = 80.91, p <.001), and Nagelkerke R^2 of .25 indicated that the predictors and covariances in the model accounted for 25% of the variance in specialty selection. When controlling for race and gender, the overall model (χ^2 (78, N = 309) = 131.80, p<.001), and Nagelkerke R^2 of.39 indicated that predictors in the model accounted for 39% of the variance in specialty selection. These results demonstrate that when controlling for gender and race, the SEES factors had the greatest independent effect on specialty selection of all the variables in the study. In addition, as shown in Table 12, identifying as economically disadvantaged and being from the first generation to attend college both made significant contributions (p =.04, p = .01 respectively) to the model even when controlling for race/ ethnicity and gender. Additionally, gender, and race/ethnicity made a significant contribution to the second model. Model 1 represents the overall regression model with the predictors only, and Model 2 represents the overall regression model when controlling for race/ ethnicity and gender.

Table 12

SEES Predictor's Unique Contributions to Hypothesis 1 (N = 309)

	Model 1			Model 2		
Predictor	χ^2	df	p	χ^2	df	p
Languages spoken	10.89	9	.28	10.77	9	.29
Geographic area	20.31	18	.32	23.17	18	.18
Grew up in HPSA/MUA	10.7	7	.1	11.73	6	.07
Economically disadvantaged	13.38	6	.04	19.39	6	.004
First generation	15.94	6	.01	16.74	6	.01
Gender				10.62	3	.01
Race/ ethnicity				28.95	15	.02

Parameter estimate results showed language spoken, being a part of the first generation to attend college, identifying as economically disadvantaged, and growing up in either a HPSA or MUA had significant parameters when comparing primary care, surgical specialty, and unknown specialty with medical specialty. More specifically, those that spoke Spanish in addition to English had .16 times higher odds (p =.03) of having their specialty unknown compared to English speaker. Those who are from the first generation to attend college similarly had 1.46 times higher odds (p<.001) of having their specialty unknown compared to those who did not report if they were in the first generation to attend college. Students identifying as economically disadvantaged also had 11.66 times higher odds (p = .006) of having their specialty unknown compared to those whose childhood economic status indicators were not reported. Finally, PAs who grew up in a HPSA or MUA also had 1.49 times higher odds (p<.001) of having their specialty unknown compared to those whose status was not known. After controlling for gender and race/ ethnicity, parameter estimates results showed language spoken, being a part of the first generation to attend college, identifying as economically disadvantaged, growing up in a HPSA or MUA, and gender had significant parameters when comparing those who chose primary care, a surgical specialty, and whose specialty was unknown with those who chose a medical specialty. Interestingly, male PAs had 3.1 times higher odds (p =.008) of working in primary care compared to females. More detailed parameter estimations are shown in Table 13.

In summary, this result suggested that growing up in an economically disadvantaged environment, being a part of the first generation to attend college and growing up in a HPSA/MUA as well as the PA's gender and race/ethnicity were

significant predictors of initial specialty selection. Of these, only male gender emerged as a significant parameter for predicting practice in primary care.

Table 13

Parameter Estimates for SEES Variables (N = 309)

	Model 1				Model 2			
	OR	95% Confidence Interval		*p*	OR	95% Confidence Interval		*p*
Predictor		Lower	Upper			Lower	Upper	
Primary care versus medical specialty [a]								
Language spoken								
English and Spanish	.73	.2	2.63	.63	.58	.11	3.14	.53
English, Spanish and Other	.7	.07	7.14	.76	.79	.08	8.16	.85
English and Other	.24	.05	1.24	.09	.31	.06	1.69	.17
Ref. English Only	-	-	-	-	-	-	-	-
First generation to attend college								
Yes	1.95 E7	0	.c	.99	2.8 E7	0	.[c]	.99
No	4.43 E6	0	.c	.99	5.99 E5	0	.[c]	.99
Ref. Not reported	-	-	-	-	-	-	-	-
Geographic region of childhood home								
Rural	2.17	.12	37.8	.6	2.52	.13	49.25	.54
Small town	1.82	.43	7.73	.42	1.87	.4	8.84	.43
Large town	1.18	.29	4.75	.81	1.26	.28	5.61	.77
Middle sized city	.34	.03	3.61	.37	.26	.02	3.35	.3
Large city	5.88	.72	47.93	.1	5.55	.63	49.3	.12
Urban	1.98	0	.[c]	1	1.13		.[c]	.99
Ref. not reported	-	-	-	-	-	-	-	-
Economically disadvantaged								
Yes	.6	.09	3.83	.59	.32	.04	2.4	.27
No	.46	.13	1.61	.22	.41	.1	1.69	.22
Ref. not reported	-	-	-	-	-	-	-	-

Predictor	Model 1				Model 2			
	OR	95% Confidence Interval		*p*	OR	95% Confidence Interval		*p*
		Lower	Upper			Lower	Upper	
Grew up in HPSA/MUA								
Yes	2.66	0	-[c]	.99	2.05	0	.[c]	.99
No	1.04	0	-[c]	.99	7.82	0	.[c]	.99
Ref. not reported	-	-	-	-	-	-	-	-
Gender								
Male					2.91	1.22	6.94	.02
Ref. Female					-	-	-	-
Race/ ethnicity								
White, Non-Hispanic					.45	.07	2.92	.4
Hispanic					.94	.09	9.25	.96
Asian					.24	.02	2.29	.21
Black, Non-Hispanic					.85	.07	9.86	.9
Mixed race					3.12	.15	65.21	.46
Ref. not reported					-	-	-	-
Surgical Specialty vs Medical Specialty [a]								
Language Spoken								
English and Spanish	.98	.4	2.41	.96	1.16	.41	3.31	.78
English, Spanish and Other	1.19	.3	4.77	.81	1.31	.31	5.5	.72
English and Other	.75	.32	1.76	.51	1.03	.41	2.62	.95
Ref. English Only	-	-	-	-	-	-	-	-
First generation to attend college								
Yes	1.45	.11	19.34	.78	1.72	.12	25.61	.69
No	2.5	.22	29.06	.46	2.93	.23	37.3	.41
Ref. not reported	-	-	-	-	-	-	-	-

	Model 1				Model 2			
	OR	95% Confidence Interval		*p*	OR	95% Confidence Interval		*p*
Predictor		Lower	Upper			Lower	Upper	
Geographic region of childhood home								
Rural	5.13	0	.[c]	1	4.92	0	.[c]	1
Small town	1.82	.64	5.17	.26	1.83	.62	5.4	.28
Large town	2.04	.83	5.01	.12	2.23	.87	5.7	.09
Middle sized city	1.02	.3	3.4	.98	1.15	.33	3.99	.82
Large city	4.27	.8	22.7	.09	4.04	.74	22.05	.11
Urban	1.27	.23	6.95	.78	1.31	.23	7.33	.76
Ref. not reported	-	-	-	-	-	-	-	-
Economically disadvantaged								
Yes	1.38	.27	6.97	.7	1.07	.2	5.83	.94
No	1.14	.34	3.83	.83	.98	.27	3.54	.98
Ref. not reported	-	-	-	-	-	-	-	-
Grew up in HPSA/MUA								
Yes	.49	.02	12.7	.67	.44	.02	12.26	.63
No	.26	.02	3.46	.31	.22	.02	3.13	.26
Ref. not reported	-	-	-	-	-	-	-	-
Gender								
Male					1.82	.9	3.66	.09
Ref. female					-	-	-	-
Race/ ethnicity								
White, non-Hispanic					.69	.2	2.41	.56
Hispanic					.6	.12	3.01	.53
Asian					.29	.06	1.34	.11
Black, non-Hispanic					1.07	.16	7.23	.95
Mixed race					.34	.02	5.84	.46
Ref. not reported					-	-	-	-

	Model 1				Model 2			
	OR	95% Confidence Interval		*p*	OR	95% Confidence Interval		*p*
Predictor		Lower	Upper			Lower	Upper	
Unknown specialty versus medical specialty [a]								
Language spoken								
English and Spanish	.16	.03	.86	.03	.1	.01	.82	.03
English, Spanish and Other	.43	.04	4.52	.48	.49	.04	5.86	.58
English and other	.75	.28	2.01	.56	.53	.15	1.83	.31
Ref. English only	-	-	-	-	-	-	-	-
First generation to attend college								
Yes	1.46 E13	2.91 E13	7.31 E13	<.001	1.02 E13	1.70 E13	6.07 E13	<.001
No	1.04 E13	3.28 E13	3.27 E13	<.001	1.13 E13	2.99 E13	4.28 E13	<.001
Ref. not reported	-	-	-	-	-	-	-	-
Geographic region of childhood home								
Rural	4.12	0	.[c]	1	6.31	0	.[c]	1
Small town	1.35	.33	5.57	.68	2.41	.50	11.61	.27
Large town	.53	.11	2.49	.42	.58	.10	3.18	.53
Middle sized city	.57	.09	3.50	.54	.52	.07	3.77	.52
Large city	4.72	.56	39.42	.15	3.87	.40	37.76	.24
Urban	1.64	.21	12.48	.63	2.68	.27	26.51	.4
Ref. not reported	-	-	-	-	-	-	-	-
Economically disadvantaged								
Yes	11.66	2.02	67.42	.01	17.94	2.56	125.88	<.001
No	3.41	.81	14.34	.09	7.32	1.37	39.11	.02
Ref. Not reported	-	-	-	-	-	-	-	-
Grew up in HPSA/MUA								
Yes	1.49	9.59	2.32	<.001	2.57	1.35	4.89	<.001
No	2.01	2.01	2.01	-	1.39	1.39	1.39	-
Ref. not reported	-	-	-	-	-	-	-	-

	Model 1				Model 2			
	OR	95% Confidence Interval		*p*	OR	95% Confidence Interval		*p*
Predictor		Lower	Upper			Lower	Upper	
Gender								
Male					3.1	1.35	7.12	.01
Ref. female					-	-	-	-
Race/ ethnicity								
White, Non-Hispanic					3.60 E6	0	.c	.99
Hispanic					1.28 E7	0	.c	.99
Asian					1.12 E7	0	.c	.99
Black, Non-Hispanic					3.40 E7	0	.c	.99
Mixed race					.16	0	.c	1
Ref. not reported					-	-	-	

Note: OR =odds ratio associated with the effect of a one standard deviation increase in the odds of working in the specific specialty compared to a medical specialty.

[a] Medical Specialty is the reference variable. [b] This parameter is set to zero because it is redundant. [c] Floating point overflow occurred while computing this statistic. Its value is therefore set to system missing.

Hypothesis 2: Academic History is Predictive of Working in Primary Care

A multinomial logistic regression was performed to model the relationship between the subjects' initial specialty (primary care, medical, surgical, and unknown) and indicators representing the academic history of the PA. The academic history is described by indicators representing the academic conditions of the PA's high school as well as their undergraduate major, highest degree earned, and overall science, and non-science GPA.

The overall adjusted model was not statistically significant ($\chi 2$ (39, N = 309) = 45.10, p = .23) and the Nagelkerke R^2 was .16. When controlling for gender and race/ ethnicity, the overall model became statistically significant (χ^2 (57, N = 309) = 81.62, p =.02) and the Nagelkerke R^2 was .27 indicating that the predictors in the model accounted for 27% of the variance in specialty selection. These results demonstrate that the academic history indicators only had a significant independent effect on specialty selection when controlling for gender and race/ ethnicity. As shown in Table 14, identifying as educationally disadvantaged made a significant contribution (p =.01) to the model even when controlling for race/ ethnicity and gender. Additionally, both gender and race/ ethnicity made a significant contribution to Model 4. Model 3 represents the overall regression model with the predictors only, and Model 4 represents the overall regression model when controlling for race/ ethnicity and gender.

Table 14

Academic History Predictor's Unique Contributions to Hypothesis 2 (N = 309)

	Model 3			Model 4		
Predictor	χ^2	Df	*p*	χ^2	Df	*p*
Educ. Disadvantaged	13.97	6	.03	16.38	6	.01
Highest Degree Earned	7.67	6	.26	7.67	6	.26
Undergraduate Major	21.71	18	.25	21.66	18	.25
Overall GPA	2.53	3	.47	3.22	3	.36
Science GPA	2.97	3	.4	3.72	3	.29
Non-Science GPA	1.67	3	.65	1.49	3	.69
Gender				8.07	3	.05
Race/Ethnicity				28.66	15	.02

Parameter estimates comparing primary care to medical specialty showed that none of the parameters in the PA's academic history increased the odds of the PA working in primary care; however, race/ ethnicity, undergraduate major and gender had significant parameters when comparing surgical specialty and unknown specialty with medical specialty. More specifically, PAs who were Asian had .17 times higher odds (*p* =.04) of working in a surgical specialty than those whose race was not reported. Additionally, males had 3.13 times higher odds (*p* =.01) of having their specialty unknown compared to females. In the overall model, majoring in another applied science (e.g. exercise science, health science, engineering, and nutrition) had a 6.45 times higher odds (*p* =.03) of having their specialty unknown compared to those whose major was not otherwise categorized; however, this parameter was not significant when controlling for gender and race/ ethnicity. More detailed parameter estimations are showed in Table 15. In conclusion, while identifying as educationally disadvantaged, gender, and race/ ethnicity each made significant contributions to the model, there were no individual parameters that increased the odds of working in primary care.

Table 15

Parameter Estimates for Academic History Variables (N = 309)

	Model 3				Model 4			
	OR	95% Confidence Interval		*P*	OR	95% Confidence Interval		*p*
Predictor		Lower	Upper			Lower	Upper	
Primary care versus medical specialty [a]								
Educationally disadvantaged								
Yes	0	0	.[b]	.99	0	0	.[b]	.98
No	0	0	.[b]	.99	0	0	.[b]	.98
Ref. not reported	-	-	-	-	-	-	-	-
Highest degree earned								
None (3+3)	0	0	.[b]	.99	0	0	.[b]	.99
Bachelor	.59	.17	2.1	.42	.7	.19	2.65	.60
Ref. masters or doctorate	-	-	-	-	-	-	-	-
Undergraduate major								
Bio/Chem/Biochemistry	.77	.17	3.42	.73	.63	.13	30	.56
Psychology	.57	.07	4.44	.59	.41	.05	3.4	.41
Public Health	3.59	.28	45.26	.32	1.82	.12	27.79	.67
Other Natural Science	1.65	.14	19.05	.69	1.45	.12	17.82	.77
Other Social Science	0	0	.[b]	.98	0	0	.[b]	.98
Other Applied Science	1.61	.34	7.65	.55	1.51	.29	7.8	.63
Ref. Other	-	-	-	-	-	-	-	-
GPA								
Overall GPA	139.53	.01	2.26 E6	.32	989.61	.03	3.80 E8	.20
Science/Math GPA	.14	0	12.97	.39	.05	0	7.98	.25
Non-Science GPA	.07	0	22.09	.36	.05	0	25.82	.35
Gender								
Male					2.28	.86	6.02	.10
Ref. female					-	-	-	-

	Model 3				Model 4			
	OR	95% Confidence Interval		*P*	OR	95% Confidence Interval		*p*
Predictor		Lower	Upper			Lower	Upper	
Race/ ethnicity								
White, non-Hispanic					.58	.09	3.67	.56
Hispanic					2.02	.27	14.87	.49
Asian					.37	.04	3.24	.37
Black, non-Hispanic					0	0	.[b]	.98
Mixed race					8.61	.37	199.38	.18
Ref. not reported					-	-	-	-
Surgical specialty versus medical specialty [a]								
Educationally disadvantaged								
Yes	1.24	.35	4.43	.74	1.35	.35	5.25	.66
No	1.45	1.45	1.45	-	2.2	2.2	2.2	-
Ref. not reported	-	-	-	-	-	-	-	-
Highest degree earned								
None (3+3)	0	0	.[b]	.99	0	0	.[b]	.99
Bachelor	1.8	.54	5.98	.33	2.23	.64	7.78	.21
Ref. masters or doctorate	-	-	-	-	-	-	-	-
Undergraduate major								
Bio/Chem/Biochemistry	.68	.22	2.07	.49	.63	.19	2.04	.44
Psychology	.44	.09	2.01	.29	.38	.08	1.81	.22
Public Health	.59	.04	8.7	.7	.39	.02	6.22	.50
Other Natural Science	2.12	.36	12.45	.41	2.12	.34	13.03	.42
Other Social Science	.98	.21	4.54	.98	.8	.17	3.86	.78
Other Applied Science	1.44	.45	4.66	.54	1.33	.39	4.53	.65
Ref. Other	-	-	-	-	-	-	-	-

	Model 3				Model 4			
	OR	95% Confidence Interval		*P*	OR	95% Confidence Interval		*p*
Predictor		Lower	Upper			Lower	Upper	
GPA								
Overall GPA	64.73	.07	5,6821.4	.23	78.21	.06	97,471.68	.23
Science/Math GPA	.16	.01	4.46	.28	.16	0	5.13	.3
Non-Science GPA	.11	0	5.95	.28	.15	0	9.31	.37
Gender								
Male					3.37	1.6	.76	.22
Ref. female					-	-	-	-
Race/ ethnicity								
White, Non-Hispanic					.51	.14	1.87	.31
Hispanic					.82	.17	3.91	.81
Asian					.17	.03	.9	.04
Black, Non-Hispanic					.9	.12	6.68	.92
Mixed Race					1.03	.04	240	.98
Ref. not reported					-	-	-	-
Unknown specialty versus medical specialty [a]								
Educationally disadvantaged								
Yes	0	0	.[b]	.99	0	0	.[b]	.99
No	0	0	.[b]	.99	0	0	.[b]	.99
Ref. not reported	-	-	-	-	-	-	-	-
Highest degree earned								
None (3+3)	0	0	.[b]	.99	0	0	.[b]	.99
Bachelor	.55	.19	1.65	.29	.66	.21	2.07	.48
Ref. master or doctorate	-	-	-	-	-	-	-	-

	Model 3				Model 4			
	OR	95% Confidence Interval		*P*	OR	95% Confidence Interval		*p*
Predictor		Lower	Upper			Lower	Upper	
Undergraduate major								
Bio/Chem/Biochemistry	2.65	.52	13.61	.24	1.86	.32	10.64	.49
Psychology	2.95	.44	19.66	.26	3.67	.49	27.67	.21
Public Health	4.65	.23	92.4	.31	5.3	.19	146.08	.32
Other Natural Science	1.95	.1	38.26	.66	1.67	.08	36.63	.74
Other Social Science	1.08	.08	14.24	.95	.87	.06	12.28	.92
Other Applied Science	6.54	1.2	35.58	.03	5.63	.93	33.88	.06
Ref. Other	-	-	-	-	-	-	-	-
GPA								
Overall GPA	.62	0	297.69	.88	.31	0	173.88	.72
Science/Math GPA	3.19	.16	64.82	.45	4.73	.21	107.45	.33
Non-Science GPA	.39	.01	20.94	.64	.95	.01	63.58	.98
Gender								
Male					3.13	1.35	7.28	.01
Ref. female					-	-	-	-
Race/ ethnicity								
White, Non-Hispanic					670,412.08	0	.[b]	.97
Hispanic					830,094.42	0	.[b]	.97
Asian					960,453.56	0	.[b]	.97
Black, Non-Hispanic					2.052 E6	0	.[b]	.97
Mixed race					.15	0	.[b]	10
Ref. not reported					-	-	-	-

Note. OR =odds ratio associated with the effect of a one standard deviation increase in the odds of working in the specific specialty compared to a medical specialty.

[a] Medical Specialty is the reference variable. [b] This parameter is set to zero because it is redundant.

Hypothesis 3: Work Experience Prior to PA School is Predictive of Practice in Primary Care

A multinomial logistic regression was performed to model the relationship between the initial specialty (primary care, medical, surgical, and unknown) and indicators representing the work history of the PA prior to PA school. This includes variables describing if the PA was ever licensed in a medical profession, the number of years between PA school and their last earned degree, and if they had a career prior to coming to PA school.

The overall adjusted model was not statistically significant (χ^2 (9, N = 309) = 14.53, p = .11) with a Nagelkerke R^2 of .05. When controlling for gender and race/ethnicity, the overall model became statistically significant (χ^2 (27, N = 309) = 52.09, p = .003) and the Nagelkerke R^2 = .17 indicating that the predictors in the model accounted for 17% of the variance in specialty selection. These results demonstrate that the work history indicators in the model only had a significant independent effect on specialty selection when controlling for gender and race/ ethnicity. As shown in Table 16, having professional work experience prior to PA school still made a significant contribution (p =.01) to the model even when controlling for gender and race/ ethnicity. Additionally, both gender and race/ethnicity made significant contributions to Model 6. Model 5 represents the regression model with the predictors only and Model 6 represents the regression model when controlling for gender.

Table 16

Work History Predictor's Unique Contributions to Hypothesis 3 (N = 309)

	Model 5			Model 6		
Predictor	χ^2	Df	*p*	χ^2	Df	*p*
Years since last degree	5.26	3	.15	6.48	3	.09
Professional work experience	11.85	3	.01	11.13	3	.01
No. of medical license	1.89	3	.6	2.52	3	.47
Gender				13.33	6	.004
Race/ ethnicity				26.04	15	.04

Parameter estimate results showed having previous work experience and gender each had significant parameters when comparing primary care and unknown specialty with medical specialty. More specifically, those that were male had 3.01 times higher odds (p =.01) of working in primary care compared to females. PAs who had previous professional work experience had 2.66 times higher odds (p =.05) of having their specialty unknown compared to those with no prior professional work experience. Furthermore, males had 3.58 times higher odds (p< .001) of having their specialty unknown compared to those who were female. More detailed parameter estimations were showed in Table 17.

In summary, these results suggest that having professional experience prior to PA school, gender, and race/ethnicity were significant variables to predict the PA's specialty selection; however, similar to Model 2 only gender (male) significantly increased the odds of the PA working in primary care.

Table 17

Parameter Estimates for Work History Variables (N = 309)

	Model 5				Model 6			
	OR	95% Confidence Interval		*p*	OR	95% Confidence Interval		*p*
Predictor		Lower	Upper			Lower	Upper	
Primary care versus medical specialty [a]								
Years since last degree	.93	.79	1.08	.33	.91	.77	1.07	.26
Professional work experience								
Yes	1.57	.54	4.59	.41	1.2	.38	3.75	.76
Ref. No	-	-	-	-	-	-	-	-
Number of medical licenses	.93	.48	1.79	.82	.84	.42	1.67	.62
Gender								
Male					3.01	1.31	6.92	.01
Ref. female					-	-	-	-
Race/ ethnicity								
White, Non-Hispanic					.73	.14	3.89	.72
Hispanic					1.66	.25	11.05	.6
Asian					.34	.05	2.61	.3
Black, Non-Hispanic					2.48	.28	22.22	.42
Mixed Race					1.98	.15	26.59	.6
Ref. not reported					-	-		-
Surgical Specialty vs Medical Specialty [a]								
Years since last degree	1.07	.97	1.17	.17	1.06	.96	1.17	.24
Professional work experience								
Yes	.45	.18	1.16	.1	.39	.15	1.04	.06
Ref. No	-	-	-	-	-	-	-	-
Number of medical licenses	.91	.55	1.51	.71	.87	.52	1.46	.6

	Model 5				Model 6			
	OR	95% Confidence Interval		*p*	OR	95% Confidence Interval		*p*
Predictor		Lower	Upper			Lower	Upper	
Gender								
Male					1.75	.87	3.52	.12
Ref. female					-	-	-	-
Race/ ethnicity								
White, non-Hispanic					.64	.2	2.07	.46
Hispanic					.89	.21	3.79	.88
Asian					.25	.06	1.05	.06
Black, non-Hispanic					1.23	.21	7.33	.82
Mixed race					.45	.03	6.45	.56
Ref. not reported					-	-	-	-
Unknown specialty versus medical specialty [a]								
Years since last degree	.95	.85	1.07	.43	.92	.81	1.05	.21
Professional work experience								
Yes	2.75	1.1	6.86	.03	2.66	.98	7.21	.05
Ref. No	-	-	-	-	-	-	-	-
Number of medical licenses	.64	.33	1.23	.18	.57	.28	1.16	.12
Gender								
Male					3.58	1.64	3.58	<.001
Ref. Female					-	-	-	-
Race/ ethnicity								
White, non-Hispanic					5.63 E7	0	.[b]	1
Hispanic					6.56 E7	0	.[b]	1
Asian					8.20 E7	0	.[b]	1
Black, non-Hispanic					3.02 E8	0	.31	1
Mixed race					.31	.31	-	-
Ref. not reported					-	-		-

Note. OR =odds ratio associated with the effect of a one standard deviation increase in the odds of working in the specific specialty compared to a medical specialty.

[a] Medical Specialty is the reference variable. [b] Floating point overflow occurred while computing this statistic. Its value is therefore set to system missing.

Hypothesis 4: Having Pre-PA School Exposure to Primary Care is Predictive of Practice in Primary Care

A multinomial logistic regression was performed to model the relationship between the initial specialty (primary care, medical, surgical, or unknown specialty) and indicators representing the PA's exposure to primary care prior to PA school. This includes indicators that describe if the PA had health related or PCE in primary care and if they shadowed a physician, PA, or NP in primary care. The number of hours spent participating in each experience was theoretically hypothesized to contribute to initial specialty selection; however, preliminary analysis demonstrated skewed results; therefore, the number of hours were dropped from the final models because the data available in the sample did not represent the theoretical model.

The overall adjusted model was not statistically significant (χ^2 (9, N = 309) = 12.85, p = .17) and Nagelkerke R^2 = .17. When controlling for gender and race/ ethnicity, the overall model became statistically significant (χ^2 (27, N = 309) = 48.93, p = .01) with a Nagelkerke R^2 = .16 indicating that the predictors in the model accounted for 16% of the variance in specialty selection. These results demonstrate that when controlling for gender and race, work history indicators have a significant independent effect on specialty selection. Interestingly, as shown in Table 18, having PCE in primary care made a significant contribution to the overall model (p =.04), but not when controlling for gender and race/ethnicity (p =.06). Additionally, both gender and race/ethnicity made significant contributions to Model 8. Model 7 represents the regression model with the predictors only, and Model 8 represents the regression model when controlling for gender.

Table 18

Primary Care Exposure's Unique Contributions to Hypothesis 4 (N = 309)

	Model 7			Model 8		
Predictor	χ^2	df	*p*	χ^2	df	*p*
HRE in PC	.72	3	.87	.4	3	.94
PCE in PC	8.37	3	.04	7.39	3	.06
Shadowed a PCP	3.26	3	.35	3.72	3	.29
Gender				11.40	3	.01
Race/ ethnicity				25.57	15	.04

Notes. HRE = Health related experience, PC = Primary Care, PCE = Patient care experience, PCP = Primary Care Provider

Parameter estimate results showed gender had significant parameters when comparing primary care and unknown specialty with medical specialty. More specifically, those PAs that were male had 2.55 times higher odds (p =.02) of working in primary care compared to females. Additionally, PAs who were male also had 3.25 times higher odds (p<.001) of having their specialty unknown compared to females. More detailed parameter estimations are shown in Table 19. In summary, only gender and race/ethnicity made significant contributions to the model. Similar to Models 2 and 6; male gender was the only parameter that significantly increased the odds of working in primary care.

Table 19

Parameter Estimates for Pre-PA School Primary Care Exposure Variables (N = 309)

	Model 7				Model 8			
	OR	95% Confidence Interval		*p*	OR	95% Confidence Interval		*p*
Predictor		Lower	Upper			Lower	Upper	
Primary care versus medical specialty [a]								
HRE in primary care								
Yes	.98	.19	4.91	.98	1.02	.19	5.41	.98
Ref. No	-	-	-	-	-	-	-	-
PCE in primary care								
Yes	.71	.15	3.44	.67	.71	.14	3.61	.68
Ref. No	-	-	-	-	-	-	-	-
Shadowed a PCP								
Yes	.56	.2	1.56	.27	.56	.19	1.64	.29
Ref. No	-	-	-	-	-	-	-	-
Gender								
Male					2.55	1.13	5.76	.02
Ref. Female					-	-	-	-
Race/ ethnicity								
White, non-Hispanic					.79	.15	4.17	.78
Hispanic					1.76	.27	11.62	.56
Asian					.37	.05	2.80	.34
Black, non-Hispanic					2.22	.24	20.28	.48
Mixed Race					2.42	.18	31.88	.5
Ref. not reported					-	-	-	-

	Model 7				Model 8			
	OR	95% Confidence Interval		*p*	OR	95% Confidence Interval		*p*
Predictor		Lower	Upper			Lower	Upper	
Surgical specialty versus medical specialty [a]								
HRE in primary care								
Yes	.90	.25	3.18	.87	.95	.26	3.45	.94
Ref. No	-	-	-	-	-	-	-	-
PCE in primary care								
Yes	1.40	.54	3.63	.49	1.47	.55	3.92	.45
Ref. No	-	-	-	-	-	-	-	-
Shadowed a PCP								
Yes	1.38	.73	2.62	.32	1.42	.74	2.75	.29
Ref. No	-	-	-	-	-	-	-	-
Gender								
Male					1.81	.92	3.56	.08
Ref. Female					-	-	-	-
Race/ ethnicity								
White, non-Hispanic					.84	.26	2.69	.76
Hispanic					.94	.22	3.99	.93
Asian					.33	.08	1.40	.13
Black, non-Hispanic					1.37	.23	8.28	.73
Mixed race					.47	.03	70	.58
Ref. Not reported					-	-	-	-
Unknown specialty versus medical specialty [a]								
HRE in primary care								
Yes	1.62	.45	5.65	.46	1.49	.38	5.83	.57
Ref.	-	-	-	-	-	-	-	-

	Model 7				Model 8			
	OR	95% Confidence Interval		*p*	OR	95% Confidence Interval		*p*
Predictor		Lower	Upper			Lower	Upper	
PCE in primary care								
Yes	0	0	0	-	0	0	.[b]	1
Ref. No	-	-	-	-	-	-	-	
Shadowed a PCP								
Yes	1.05	.46	2.37	.91	1.4	.59	3.29	.45
Ref. No	-	-	-	-	-	-	-	-
Gender								
Male					3.25	1.51	6.95	<.00
Ref. Female					-	-	-	-
Race/ ethnicity								
White, non-Hispanic					4.78	0	.[b]	1
Hispanic					7.19	0	.[b]	1
Asian					6.88	0	.[b]	1
Black, non-Hispanic					3.16	0	.[b]	1
Mixed race					.29	.29	.29	-
Ref. not reported					-	-	-	-

Note. OR =odds ratio associated with the effect of a one standard deviation increase in the odds of working in the specific specialty compared to a medical specialty.

[a] Medical Specialty is the reference variable. [b] Floating point overflow occurred while computing this statistic. Its value is therefore set to system missing.

Hypothesis 5: Having Pre-PA School Volunteer Experience with Underserved Populations is Predictive Of Practice in Primary Care

A multinomial logistic regression was performed to model the relationship between the initial specialty (primary care, medical, surgical, and unknown specialty) and if the PA volunteered in a health-related capacity in an underserved community. The number of hours a PA spent volunteering in this capacity was theoretically hypothesized to contribute to initial specialty selection; however, preliminary analysis demonstrated skewed results; therefore, the number of hours was dropped from the final models because the data available was not representative of the theoretical model.

The overall adjusted model was not statistically significant (χ^2 (3, N = 309) = .26, p =.26) with Nagelkerke R^2 =.001. When controlling for gender and race/ ethnicity, the overall model became statistically significant (χ^2 (21, N = 309) = 37.22, p =.02) and the Nagelkerke R^2 = .02 indicates that the predictors in the model accounted for 2% of the variance in specialty selection. These results demonstrate that when controlling for gender and race, the model accounts for a very small independent effect on specialty selection. In addition, as shown in Table 20, only gender and race/ethnicity made significant contributions to Model 1. Model 9 represents the regression model with the predictors only, and Model 10 represents the regression model when controlling for gender.

Table 20

Health Related Volunteer Work's Unique Contributions to Hypothesis 5 (N = 309)

	Model 9			Model 10		
Predictor	χ^2	df	*P*	χ^2	Df	*p*
Medical volunteer work	.26	3	.97	.23	3	.97
Gender				11.5	3	.01
Race/ ethnicity				26.14	15	.04

Parameter estimate results showed gender and race/ ethnicity had significant parameters when comparing primary care and unknown specialty with medical specialty. More specifically, those that were male had 2.6 times higher odds (p =.02) of working in primary care compared to females. Additionally, PAs who were male also had 3.21 times higher odds (p =.002) of having their specialty unknown compared to females. Finally, White non-Hispanic, Hispanic, and Asian PAs each had a significantly higher odd of being in the unknown category than those that did not identify their race/ ethnicity. More detailed parameter estimations are shown in Table 21. In summary, only gender and race/ ethnicity made significant contributions to the model and male gender was again the only parameter with an increased odd of working in primary care.

Table 21

Parameter Estimates for Pre-PA Health Related Volunteer Work Variables (N = 309)

	Model 9				Model 10			
	OR	95% Confidence Interval		*P*	OR	95% Confidence Interval		*p*
Predictor		Lower	Upper			Lower	Upper	
Primary care versus medical specialty [a]								
Medical volunteer work								
Yes	.8	.34	1.92	.62	.82	.33	2.02	.67
Ref. No	-	-	-	-	-	-	-	-
Gender								
Male					2.6	1.16	5.85	.02
Ref. Female					-	-	-	-
Race/ ethnicity								
White, Non-Hispanic					.84	.16	4.36	.83
Hispanic					1.88	.29	12.26	.51
Asian					.41	.06	3.04	.38
Black, Non-Hispanic					2.54	.29	22.59	.4
Mixed Race					2.35	.18	30.9	.52
Ref. not reported					-	-	-	-
Surgical specialty versus medical specialty [a]								
Medical volunteer work								
Yes	.93	.49	1.77	.82	1	.52	1.94	.99
Ref. No	-	-	-	-	-	-	-	-
Gender								
Male					1.74	.89	3.39	.11
Ref. Female					-	-	-	-

	Model 9				Model 10			
	OR	95% Confidence Interval		*P*	OR	95% Confidence Interval		*p*
Predictor		Lower	Upper			Lower	Upper	
Race/ ethnicity								
White, non-Hispanic					.74	.24	2.34	.61
Hispanic					.84	.2	3.5	.81
Asian					.29	.07	1.21	.09
Black, non-Hispanic					1.15	.2	6.74	.88
Mixed race					.46	.03	6.59	.57
Ref. not reported					-	-	-	-
Unknown specialty versus medical specialty [a]								
Medical volunteer work								
Yes	.93	.43	2.03	.86	1.03	.45	2.32	.95
Ref. No	-	-	-	-	-	-	-	-
Gender								
Male					3.21	1.52	6.81	.0002
Ref. Female					-	-	-	-
Race/ Ethnicity								
White, Non-Hispanic					5.68 E7	1.51 E7	2.14 E8	<.001
Hispanic					7.68 E7	1.40 E7	4.20 E8	<.001
Asian					7.92 E7	1.82 E7	3.45 E8	<.001
Black, non-Hispanic					3.65 E8	3.65 E8	3.65 E8	-
Mixed race					.38	.38	.38	-
Ref. Not reported					-	-		-

Note. OR =odds ratio associated with the effect of a one standard deviation increase in the odds of working in the specific specialty compared to a medical specialty.

[a] Medical Specialty is the reference variable.

Chapter 6: Discussion

There is a shortage of PCPs in the United States, and PAs have been suggested as a potential solution to this problem (DHHS, 2016). The PA profession was developed to facilitate the rapid deployment of high functioning healthcare professionals to work with physicians to increase access to healthcare services, particularly, primary care in areas where the physician shortage was greatest (Hooker, Cawley, and Asprey, 2010). Despite this intent, PA workforce data show that PAs are increasingly working in medical and surgical specialties, similar to physicians (Smith, 2017). The conceptual framework used in this study to explore factors that are hypothesized to influence a PA to select primary care as their initial specialty was based on the Bennett and Phillips' (2010) model of physician specialty selection. This model describes several domains that influence physicians when selecting their practice specialty such as the healthcare environment, lifestyle considerations, medical school experience, and the pre-medical school period. Using the framework developed by Bennett and Phillips, the existing PA workforce literature was reviewed which suggests that those PAs who work in primary care are most likely to be influenced by their pre-PA school experiences. Therefore, this study sought to identify which pre-PA school experiences influence the decision to work in primary care.

To operationalize this hypothesis, the PA's pre-PA school experience was described by several domains, including the social, economic, and environmental conditions the PA grew up in as well as their academic and pre-PA school professional experiences. Additionally, the extent to which they were exposed to primary care practice and to which they engaged in health related volunteer work in underserved communities

were further studied to quantify their influence on a PA's decision to work in primary care.

Study Design

Many of the existing PA workforce studies examining predictors of primary care practice have used practicing PAs as their study subjects. Therefore, most researchers ask participants to recall the factors that influenced initial specialty selection which may have been several years prior to when the study was conducted. This design introduces a risk for recall bias as any responses may have been influenced by events and experiences that have occurred since the event, particularly within their experience as practicing PAs. Other PA primary care workforce studies used PA students as the study participants. While these studies better capture the decision-making process for initial specialty compared to studies using practicing PAs, the outcome variable, intention to practice, has been shown to be only a moderate predictor of actual practice (Shannon & Jackson, 2011).

Additionally, the literature contains very few longitudinal studies as most are cross sectional studies (Coplan et al., 2013; Muma et al., 2010). This study sought to address some of the limitations of cross-sectional studies by using a longitudinal study design with multiple PA cohorts. Some of the advantages of using a longitudinal design include improved validity, the ability to monitor changes and trends in the characteristics of the target population at both a group and individual level, as well as allow you to use the study data to establish a sequence of events when looking at the time process. A longitudinal design that minimized the risk of recall bias was achieved by using the PA's application to PA school, submitted CASPA, a comprehensive record of the PA's Pre-PA

school experience captured at the time they applied to PA school. Furthermore, the data representing the pre-PA school experience were matched with the initial specialty that the PA worked in eliminating the need to use intention to practice as the outcome variable. Lastly, seven cohorts were used in the study to capture workforce trends over nearly a decade.

Trends in Specialization

The longitudinal sample used in this study had a lower percentage of PAs choosing primary care as their initial specialty (12.9%) than the national PA workforce (25% of PAs work in primary care); however, the percentage of the 2019 RUPAP cohort going into primary care was 2.8%, concluding an upward trend each year in the graduating cohort from a low of 6.8% in 2015 (NCCPA, 2020). Similar to the national PA workforce, the percentage of PAs choosing surgical specialties as their initial specialty has increased over the seven years included in the study; however, there was a higher percentage of the study sample that chose surgery as their initial specialty (27.5%) than there were PAs working in surgery nationwide (23.7%). In this study, most of the graduates were from the New Jersey/ New York area and stayed in the greater tri-state area after graduation. The tri-state area (New York, New Jersey, Connecticut) is a mostly urbanized region of the country with a higher cost of living which may contribute to the need for a higher salary that can be achieved in a surgical specialty. Additionally, the cost of PA school increased significantly over the course of the study period, again supporting the argument of the need for graduates to earn a higher salary. According to the 2013 and 2019 PAEA Annual Program Reports, the average tuition at a public university (in-state tuition) rose by 35.5% between academic year 2013–14 and 2018–19 from $38,794 to

$52,585. Additionally, the average cost of tuition at a private university rose 27.6% over the same period from $74,475 to $95,058 (PAEA, 2020b).

Additionally, the job availability for PAs in primary care in recent years needs to be considered. Rana et al. (2020) demonstrated that the number of primary care PA jobs is lower than the number of medical and surgical subspecialty jobs. In 2014, 18% of total PA jobs posted were for primary care positions and only 19% in 2016. Additionally, the number of medical specialty PA positions rose from 23% to 30% between 2014 and 2016 and surgical specialty positions remained stable (29% in 2014 and 26% in 2016). The authors hypothesized that despite the increase demand by patients for primary care services, facilitated by expanding coverage of those services by the ACA, market demand for PAs remain highest in specialties with the highest PA physician salary ratio such as orthopedics and neurosurgery, consistent with the findings of Morgan et al. (2016). Furthermore, data from the AAPA suggested that PAs in urban areas are more likely to work in medical (49%) and surgical specialties (27%) than primary care (21%), similar to the trends found in this study (Smith, 2018). This trend is likely overrepresented in the study population as the geographic areas RUPAP graduates tend to work in are saturated with large academic and tertiary healthcare centers relative to the rest of the country.

Some will also argue that there is not a true shortage of PCPs; rather, a maldistribution to urban and suburban areas. As noted by a study conducted by the Agency for Health Research and Quality (AHRQ, 2012), PAs and NPs working in primary care are mostly likely to do so in a rural area which may reflect this maldistribution of physicians. This increase in demand in rural areas and saturation of physicians in suburban and urban areas may therefore impact the demand and number of

job opportunities for primary care PAs in the geographical areas RUPAP graduates tend to work (AHRQ, 2012).

Study Sample

All PAs included in this study are graduates of RUPAP. While the number of cohorts as well as the longitudinal design are all strengths of this study, the study sample only included PAs from a single institution which introduces the risk of convenience sampling bias. Despite this risk, many of the demographics of the study sample were comparable to the general PA student population in terms of gender, average age, and languages spoken. With respect to race and ethnicity, the overall study sample was more diverse than the general PA student population; however, it should be noted that the RUPAP sample became more racially and ethnically diverse as the years progress. In the first cohort included in the study (2013) the percentage of the sample that was White, non-Hispanic was 70%; however, in 2019, the final cohort included, the percentage was 56.3% (compared with 64.7% nationally). With regards to gender, the percentage of the study sample that was female (74.1%) was similar to the national PA student population (74.8%) (PAEA, 2020a). The average age of a study subject when they started PA school was 24.8 (*SD* = 4.9), similar to the average age nationally for a PA student which is 25.6 (*SD* = 4.7). One area where the sample is skewed, however, is the geographic origins of students. Approximately 75% of the study sample originates from a state in the Middle Atlantic region compared with 21.9% of all first year PA students in 2019 (PAEA, 2020a). This is important to acknowledge because this study examines the influence of the pre-PA school experience and the experience of someone in the Middle Atlantic states is likely to be different than those in other regions of the country. Overall, there are

enough demographic similarities between the sample population and the national PA student population demographically contribute to the study's external validity and suggests the findings may be generalizable.

Gender

Gender (female), race/ ethnicity (Hispanic), growing up in a household with a low income, and age (older than 40 years old) have been shown in the PA workforce literature to be associated with working in primary care and were the first variables explored in this study (Coplan et al., 2013; Muma et al., 2010). While identifying as female has been shown in several studies to be associated with working in primary care, the specific mechanisms of why this has been observed is not well defined, has largely been speculative, and based on dated stereotypes (Hedden et al., 2014). The results of this study further support that a PA's gender is associated with initial specialty selection. Furthermore, gender made a unique significant contribution in all five regression models. The findings of this study; however, differ from previous primary care workforce studies because in 4 out of the 5 regression models, males, not females, had higher odds of working in primary care than a medical specialty. Despite the results from the regression models, like past studies, it was noted in this study also that there were twice as many females that went into primary care than males in the study sample. Further studies which examine the role of gender on initial specialty selection to see if the findings of this study represent a regional trend of female specialty selection that differs from the national sample or whether there is something unique about males who chose to attend Rutgers.

Race/ Ethnicity

Race and ethnicity, specifically identifying as Hispanic or Black, has been demonstrated in the PA workforce literature to be associated with working in primary care (Muma et al., 2010) as well as predictive of working in primary care (Coplan et al., 2013). Physician workforce studies show similar trends and have furthermore begun to examine why this may be the case. Hypotheses include both patient demand reasons as well as clinician preference. From the patient's perspective, patients prefer to see clinicians whom they perceive to have similar lived experiences as themselves. This is likely because of cultural and language congruence with the clinician (Keith et al., 1985; Komaromy et al., 1996; Saha, 2014). Additionally, non-White patients were more likely to note that they did not receive culturally competent care from White physicians, again supporting the findings that suggest cultural congruence was important to patients (Blewett et al., 2019). This all creates a demand for URM clinicians in primary care which may be one reason we observe this trend.

Not only are there perceived benefits of having cultural and language congruence, but there are also some improved outcomes. In a framework developed by Saha and Shipman (2006) that looks at the ways in which patients, particularly patients who are racial and ethnic minorities, benefit from a more diverse workforce, the authors noted that when there is a greater likelihood of race, ethnic, and language concordance between the patient and the clinician, this increases the odds of the patient having an improved trust in the healthcare system, which has traditionally been set up to be run by White clinicians and address the needs of White patients.

Additionally, studies have demonstrated that primary care clinicians are most likely to see their work in medicine as a "calling" or have a strong sense of wanting to connect with a community for the long term (Halasy et al., 2012; Kao & Jager, 2018). In a landmark study examining clinicians who were most likely to work in underserved communities in primary care, Pathman et al. (2012) found that clinicians who stayed the longest were found to be working in communities with patients that were similar to where they grew up. Urban HPSAs are generally populated with racial and ethnic minorities. Furthermore, there are a growing population of Hispanic patients in rural areas also likely to be designated as a HPSA. It would, therefore, be logical to conclude that there may be a stronger desire by URM clinicians from HPSAs to work in primary care with patient populations who may have a similar lived experience.

This study did not show the PA's race/ ethnicity to be significantly associated with initial specialty selection. In all the regression models, race and ethnicity did make significant contributions to the model. Additionally, no specific race/ ethnicity increased the odds of the PA working in primary care compared to medical specialty. While this is different from early work, there are several possible reasons for this finding. The first may be a result of the study demographics. Aside from the 2019 cohort, the percentage of each graduating cohort that identified as Hispanic was less than 10% (less than 4–5 PAs per year). Therefore, the total number of Hispanic PAs included in this study may have been too low to establish a significant association. Furthermore, the distribution of initial specialties in this small sample of Hispanic students was evenly distributed between medical specialty ($N = 11$), primary care ($N = 8$), and surgical specialty ($N = 8$). Similar trends were observed for Black PAs in the sample, with approximately 5% of each cohort

identifying as Black, non-Hispanic. Like Hispanic PAs in the sample, the specialty distributions were evenly distributed. Furthermore, as noted previously, the majority of PAs in the study sample work in urban and suburban areas in the northeast where the number of primary care jobs is less. Therefore, qualitative studies are needed to understand the association between race/ ethnicity and initial specialty selection. Specifically, it would be interesting to study individuals whom the literature would identify as most likely to work in primary care and find out what caused them to not choose primary care as their initial specialty. As there is robust theoretical and empirical data to suggest a relationship between race/ethnicity and primary care, this relationship requires further study.

Age

Coplan et al. (2013) noted that there was an association between PAs who were over 40 years old and working in primary care. This study's results did not demonstrate a significant association between age and initial specialty selection. The findings of Coplan et al. (2013) are unique and may represent the portion of the PA workforce who entered practice when primary care was a more common choice for PAs before the recent downward trend started. One reason why this study may not have found this association is because the mean age of PAs when they applied to PA school was 24.8 years and the number of PAs greater than 40 years old when they applied only accounted for 2.2% of the sample.

Overall, there is strong evidence from the literature that race/ ethnicity and gender are known predictors of working in primary care in both the physician and PA workforce literature. Age, by contrast, was only found in a limited number of studies and it is not

well developed why this was found. For this reason, it was decided to also control for race/ ethnicity, along with gender, in the regression models.

Social, Environmental, and Economic Status

The physician workforce literature has demonstrated a strong relationship between growing up in a low SES and working in primary care; therefore, it was hypothesized that PAs that had the lived experience of coming from communities that are most likely to face primary care shortages were hypothesized to have the greatest influence on instilling that sense of mission to partner with communities that allows a PA to choose primary care as a specialty despite economic and professional status parity disparities.

Bivariate analysis showed that there was a significant association between being economically disadvantaged, from a HPSA/MUA, or being the first generation to attend college and initial specialty selection. Regression modeling showed that SEES accounted for 39% of the variation in initial specialty selection, when controlling for gender and race/ ethnicity, the largest of any group of variables in the study. More specifically, identifying as economically disadvantaged, being a part of the first generation to attend college, gender, and race/ ethnicity each made significant contributions to the model. Of these, only gender, specifically male PAs, were associated with higher odds of working in primary care than medical specialty.

Overall, these findings suggest that environmental experiences, specifically those that contribute to one's social and economic status, made the greatest impact on initial specialty selection. Having lower family income, living in low-income environments (as represented by the variable "economically disadvantaged") and being from the first

generation to attend college all represent circumstances that increase the chance that the PA experienced issues with access to healthcare growing up. The literature suggests that clinicians are likely to work with populations and areas not dissimilar from themselves; therefore, it would have been expected that (in addition to physician literature suggesting similar) growing up in a HPSA/MUA, areas that represent low access to care, to be associated with specialty selection (Pathman et al., 2012). This may be because of the relatively low number of individuals that were from HPSAs and MUAs. Of note, of all the PAs who identified as economically disadvantaged, 32% had their specialty unknown.

Additionally, workforce studies suggest that those from rural areas are most likely to work in rural practice where primary care jobs are abundant (Smith et al., 2012; Yuen & Lessard, 2018). It can therefore be hypothesized, based on the concept that experiencing low access to primary care would be a predictor of practice in primary care, that those from either rural, small town, or urban communities would be more likely to work in primary care. Again, the proportion of the study population from rural, small town, and urban populations was low, 1.3%, 12.9%, and 3.6% respectively. Similar to the HPSA/ MUA question, nearly 50% of the study sample did not provide this data on the application or it was not asked (for the class of 2013 and 2014).

This study finds that the lived experiences of PAs, including variables such as race/ ethnicity, gender, if they were economically and educationally disadvantaged, from the first generation to attend college, all contributed to the initial specialty of the PA. This is particularly important for considering factors for not only working in primary care, but more specifically primary care in communities with lower access to primary care services

(HPSAs/ MUA). These findings are congruent with the findings of Pathman et al. (2012) and Smith et al. (2012) suggesting clinicians are most likely to work in areas and populations that are similar to themselves. Therefore, this may give insight into demographics of PAs who are most likely to work in MUAs/HPSAs. While this study was different from most in finding that male gender was predictive of working in primary care, it is largely in line with existing PA and physician workforce literature that suggests that SES plays a role in initial specialty selection. Future work is needed, however, via qualitative work to better understand the mechanisms of these observed relationships and in what ways they influence initial specialty selection.

Academic History

The PA's academic history prior to PA school, was hypothesized to influence initial specialty selection. Bivariate analysis demonstrated that identifying as educationally disadvantaged was associated with initial specialty selection. Regression modeling, when controlling for race and ethnicity, found that none of the variables in the academic history domain significantly increased the odds of working in primary care. This further supports the findings of the SEES regression models that suggests that the lived experience may have the greatest impact on specialty selection.

There are a few considerations to discuss when contextualizing these findings. In the study sample, there was little variation in terms of degree earned, major, and GPA within the study sample, and over 80% of PAs had a bachelor's degree, over 75% majored in biology, chemistry, or another applied science (only 2% majored in public health), and each of the GPA categories had a small (.26–.29) standard deviation. Each of these descriptors are similar to the overall PA student population. Additionally, it is not

surprising that most PAs have an undergraduate major in biology, chemistry, or another applied science given that PA school follows the traditional medical model of clinician training, heavily rooted on the physical and biological manifestation of disease, thus attracting those who have an interest in biology and chemistry. However, PA school will also often incorporate many of the elements that the traditional nursing model of education has, including an emphasis on thinking of the whole person and how disease will impact the whole life. Despite this somewhat hybrid approach, the pre-requisites for entry to PA school mirror medical school, requiring proficiency in advanced biological classes for admission. This model makes it inherently a more attractive career path for those with strong academic preparation in the biological sciences to apply to PA school without the need for additional post baccalaureate classes. While the hypothesis that recruiting those with non-science degrees that may instill an understanding of the value of primary care for communities, such as public health, have theoretical validity (Cawley et al., 2011), there is a need for some expertise in the biological sciences to be successful in PA school. Therefore, additional attention to recruiting those with a public health background may have a limited benefit on any significant reduction in the primary care clinician shortage.

While none of the predictors within the academic history model individually increased the odds of working in primary care compared to a medical specialty, the results continue to suggest that environmental experiences that contribute to the PA having a lower SES, including the PA's high school educational environment, play a meaningful role in initial specialty selection.

Work History

The professional experience of a PA prior to starting PA school was hypothesized to contribute to initial specialty selection. Bivariate analysis demonstrated that none of the variables in this domain were associated with initial specialty selection. In the regression models, only male gender increased the offs of working in primary care. Interestingly, having prior work experience increased the odds of being in the unknown specialty category.

There are several considerations to discuss when interpreting these results. The first is that having a career before PA school may actually be associated with a financial disincentive to work in primary care. Those who change careers may need to retake courses to refresh on the subject matter before beginning PA school. Additionally, some may require post-baccalaureate classes to meet the prerequisite requirements if their undergraduate course of study did not require a heavy biology and chemistry course load. For example, if someone majored in business, they would have approximately 10 additional courses they would need to take to qualify to apply to PA school. Additionally, some schools require GREs for admission, adding additional costs to the process of eligibility. Therefore, the total cost of attending PA school, beyond direct PA school tuition costs, may serve as a disincentive to work in a lower paying specialty such as primary care. The second conceptual consideration is that not all prior careers may influence specialty selection in the same way. For example, if someone had a career in education in a low socioeconomic community, would that have a different influence on specialty selection than if someone worked in a corporate setting? In addition to some of these conceptual considerations, there are potential sampling biases that may contribute

to the findings of the study. Like academic history, there was very little variation in the variables used to describe the PA's work experience. In this study, most PAs did not have career experience (75%) prior to attending PA school, and for those that did, there was not a great enough sample, nor detail in the application, to reliably categorize the career experience to assess the impact on specialty selection. This would be an opportunity for exploration in future qualitative work. Furthermore, the range of medical licenses held by PAs prior to PA school was small (0–2) with a mode of . Additionally, the average number of years between the PAs last degree earned and PA school was 2.61 years suggesting most of the time between these degrees was spent working towards getting into PA school and not in another career.

Primary Care Exposure

The role of a clinician mentor in specialty selection is noted in both Bennett and Phillips' model as well as the physician workforce literature (Long et al., 2016). Specifically, the literature suggests that the presence of a primary care mentor, who has a positive outlook of the value that primary care adds to the healthcare system, may increase the likelihood a clinician will choose to work in primary care. Therefore, it was hypothesized that those PAs that had a primary care mentor prior to PA school may be more likely to understanding the role primary care plays in the healthcare system and be more likely to work in primary care. In this study, the presence of a primary care mentor prior to PA school was constructed based on the information provided in CASPA that allows the applicant to describe the types of health care experiences an applicant has as well as the number of hours the PA spent in a primary care setting including HRE, PCE, and shadowing a PCP.

Bivariate analysis showed that neither HRE nor PCE in primary care was associated with working in primary care. Shadowing a PCP was similarly not associated with initial specialty selection. Additionally, there was no correlation between the number of hours in each category and initial specialty selection. Regression modeling also showed none of these experiences increased the odds of working in primary care. Similar to the SEES and work history regression models, males had higher odds of working in primary care than females.

This discrepancy between the theoretical model and study findings may be explained by two limitations of the study. The first is that under 25% of the sample had any exposure to a primary care clinician in any of the three categories. Additionally, for those that did have primary care experience, the number of hours spent in a HRE, PCE, or shadowing in a primary care setting had a wide range. For example, the range for those who had primary care PCE was 20–2,880 hours. The second limitation is that the literature suggests that having a positive experience in primary care was associated with having an interest in working in primary care, not simply having exposure to primary care. Long et al. (2016) noted that while having positive mentors in primary care may be associated with working in primary care, the authors also noted that having mentors who appeared burnt out could discourage physicians from wanting to work in primary care. Because the CASPA application is a closed form that simply asks applicants to record their experience quantitatively and describe the role they had qualitatively, there was no source of data in the application that allowed this study to assess if the experience was positive or negative. This limitation provides an opportunity for a future qualitative study to understand how the PA's exposure to primary care influenced their initial specialty.

Volunteer Experience in Underserved Communities

The literature demonstrates that PAs who work in primary care ranked having the opportunity to make a difference as well as having a long-term relationship with their patients as most important when picking their specialty (Halasy et al., 2012). Furthermore, Larson and Frogner (2019) found that PA students who had any volunteer experience prior to PA school were more likely to note an intention to practice in primary care than those who had no experience. Lastly, physician workforce literature suggests the idea that medical students who intend to work in primary care are more likely to see their work in medicine as a "calling" than those who plan to work in other specialties (Kao & Jager, 2018). Primary care is the field of medicine that also most focuses on understanding and addressing the social needs of patients and understanding how the social determinants of health impact patient outcomes (Williams & Cooper, 2019). Volunteer work in a health setting with the underserved was hypothesized to increase exposure for the applicant to some of the consequences of the social determinants of health and therefore was theorized to lead to a greater desire to addresses these issues in one's career.

Bivariate analysis demonstrated that having engaged in any amount of health related volunteer work in underserved communities was not significantly associated with working in primary care; however, there was a correlation between the number of hours a PA volunteered in a health related role and initial specialty selection. Furthermore, regression modeling demonstrated that having health related volunteer work in a health related role in underserved communities did not increase the odds that the PA would work in primary care.

When considering the reasons why the theoretical association between volunteer work in a healthcare setting and a career in primary care did not emerge in the study, there are several considerations to discuss. Similar to the section on the CASPA application where candidates report HRE, PCE, and shadowing experiences, CASPA allows applicants to report the volunteer experiences that the applicant has, the organization they volunteered with, a description of the activity, and then number of hours volunteered. As a result, the data available from CASPA was sufficient to identify if the PA had done any health related volunteer work in underserved communities as well as how much they volunteered. Because the CASPA application does not specifically ask if the community the PA volunteered in was underserved, this was determined based on the description provided by the PA. If they specifically noted that the community was underserved or if the organization they volunteered with specifically addresses underserved communities (e.g., global health brigades), this was categorized as having volunteer experience in a healthcare setting with the underserved. Therefore, a potential source of error in the data is the incorrect categorization of student experiences in this category. Additionally, like HRE, PCE, and shadowing in primary care, the percentage of PAs in the study who had any health related volunteer experience in underserved communities was small (22.7%). The range of hours (0–2,800), average hours (36.8) and *SD* (195.5) for number of hours volunteering was also large, suggesting that the few PAs that participated in health related volunteer work in underserved communities spent a lot of time doing so.

Future work should continue to study these variables in a qualitative framework to understand how health related volunteer work in underserved communities influenced

initial specialty selection. In this study, of those that had health related volunteer work in underserved communities, only 10% ($N = 7$) went into primary care. Therefore, the outcome observed in this study may reflect the importance of the quality of these experiences, as was found with primary care exposure in Long et al. (2016). For example, it may be that working with the underserved and recognizing the need to address the social circumstances of patients, a common role in the primary care setting, intimidated the PA rather than inspired, influencing them to choose a different specialty that may not focus on addressing these needs and issues so directly or continuously. Additionally, it may be found that applicants engaged in a small amount of health related work in underserved communities (such as going on a week-long medical mission) to try to impress the admissions committee at the PA program. Nevertheless, the significance of the association found with number of hours spent volunteering and initial specialty selection suggest this is a variable worth continuing to study in a qualitative format.

Contributions of the Study

The literature review conducted for this study suggests that healthcare environment, including lower than average salaries and a view by some specialty clinicians that primary care is not prestigious or challenging, may deter PAs from wanting to work in primary care. However, the pre-PA school period has emerged as one of the most influential in terms of developing the personal attributes that may influence a PA to choose primary care as their initial study regardless of salary. This study is unique in that it is one of the most comprehensive in terms of its review of the pre-PA school experience. It is also one of the few longitudinal studies to look at multiple PA cohorts.

The results of this study support the findings of others in that the social, environmental, and economic experiences of the PA as constructed by race/ ethnicity, gender, growing up in an HPSA/MUA, as well as multiple economic and educational variables contributing to the PA's SES as a child are most strongly associated with initial specialty selection. Furthermore, race/ ethnicity and gender were found to be significant predictors of initial specialty selection in multiple regression models. While there is evidence in the literature that supports the hypothesis that the PA's academic major in college, prior work experiences, exposure to primary care, and volunteer work could each influence PA specialty selection, the findings of this study suggest that initial specialty selection seems to be strongest influenced by the PA's lived experiences, not their chosen experiences.

Only found one variable was found that increased the odds of working in primary care compared with a medical specialty. Gender was found to be associated with initial specialty selection and was a significant contributor to 4 out of the 5 models, and it was interesting to see that male gender was associated with higher odds of working in primary care than medical specialty, and not females, as is shown in most workforce studies. Descriptive statistics were consistent with others showing that 65% of those who chose primary care were female.

Implication of Findings

Primary care is the field of medicine that specialized in the prevention of disease and management of many chronic medical conditions. The long-term relationships formed with their PCPs lead many patients to view their PCP as their "medical home." A robust primary care system has been identified as a way to improve health outcomes and

reduce healthcare spending (Bazemore et al., 2015; Starfield et al., 2005). There has been a PCP shortage since the 1960s which has disproportionately grown in rural and urban communities. PAs have not only been identified as a solution to fill this gap, they have also been shown to provide high quality care for patients in the primary care setting (Everett et al., 2019). Rural and underserved urban communities face a disproportionate shortage of PCPs and the recruitment of PAs who are most likely to work in these areas is critical to address this shortage. While the PA profession was initially intended to address physician shortages, PAs, just like their physician colleagues, have been increasingly working more in medical and surgical specialties over the last decade. Therefore, it is important to identify and recruit those who are most likely to work in primary care to ensure equitable access to primary care services for all communities.

The findings of this suggest that having a socially, racially, and economically diverse workforce will likely increase the number of PAs who work in primary care. Organizations, such as the PAEA have set PA diversification as a top priority. By establishing policies, programs, and practices that help to recruit and train a diverse workforce (including racial/ ethnic diversity and SES diversity), the outcome may be an increase in the supply of primary care PAs. However, initiatives to date have resulted in no significant changes in racial diversity for first year PA students during the study period, with only 25.9% of PA students identifying as anything other than White, non-Hispanic in the 2019 compared with 28.2% in 2013 (PAEA, 2014, 2020a). The reasons for this are complex and multifocal, and physician and PA educational literature have begun to identify the barriers that exist for diversifying medical professions. Some of the

identified barriers include inequitable academic resources, lack of academic and professional role models, and inequitable admissions practices (Lupkin, 2016).

The first barrier includes inequitable K–16 resources for many URM. This includes fewer options for advanced STEM classes in high schools that traditionally serve URMS as well as a lack of staff and resources in these high schools dedicated to college advising, SAT preparation, and even graduate school counselors at universities with large URM populations (Arbeit et al., 2016; Schneider et al., 2006). Additionally, a lack of professional and academic role models for URMs can lead to a lack of diversity in medical education. This may manifest itself in terms of access to professional role models to shadow, get letters of recommendation, and gain hands on healthcare experience, all of which are required to gain entry to PA school. The second way that a lack of professional or academic role models can contribute to low professional diversity is that it can lead to imposter syndrome, or the feeling that one does not belong or is not qualified to be a part of the program (Lupkin, 2016; Schneider et al., 2006). Finally, admission practices, such as using GPA and standardized test scores as the principle determinant of admission is associated with a lower rate of URM in PA programs (DiBaise et al., 2015).

Policy level solutions that have emerged from physician and PA education literature to support a diverse profession include addressing these barriers. The first proposed policy solution is the use of "Bridge Programs." Bridge programs often facilitate connections between URM communities and graduate medical schools and are designed to remediate any educational or professional networking and advising gaps to help participates in the program be successful in PA school (Mayo et al., 2019). The next proposed solution is to have PA programs build a culture that values diversity at all

institutional levels. Studies suggest that URM students seek out programs that include a diverse leadership team, faculty, and student body, as well as those that have a well-developed program to identify students who are struggling and connect them with resources to enable success (Coplan, 2019). Finally, the use of holistic admissions practices leads to a more diverse profession. According to the Association of Public Land-Grant Universities (n.d.), this is broadly described as an admissions practice that evaluates the academic potential of an applicant based on the totality of their academic, professional, and other life experiences in addition to, and not exclusively by, GPA and standardized testing scores. Studies conducted at medical schools that utilize holistic admissions process saw an increase in their URM enrollment with no meaningful change in licensure exam scores (Glazer et al., 2014).

Application of recommendations at the RUPAP

This dissertation presents the argument that the characteristics and experiences found to be most influential on specialty selection can be used by PA programs to identify applicants that are most likely to work in primary care and implement policies and programs to recruit, train, and deploy these PAs into the healthcare system to reduce the PCP shortage. Central to this argument is the underlying assumption that PA programs want to take an active role in addressing this shortage; rather than to take a more laissez-faire approach to which specialty their graduates will work in. For example, some programs such as the Oregon Health Sciences University PA program have an explicit mission to prepare graduates to work in primary care (Oregon Health Sciences University PA Program, n.d.). The RUPAP, by contrast, does not have as part of its mission, vision, or program goals anything specifically referring to training primary care

clinicians. By contrast, the RUPAP has a goal to "provide broad-based, high-quality education to graduate PAs who are well-prepared for work in a variety of settings" (Rutgers Physician Assistant Program, n.d.). While the RUPAP program seeks to train PAs to work in all fields, it would be reasonable for the program to reflect on strategies to recruit students that may be positioned to meet specific needs of healthcare system.

With respect to admissions, the RUPAP began incorporating holistic admissions practices during the 2015 admission cycle. For the cohorts in this study this is represented by the classes of 2018 and 2019. As discussed, this holistic admission process has resulted in a student body that has a greater degree of diversity than the national PA student population. Diversifying the student body through holistic admissions practices has been accompanied by additional outreach to undergraduate organizations at local colleges and universities that focus on the professional development of URMs interested in medicine (e.g. Minority Association of Pre-Health Students). Situated in a large, diverse university in an urbanized region of the country, an opportunity for further development of a diverse RUPAP pipeline would be to invest time and resources into a more formalized mentorship program in diverse communities within the state that may take the form of a formalized bridge or mentorship program. While this change in admissions practices was not done as a mechanism to increase the number of primary care PAs, this may be a natural outcome of this decision.

Limitations

As noted, one of the strengths of the study was that this was a longitudinal study; therefore, intention to practice was not required to be used as the dependent variable; however, one of the limitations of this secondary data analysis was that there was some

missing data with respect to initial specialty selection. The source of initial specialty was from the RUPAP graduate job database. The data are solicited from PA students around the time the PA graduates from the RUPAP. While many students do know where they will work, some do not when the data are gathered, and follow-up attempts to obtain this data are not always successful. As a result, 15.9% of the sample's initial specialty was unknown. Furthermore, 40% of Black PAs and 14% of Hispanic PAs in this study had their specialty unknown which may have impacted the results in terms of how race specifically influences initial specialty selection.

An additional limitation of this secondary data analysis was that the CASPA application was not the same for all seven years of the study data. For example, it was not asked if the applicant was from a HPSA/ MUA until 2015 leading to nearly 35% of the study sample being categorized as unknown for if they grew up in a HPSA/ MUA. Furthermore, the data obtained from CASPA was not independently verified and may not be accurate. For example, applicants may not know if they grew up in a MUA/ HPSA or if their K–12 experience would have qualified them as educationally disadvantaged.

Despite the study design being a longitudinal study with multiple cohorts, all cohorts were from a single institution. While RUPAP graduates work throughout the country, a large proportion stay in the Northeast and Atlantic regions of the country, thus creating a form of bias based on job availability and cost of living in this region. As with all forms of secondary analysis, the study was limited to only the data that were available from the CASPA application. While the literature suggests that those who had positive experiences in a primary care setting may be more likely to work in primary care, the

CASPA application simply asks if they had the experience and does not allow for follow-up to assess the quality of the experience.

Additionally, the study sample included several variables with very low variability limiting the ability of the regression models to predict the dependent variable based on the independent variable. Examples of this include a small number of PAs with prior primary care and health related volunteer experience as well as a small standard deviation in GPA, gap years, major. Additionally, while the sample was overall similar demographically to the national PA student profile (the sample was overall more racially and ethnically diverse) the sample was still mostly young White females. Furthermore, the RUPAP began utilizing a holistic admissions process when reviewing the applications for the 2019 cohort. This change in practice mid study may limit some of the generalizability of the results.

Future Work

There is a growing body of work that suggests that the environmental experiences of a PA prior to PA school have the most impact on their decision to work in primary care; specifically race/ ethnicity and gender. Other variables representing the PA's social and economic status were found to be associated with initial specialty selection. Future work now needs to be done using qualitative methods to understand how and why these experiences impact these decisions.

While the literature suggests that the pre-PA school experience plays a significant role in the development of a personal identity that may pre-dispose a PA to want to work in primary care, it would be naïve to suggest that the other domains of Bennett and Phillips' model such as the healthcare environment, financial considerations, and the PA

school environment have no influence on specialty selection. Therefore, qualitative studies, specifically interviews should be done to assess the role of these domains on specialty selection. One study design would be to conduct focus groups on four different groups of PAs: (a) those who fit most of the demographic and SES variables that have been shown by multiple studies to be predictive of working in primary care and work in primary care, (b) those who have most of the demographic and SES characteristics and do not work in primary care, (c) those who do not have most of the characteristics that are predictive of working in primary care and work in primary care, and (d) those who do not have most of the characteristics that are predictive of working in primary care and do not work in primary care. Most interesting in terms of the role policy could have on retaining individuals who are demographically predisposed to working in primary care would be the results of those who were predisposed and chose other specialties but initially intended to work in primary care.

Future of Primary Care Practice Post COVID-19

It would be inappropriate to discuss these findings in a theoretical vacuum and not take into consideration several recent changes to primary care utilization and service delivery that have occurred in the time since this research started. On March 11, 2020, the World Health Organization declared the Coronavirus disease 2019 (COVID-19) outbreak a global pandemic. In the months that followed, the outpatient healthcare system experienced a sharp decrease in the number of adult primary care, pediatrics, and OB/GYN office visits. According to a study done by the Commonwealth fund, there was a significant decrease in the number of office visits (-70% from baseline per week) in late March, with primary care and pediatrics among the hardest hit specialties. This was

followed by an initial rise in telehealth visits, approximately 14% higher across all outpatient specialties; however, this trend is decreasing as confidence grows in the safety of in person visits. In late July 2020, adult primary care visits (both in person and telemedicine visits was only 10% less than the baseline visit numbers with a smaller percentage of visits across all outpatient specialties decreasing (about 8% of visits). Interestingly, FQHCs, that often employ a high number of PAs to provide primary care services, were found to provide a higher percentage of their services via telemedicine compared to all other outpatient practices (Mehrotra et al., 2020).

As noted, there has been a transition to telemedicine to address many primary care needs. Regulation for the provision of telemedicine services and reimbursement for telemedicine services by PAs varies by state. In March, the Centers for Medicare and Medicaid Services (CMS) issued temporary relaxations to the regulations surrounding telemedicine visits as well as reimbursement requirements. For example, previously CMS would pay for telemedicine visits when certain criteria were met such as the patient living in a rural area. As reflected in the data from the Commonwealth Fund, this has allowed for increased use of telemedicine for all patients. Although telemedicine has been touted as a way to increase access to care and efficiency for providers, it is unclear how inconsistencies in telemedicine regulations will impact PA job opportunities in primary care and is something that should be assessed in future workforce studies. I suspect this will largely depend on if the relaxation of regulations enacted during the initial phase of the pandemic continues or if there is a return to pre-COVID-19 regulations. If current relaxed practices continue, I believe state policy makers will continue to adapt

regulations to ensure PAs can both work in the telehealth setting as well as be reimbursed adequately.

Conclusion

There is a PCP shortage in the United States. PA workforce studies suggest that the experiences accumulated by PAs before they start PA school may be most influential in their decision to work in primary care. This study supports the findings of others that demographic variables such as gender, race, and ethnicity as well as those that contribute to the PAs SES such as if they grew up in a HPSA/ MUA, were the first generation to attend college, or identified as economically or educationally disadvantaged were associated with initial specialty selection. Pre-PA school experiences that are chosen by the PA such as their academic major, work experience prior to PA school, experiences in primary care, and volunteer work were not associated with initial specialty selection. While only male gender predicted work in primary care, there was little variation in many of the variables used in this study like contributing to these findings. Additional qualitative studies are needed to best understand how these, as well as other SES variables found in other studies, impact the decision to work in primary care.

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