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Impact of State Scope of Practice Laws and Other Factors on the Practice and Supply of Primary Care Nurse Practitioners

Final Report

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Executive Summary

This project explored the effects of nurse practitioner (NP) scope of practice (SOP) legislation on the distribution and practice patterns of NPs as well as their billing practices. The goal was to understand where and how NPs are practicing, identify barriers that limit the degree to which NPs are practicing to the full extent of their education and training, and to inform policymakers as they seek to remove barriers in order to fully utilize NP to support healthcare delivery in the United States. In addition to background preparation including conducting an environmental scan and convening a Technical Expert Panel, this project included two main components: qualitative case studies, and quantitative data analyses.

In support of this project, Westat conducted five state-level case studies to gather information on how and under what conditions NPs are improving access to primary care, taking into account state scope of practice laws and other factors. States were selected for their diversity in SOP laws, timing of SOP reform, supply of and demand for primary care services, and Medicaid reimbursement level. The five states ultimately selected for the case studies were Florida, Nevada, New Mexico, Texas, and Washington. Given the goal of describing the barriers that limit the degree to which NPs are practicing to the full extent of their education and training, Westat interviewed individuals within the state, with a focus on those who could exert change in how NPs practice and deliver care. These included employers and payers of NPs as well as representatives of NP schools. Recruitment of case study participants was conducted from April through November, 2014, with interviews scheduled from May through December, 2014.

Through the case studies, several barriers to NP practice were identified. Overall, we found that NPs are generally not practicing to the full extent of their education and training, and practice is often constrained by factors beyond (and including) state SOP laws. Many barriers stand in the way of NPs practicing to the top of their licensure, including state and federal regulations and statutes, hospital and facility bylaws that prescribe NP practice scope within institutions, and deep-rooted cultural beliefs.

Most of the extant federal barriers to NP practice address services and reimbursement provided under the Medicare system and are codified in the Social Security Act. These include: reimbursement for comparable services at only 85 percent of the physician rate; inability to autonomously order home health, hospice, and skilled nursing facility services for Medicare patients; and barriers to receiving NP services under the Medicare Shared Savings Accountable Care Organizations program.

Federal statute, regulated through the granting of administration, dispensing, and prescribing authority by the Drug Enforcement Agency, also prohibits NPs from prescribing some medications for the treatment of opioid addiction that physicians can prescribe. These barriers supersede state regulations that may otherwise permit autonomous prescribing and practice for NPs.

Across urban and rural areas, a variety of factors impact how NPs are utilized and the settings in which they work. While NPs in urban areas may have access to physicians to support collaborative practice in primary care, many are drawn into specialty practice where pay may be higher and pressures lower. In rural areas, while many more NPs may be working in primary care, they are often hampered by physician collaboration requirements or other state or federal regulations and statutes that make care delivery more difficult or less efficient.

Restrictive SOP laws and the other barriers impede the extent to which NPs may help improve access to primary care in the context of primary care physician shortages. In the absence of efforts to ease the SOP restrictions and other barriers, states may find it difficult to meet the growing demand for health care. Addressing SOP laws may be a first step toward reducing the barriers that hinder NP practice, potentially alleviating the effects of primary care physician shortages while improving access to timely health care.

The quantitative portion of this study used two main data sources: the 2012 National Sample Survey of Nurse Practitioners (NSSNP) conducted by the U.S. Department of Health and Human Services Health Resources and Services Administration (HRSA), and Medicare fee-for-service claims data from 2004, 2008, and 2012. To both of these data sources we merged in data on NP SOP in each state as well as state characteristics including the number of providers, unemployment rate, and percent of the population in poverty. Regression analysis was used to estimate the impact of SOP with other state and individual characteristics controlled.

The NSSNP analysis covered a range of supply and NP practice outcomes, including whether NPs provided patient care, practiced in primary care, had their own patient panels and hospital admitting privileges, billed under their own provider numbers, and worked without a physician on site. We also examined the percent of time NPs spent in patient care (relative to other activities) and the size of NP patient panels.

Our analysis found consistent effects of SOP, with statistically significant differences in eight out of nine dependent variables examined. For most outcomes, these significant effects were only found among NPs working in states with both full practice and full prescriptive authority. This pattern

suggests that prescriptive authority is critical to the feasibility of NPs providing the range of services required in primary care practice. The strongest predictor for most outcomes, however, was the rurality of NPs' practice location. Rural NPs were far more likely to practice in primary care and be more autonomous in their provision of services.

The claims data analysis focused on the percentage of first-visit claims and reimbursement received by NPs in states with varying SOPs. We controlled for NPs as a percentage of all providers in the state, acknowledging that states with larger NP share of all providers would have a larger percentage of NP claims. Within each year (2004, 2008, and 2012), we found that NPs billed for a larger share of first-visit claims in states with less restrictive SOPs. However, we did not find evidence that states liberalizing their SOP over time experienced larger growth in the share of claims billed by NPs. A similar pattern was observed for NP share of reimbursement for first-visit claims.

Results of this study suggest that SOP is an important driver of many practice outcomes for NPs. The results suggest that states could take better advantage of the broad capacities of NPs by loosening SOP restrictions and considering other policy levers available including addressing organizational practices, education and training, and evaluating billing practices and the rates at which NPs are reimbursed compared to their physician colleagues.

Introduction and Context

Background

The U.S. Department of Health and Human Services' Office of the Assistant Secretary for Planning and Evaluation (ASPE) sponsored the research described in this report under a project titled *Impact of State Scope of Practice Laws and Other Factors on the Practice and Supply of Primary Care Nurse Practitioners.* Westat, in collaboration with partners from George Washington University, RAND, and the University of California, San Francisco, worked with ASPE to explore the effects of nurse practitioner (NP) scope of practice (SOP) legislation on the distribution and practice characteristics of NPs as well as their billing practices . Through this project, Westat examined the extent to which factors such as facility practice patterns, SOP laws, educational opportunities and requirements, and other state level factors affect the practice and supply of NPs. Westat also examined the relative effects of other factors such as reimbursement and credentialing policies and examined whether variation in NP SOP affects volume of services provided.

To set this project in context, it is important to consider factors influencing demand for health care services and affecting supply of health care providers in order to identify known barriers that constrain supply of providers from filling the population demand. Driving demand for primary care, the Unites States is both growing and aging. A recent study by HRSA found that the demand for primary care providers is expected to increase through 2020 due to population growth and aging, and to a lesser extent expanded insurance coverage provided under the Affordable Care Act (ACA) (U.S. Department of Health and Human Services, 2013). Regarding supply, the projected number of primary care physicians is expected to fall short of expected demand. The HRSA report went on to suggest however that the growing supply of NPs and Physician Assistants (PAs) could mitigate the projected physician shortage if they can be effectively integrated into the primary care delivery system.

While demand for health care is growing in the United States so too is the number of NPs. As of 2012, HRSA estimated the number of NPs eligible to practice in one or more states to be approximately 150,000. Further, HRSA reported that the number of students graduating from NP education programs grew 69 percent between 2001 and 2011; as a result of rapid growth in new graduates, it estimated that the total supply of primary care NPs will grow by 30 percent between 2010 and 2020 while physician supply will increase only 8 percent (U.S. Department of Health and Human Services, 2013).

With a primary care physician shortage projected by some, the growing availability of NPs is encouraging (U.S. Department of Health and Human Services, 2013). However, the statutorily prescribed set of activities that NPs can undertake in the performance of patient care—defined by their state's SOP—varies significantly across the country and may limit the ability of NPs to practice to the full extent of their education and training. SOP regulations affect several aspects of practice, including prescribing privileges, hospital admitting privileges, oversight, and chart reviews (Fairman, Rowe, Hassmiller, and Shalala, 2011). As of the end of 2014, 22 states permitted NPs to provide care without physician collaboration or supervision. However, in other states, NPs are not permitted to practice without physician collaboration or supervision, often requiring written practice protocols, and sometimes including restrictions on the number of NPs with whom a physician may collaborate (National Council of State Boards of Nursing, 2013). Moreover, even when NPs can practice without physician supervision, they may be required to have a collaborative or supervisory relationship with a physician to prescribe medications (Christian, Dower, and O'Neil, 2007).

There has been a general trend over time toward allowing NPs greater practice authority (Fairman, 2008). With rising concerns about shortages of primary care providers, it is not surprising that after passage of the ACA, 28 states considered expanding the SOP for NPs (Institute of Medicine, 2011). While dozens of changes are proposed each year, the magnitude and nature of changes varies greatly. For example, as of April 2015, a bill is being considered in the state of Missouri that would authorize NPs to prescribe Schedule II medications for a 120-hour supply without refill (bill HB 720/SB 313). Simultaneously the state of Florida is reviewing a proposal that would provide for removal of the supervisory agreement requirement for NPs (HB 547). Despite the overall trend toward NP SOP expansion, SOP remains a politically charged topic, and legislative changes have been slow to unfold leaving NPs in many states unable to practice to the full extent of their education and training.

In addition to state-level restrictions on NP practice, federal statutes and regulations also restrict the services that NPs can provide. Most of these restrictions address services and reimbursement provided under the federally-operated Medicare system for those aged 65 and older. For example, Section 1848 of the Social Security Act authorizes Medicare payments to NPs using the annually updated physician fee schedule, but the rate of reimbursement is only 85 percent of that provided for the same services when provided by physicians. A lower rate of reimbursement impacts the financial viability of NPs who practice autonomously in states where they are permitted to do so. NPs can obtain 100 percent of the Medicare reimbursement rate provided for physicians, but only if their services are provided "incident to" those of physicians. Regulations tightly control the

circumstances under which this type of billing is permissible. 42 CFR Part 405 requires that services billed in this way must be furnished as an incidental, although integral, part of a physician's professional services and must be furnished under the direct, personal supervision of a physician.

The Social Security Act also impacts the ability of NPs to autonomously order services for Medicare patients requiring skilled nursing, home health, and hospice care. It requires that initial certifications of Medicare beneficiaries for skilled nursing, home health, and hospice care be signed by physicians. NPs cannot order these services for their Medicare patients independent of physicians even if no state barriers exist to their ability to provide care for the Medicare population. The Affordable Care Act added a face-to-face assessment requirement for home health care certification, which can be provided by an NP. However, a physician still must certify the need for home health services, even if an NP provides the required face-to-face assessment of need.

NPs are eligible to participate in Medicare Shared Savings Accountable Care Organizations (ACOs) under the Affordable Care Act, but Section 1899(c) requires that beneficiaries are assigned to providers under this program based on their utilization of primary care services provided by an ACO professional as defined in subsection (h)(1)(A) – which references only physicians. As a result, beneficiaries in an ACO cannot be assigned to receive services from a primary care NP without having had at least one visit with a physician in the given ACO. (U.S. Department of Health and Human Services, 2011).

Federal laws also restrict the ability of NPs to prescribe some controlled substances. The Drug Abuse and Treatment Act of 2000 prohibits NPs from prescribing methadone and other medications such as buprenorphine for the treatment of opioid addiction. Although NPs may be able to prescribe these medications for pain if allowed by state law, only physicians can offer office-based opioid addiction treatment with drugs such as buprenorphine (methadone treatment for opioid addiction is limited to specialized clinics).

Research Goals

In light of the growing demand for primary care and the need to expand the primary care workforce to meet those demands, ASPE commissioned this study to explore the following research questions:

- What are the relative contributions of various state level factors in the supply and practice of NPs? Specific components to consider include, but may not be limited to:

individual components of the state SOP (level of physician supervision/ collaboration, prescription authority, direct or independent billing), reimbursement by Medicaid, Medicare and private insurers, and credentialing for primary care by insurers. What other barriers to full practice of NP in primary care exist (such as patient preference pro or con, etc.)? Are there barriers (either in the SOP laws or elsewhere) in providing specific services that NP are trained to do, and if so, under what circumstances? How do these factors differ by state?

- What are the patterns of production of NPs, in particular NPs who practice as primary care providers? Where are NP programs located and how does that correlate with the number of NPs practicing in that state? Are NPs more likely to stay and practice in the states where they were trained?
- What are patterns of Medicare and Medicaid spending on NP services in restrictive versus non-restrictive SOP states and the relative contribution of NP services to the volume of primary care within a state? Do rural versus urban settings make a difference?
- Using HRSA's 2012 NP Survey and comparing states with variations of state scope of practice requirements, are there differences in the survey variables listed below? What effect do differences in state reimbursement or credentialing have on these factors?
  - Practice setting;
  - NP specialty (primary care versus specialty);
  - Volume of services;
  - Frequency of providing specific services;
  - Hospital admitting privileges;
  - Provider satisfaction, reasons not practicing as an NP;
  - Being able to practice to fullest extent of state's legal SOP; and
  - Primarily billing under own provider number.

Project Overview and Approach

As the planning and evaluation wing of the U.S. Department of Health and Human Services (HHS), ASPE advises the Secretary of HHS on policy development in health, disability, human services, and economic policy, among other areas. In this context, and at a time when demand for health care is increasing, workforce supply is in transition, and SOP laws are rapidly changing, it is essential for ASPE to understand which policy levers may be most effective in expanding the delivery of primary care using the NP workforce. To assist ASPE in understanding the impact of state SOP laws and other factors on the practice and supply of primary care NPs, Westat undertook an environmental scan of published and grey literature to provide a summary description of the most prevalent

barriers to and enablers of NP practice. We then convened a Technical Expert Panel to obtain input on recommended approaches for case studies and quantitative data analysis. Qualitative and quantitative analyses were subsequently conducted with findings presented to ASPE and other key stakeholders. This report details the methodology used to conduct the tasks that made up this study and presents the findings both from qualitative and quantitative approaches. The report concludes with a discussion of next steps in implications of the study findings.

Methodology

Preliminary Work to Inform Analyses

Prior to undertaking the analytic work of the study, Westat completed several tasks to ensure the team had thorough understanding of current environment regarding NP practice barriers and enablers, and to make certain the analytic approach would best respond to ASPE's informational needs. Westat conducted an environmental scan and convened a TEP to obtain input from key stakeholders. Each of these tasks is briefly described in this section.

Environmental Scan

Westat conducted an environmental scan of published and grey literature on the factors that affect the use of NPs in primary care settings. Searches were conducted in PubMed, CINAHL (Combined Index to Nursing and Allied Health Literature), PsycInfo, ASSIA (Applied Social Sciences Index and Abstracts), Sociological Abstracts, Social Services Abstracts and PILOTS (a behavioral and physical health database sponsored by the Department of Veterans Affairs) with results limited to English language documents published 2011-2013. Additional articles published prior to 2011 were known to project staff as seminal works in this area, and were also included in the scan.

The scan revealed that although much has been written about state-level SOP regulations, little prior work has examined their effect on access to care. The literature identified several barriers to the effective use of NPs in primary care:

- Restrictive SOP regulations have been found to inhibit the growth and retention of NPs in a state. Less restrictive SOP regulations have been linked to increased use of primary and preventive care, although influences on the cost of care are less clear.
- Organizational policies and culture may hamper NP productivity. NPs are often provided with fewer resources and less assistance than their physician counterparts; and other staff in the organization are frequently unclear on the NP's role and responsibilities.
- Physicians continue to express concerns about the ability of NPs to practice autonomously and lead health care teams.

- Unlike physicians, who undergo lengthy residencies that prepare them to "hit the ground running," new graduate NPs face challenges during the transition to practice caused by a lack of structured support for bridging the education-practice gap.
- Refusal or reluctance by payers to narrow the gap between NP and physician reimbursement rates by Medicare, Medicaid, and many private insurers may jeopardize the financial viability of NP practices and foster dependence on physicians for billing.
- NPs in office-based general practice settings earn less than their NP counterparts in hospitals and specialty clinics.

The literature also highlighted areas of great potential for NP contributions to care:

- NPs are extending access to care in rural and underserved areas and are key providers in health centers.
- The supply of NPs is growing rapidly compared with the supply of physicians. The comparative availability of NPs is likely to increase their use.
- Patient satisfaction with and consumer acceptance of NPs are high, and clinical outcomes have repeatedly been found equivalent with those of physicians.
- NPs are key to the design of several emerging models of care, such as Nurse Managed Health Centers and Patient-Centered Medical Homes.

The environmental scan in its entirety can be found in Appendix A.

Technical Expert Panel

Westat convened a Technical Expert Panel to obtain input about the study design and methodology. A ten-person panel was assembled for a half-day meeting in Washington DC on March 12, 2014. Members of the panel represented a range of expertise including:

- SOP regulations;
- Health care and nursing workforce;
- Primary care delivery;
- Nurse-led clinics;
- Retail clinics;
- Nursing education;
- Structure and financing of healthcare;

- Health care, nursing, and workforce policy; and
- Research methodology

During the meeting, panel members reviewed and discussed the proposed methodology for qualitative and quantitative analysis. Recommendations from the panel members helped inform decisions about states selected for the site visits and participants included in the interviews. Panel input also helped shape the approach to analysis of the National Sample Survey of NP data and the Medicare claims data.

Qualitative Methodology

Case Study Selection

ASPE and Westat worked collaboratively to identify five states for the case studies. Additionally, the team obtained input on state selection from the ten-member Technical Expert Panel made up of experts and stakeholders in the fields of NP workforce and research. States were selected for their diversity in SOP laws, timing of SOP reform, supply of and demand for primary care services, and Medicaid reimbursement level. In addition, Westat reviewed recent literature to ensure that data collected were not duplicative of existing or recent data, e.g., work conducted by Yee, et al. (2013) in which NPs were interviewed in Arizona, Arkansas, Indiana, Maryland, Massachusetts, and Michigan. The five states ultimately selected for the case studies were Florida, Nevada, New Mexico, Texas, and Washington. Descriptive characteristics for each of the states are presented in Table 1.

Table 1. Descriptive characteristics of case study states

Descriptive Characteristics	FL	NV	NM	TX	WA
SOP					
Physician supervision	✓			✓	
Supervision for prescribing only		✓			
Full practice authority			✓		✓
SOP Reform					
Year of Reform	n/a	2013	1993	1989*	1973
Population in HPSA					
4-18%		✓			
19-33%				✓	✓
34-48%	✓				
49-62%			✓		
Primary Care Physicians per 100,000 population					
94.4 to 105.9					✓
84.8 to 94.3	✓		✓		
77.5 to 84.7					
63.3 to 77.4		✓		✓	
NP Medicaid reimbursement level					
% of Physician reimbursement	85-100**	85	90	92	100

*repealed in 2005

** 100% Medicaid reimbursement only if on-site physician countersigns in 24 hours

Given the goal of describing the barriers that limit the degree to which NPs are practicing to the full extent of their education and training, Westat interviewed individuals within the state, with a focus on those who could exert change in how NPs practice and deliver care. These included employers and payers of NPs as well as representatives of NP schools. Employers and payers were targeted for interviews because they set the parameters of NP employment and practice reimbursements, while representatives of NP schools can provide insight to the pipeline, education, and placement of new NPs. Some of the interview participants were NPs, and others were physicians, although being a health care provider was not a requirement for participation in the study. Westat asked the participants about how NPs are utilized in different health care delivery organizations, the financial implications of using NPs, organizational policies and procedures regarding NP practice scope in health care organizations, NP role variance across care settings, billing for NP services, NP workforce availability, and NP graduate preparedness. To capture different health care delivery modalities, Westat aimed to interview employers and payers in a variety of organization types including:

- Primary care safety net providers (this could include federally qualified health centers [FQHCs], nurse managed health centers, etc.)

- Large health systems that span multiple care settings and emerging care models
- NP companies and vendors that employ NPs
- NP schools
- Hospital employers
- Specialty practices

To further expand on what was learned through the case studies, Westat conducted a series of in-depth interviews with national stakeholders. National stakeholders were recruited based on their ability to provide the following perspectives:

- National NP organization
- National physician organization
- Retail clinic with national presence
- Medical liability insurance trade association with national presence
- Large national employer of NPs

Case Study Protocol

Recruitment of case study participants was conducted from April through November, 2014, with interviews scheduled from May through December, 2014. Most interviews were conducted in person during state site visits between May and July, 2014, however some follow-on state-level interviews were conducted in May through September, 2014 via phone to accommodate scheduling constraints of participants. Interviews with national stakeholders took place from July through December, 2014.

The recruitment of interview participants involved a multipronged approach that included contacts from members of the Technical Expert Panel, project staff contacts, known stakeholders in the NP workforce community, and recommendations from other participants. Project staff conducted numerous exploratory interviews via telephone to vet potential case study participants, with the goal of ensuring that Westat could develop a detailed description of NP practice across the states. During the exploratory interviews, potential participants discussed their personal experience, their role as an employer, payer, or educator of NPs, and their perception of national, state, and organization-level

contextual factors that affect NP practice. Although not every potential participant was selected to participate in an in-depth interview, each exploratory interview provided information and insights regarding the health care climate, contextual factors affecting NP practice, and contacts for other potential participants.

Westat selected up to nine participants for in-depth interviews in each state, based on the interviewer's assessment of each individual's capacity to provide details germane to the project focus. Each in-depth interview lasted for approximately 1 hour and involved a flexible set of open-ended questions that were designed to stimulate discussion and elicit details about each participant's experience and knowledge. Broad interview topic areas included:

- Care delivery
- Access to care
- Supply and migration
- Challenges to NP practice
- Cost and reimbursement issues
- NP experience (as appropriate)

Quantitative Methodology

Research Questions and Analytic Design

In order to respond to ASPE's informational needs, Westat set forth a series of analytic questions to be answered using quantitative techniques. Specifically, Westat proposed to answer the following five questions:

- What drives the decision of NPs to practice as NPs? To practice in primary care? How important is SOP compared with other factors?
- What factors affect the types and levels of services performed by NPs? How important is SOP compared with other factors?
- What explains the differences in billing and physician supervision reported by NPs?
- What individual and state-level characteristics affect the likelihood of an NP practicing in a Health Professional Shortage Area (HPSA) or rural area?

- Are differences in NP Medicare billing volume for first visits (where the NP is the primary care provider) related to the restrictiveness of SOP laws?

To address the analytic questions Westat used data from the 2012 NSSNP, Medicare fee-for-service claims data, data on NP SOP in each state, and state characteristics including the number of providers, unemployment rate, and percent of the population in poverty. Using a range of analytic techniques we assessed the impact of SOP and other state characteristics on practice outcomes for NPs.

Data Sources

Two main data sources were used to support the study's quantitative analysis: the 2012 NSSNP and Medicare Claims data from 2004, 2008, and 2012. Relying on these sources of data, Westat also drew additional state-level data to help address the analytic questions.

The NSSNP was conducted by HRSA to fill gaps in the nation's understanding of the supply and practice of NPs in the U.S. The NSSNP is a nationally representative probability sample of almost 13,000 individuals who were licensed and eligible to practice as NPs in one or more states in 2012. The NSSNP collected zip code for respondents' principle practice as well as their residence. For this analysis, we counted NPs within the state and Rural-Urban Commuting Area (RUCA) code associated with their practice address. Some of the analyses include NPs who were not practicing in an NP role in 2012; these NPs were counted within the state and RUCA code associated with their home address.

To investigate the possible impact of NP SOP on NP billing and reimbursement, we analyzed Medicare Fee-for-Service claims data for first visit claims. First visit claims do not reflect the totality of services NPs provide, and they may be more prevalent in practices where NPs hold a patient panel and take on new patients directly, as opposed to practices where NPs primarily support physician-led care. However, a key concern about analysis of claims data for NPs is the phenomenon of "incident-to" billing, where services provided by NPs are billed under a physician's provider number. There is a clear financial incentive for incident-to billing on the part of physicians, who can garner 100 percent of the physician's reimbursement rate versus 85 percent if the claim is billed by an NP. Conversely, there is a financial incentive for CMS and other payers to reduce inappropriate incident-to billing. Although the prevalence of incident-to billing is unknown, we suspect it occurs less often for first visits because of CMS regulations. Specifically, CMS prohibits

incident-to billing unless the patient is being treated by the NP for a problem that was originally diagnosed by a physician. If a patient presents with a new problem, or for a first visit to the practice, the service should not be billed as incident-to the services of a physician. Our proposed analysis required aggregate counts of claims and payments by State and year for 2004, 2008, and 2012. Working with ASPE, we obtained relevant data from the Medicare claims files.

Records from the NSSNP and Medicare Claims data were merged with other data sources providing state characteristics. Table 2 shows these characteristics and their sources. Information from the Pearson Report was used to determine the extent to which each state offered prescriptive authority and practice authority. Data from the Pearson Report were also used for counts of the number of NPs in each state, while data from the American Association of Medical Colleges were used for counts of physicians and the Bureau of Labor Statistics data were used for counts of PAs. Various data sets made available through the Census Bureau and Bureau of Labor Statistics provided information on state population size, rural/urban distribution, age, poverty, and unemployment rates.

Table 2. State characteristics data sources

Variable	Source	Description
Full Practice Authority - based on state SOP (Y/N)	2012 Pearson Report	Yes = Physician involvement not required for NP Diagnosing and Treating No = Physician involvement required for NP Diagnosing and Treating
Full Prescript. Authority - based on state SOP (Y/N)	2012 Pearson Report	Yes = Physician involvement not required for NP Prescribing No = physician involvement in NP Prescribing
Number of NPs in State	2012 Pearson Report	Counts represent the number of active licenses in the state in 2012
Number of Physicians Active in Patient Care and Primary Care	American Association of Medical Colleges, 2013 State Physician Workforce Data Book	Data represent 2012
Number of PAs in State	Bureau of Labor Statistics, Occupational Employment Statistics	Data represent the number of PA jobs in 2012
State Population	Census Bureau, Population Estimates	Data represent population estimates as of July 1, 2012
Percent of State Population in Rural Area	Census Bureau, Population Estimates	Percentage of population living in a rural area based on the 2010 Census
Percent of State Population in Poverty	Census Bureau, American Community Survey	Percentage of people with income below poverty level in the past 12 months in state
Percent 65+	Census Bureau, Population Estimates	Data represent population estimates as of July 1, 2012
State Unemployment Rate	Bureau of Labor Statistics, Local Area Unemployment Statistics	Percent of labor force unemployed, seasonally-adjusted, as of November 2012

Variable Coding

Some prior work (e.g., Raegan and Salsberry, 2013) suggests that the effect of SOP on NP supply and other outcomes is primarily associated with whether the state offers full prescriptive and practice independence as opposed to gradations of autonomy. Both of the dichotomous SOP measures were found to be effective predictors in our analyses. To best capture the different effects of practice vs. prescriptive authority, we created a single NP SOP variable with three categories: (1) Full Practice and Prescriptive Authority, (2) Full Practice Authority Only, and (3) Restricted Practice. Category (2) includes states that grant full practice authority to NPs but do not grant full prescriptive authority, and category (3) includes states that grant neither full practice nor full prescriptive authority. There are no states that grant full prescriptive authority but not full practice authority to

NPs. The benefit of this coding scheme in analysis is the ability to disentangle the separate effects of prescriptive and practice authority, which we found differed for some outcomes.

To support Claims data analysis, we further coded state SOP using the Pearson reports for 2004, 2008, and 2012,[1] State SOP was classified for each year, using the three categories described above. We then examined each of the states over time to determine whether our classifications were appropriate. We made modifications to three of the 153 State-Year classifications based on a review of the evidence provided by Pearson. After these corrections, all states with changes in SOP classifications were moving in a consistent direction over time. Eight states loosened their SOP regulations between 2004 and 2012 (CO, HI, ID, MD, MA, ND, RI, VT), while two states became more restrictive (KS, TX). All but three of these states made changes between 2008 and 2012. Table 3 shows the State SOP classification for each State and year, as well as a count of states moving to liberalize their SOP laws during the time frame covered by this analysis.

Table 3. State scope of practice in 2004, 2008, and 2012

Scope of practice	Frequency	Percent
State Scope of Practice, 2004		
Full Practice and Prescriptive Authority	12	23.53
Full Practice Authority Only	13	25.49
Restricted Practice and Prescribing	26	50.98
State Scope of Practice, 2008		
Full Practice and Prescriptive Authority	13	25.49
Full Practice Authority Only	11	21.57
Restricted Practice and Prescribing	27	52.94
State Scope of Practice, 2012		
Full Practice and Prescriptive Authority	19	37.25
Full Practice Authority Only	8	15.69
Restricted Practice and Prescribing	24	47.06
State Liberalized SOP, 2004-2012		
No	43	84.31
Yes	8	15.69

Other state characteristics, such as number of providers, unemployment rate, percent of the population living in a rural area, percent of the population age 65 and older, and percent of the population in poverty were treated as continuous variables in analysis. We tested several configurations for provider supply, such as including physicians only, physicians and PAs, and all providers. The best performing variable across different outcomes was the total supply of providers in the state, including NPs.

[1] Pearson, L. *The 2004 Pearson Report. The 2008 Pearson Report. The 2012 Pearson Report.* American Journal for Nurse Practitioners.

Individual characteristics modeled and treated as categorical independent variables from the NSSNP included age, gender, race, education, urban/rural location, and for some outcomes, whether the NP worked full-time or part-time. Coding was conducted as follows:

- Age was coded by five-year bands beginning with "Under 35" and ending with "65 and older".
- Race and ethnicity (individual variables) were recoded into a single measure with the categories Hispanic (any race), White, not of Hispanic origin; Black/African American, not of Hispanic origin; Asian/Native Hawaiian or other Pacific Islander; not of Hispanic origin, American Indian/AK Native; not of Hispanic origin, and two or more race; not of Hispanic origin.
- Education was measured by the highest degree respondents had earned including Certificate[2], Master's Degree, Post-master's Certificate, and Doctoral Degree.
- The number of hours worked per week was used to assign each NP to full-time (35 or more hours per week) or part-time (less than 35 hours per week) status.
- NP work location was classified as rural or urban using RUCA codes, a Census tract-based classification scheme that utilizes the standard Bureau of Census Urbanized Area and Urban Cluster definitions in combination with work commuting information to characterize all of the nation's Census tracts regarding their rural and urban status and relationships. A crosswalk of zip codes to RUCAs was developed by the Washington, Wyoming, Alaska, Montana, and Idaho (WWAMI) Rural Health Research Center[3] and was used for this analysis. The categories and associated RUCA codes were:
  - Urban: 1.0, 1.1, 2.0, 2.1, 4.1, 5.1, 7.1, 8.1, and 10.1
  - Large Rural City/Town: 3.0, 4.0, 4.2, 5.0, 5.2, 6.0, 6.1, 7.2, 8.2, and 10.2
  - Small Rural Town: 7.0, 7.3, 7.4, 8.0, 8.3, 8.4, 9.0, 9.1, 9.2, and 10.3
  - Isolated Small Rural Town: 10.0, 10.4, 10.5, and 10.6

Outcome Measures

Across the quantitative analysis we looked at a range of outcomes including likelihood of working as an NP, likelihood of working in primary care, additional practice outcomes, and changes in billing

[2] Individuals in the Certificate category do not have a graduate degree, which is now required in all states for entry into practice. These NPs are older on average, having been "grandfathered in" prior to the change in regulations.

[3] http://depts.washington.edu/uwruca/ruca-uses.php

volume over time. Outcome measures by data source – NSSNP and Medicare Claims – are each described in turn to provide useful context for understanding of the subsequent section on analytic findings.

Using the NSSNP data we examined NP distribution and practice outcomes. First, we looked at the drivers of NPs' decisions to practice in patient care. Several NSSNP questions were used to define patient care. To qualify as working in patient care, NPs had to report that they worked in an NP position and that they provided some direct patient care in their NP position.

Only NPs providing patient care were used to examine the question of specialty choice. NPs were defined as working in primary care if they reported that the specialty of the practice/facility in which they work was Internal Medicine, Family Practice, Geriatrics, General Pediatrics, Adolescent Medicine, Women's Health, or School Health. This selection of specialties was consistent with HRSA's selection of primary care specialties as published in their report on this survey. Interestingly, a number of NPs reporting a primary care specialty indicated working in hospitals, academic settings (where they may practice as part of clinical education), and other settings. A more restrictive definition of primary care was constructed limiting primary care NPs to those who also reported practicing in an ambulatory care setting (such as a physician or NP office, Nurse Managed clinic, retail-based or urgent care center, or FQHC).

The two definitions of primary care were tested extensively. For the purpose of understanding SOP effects, we elected to retain the more restrictive definition of primary care. This resulted in a more consistently affected group of providers and removed individuals practicing in settings not typically associated with primary care. We acknowledge that this is a lower estimated proportion of NPs in primary care than reported in prior research, where between half (AHRQ, 2011) and three-quarters (AANP, 2010) of NPs have been counted as working in primary care. Our coding was not intended to create an ideal estimate of NPs in primary care but rather to best observe the relationship between practice scope and other factors on primary care practice.

To support Medicare Claims analysis, we used counts of licensed NPs from the Pearson report, along with counts of active primary care physicians in each state from AAMC, to compute the NP share of the primary care workforce (defined for this analysis as NPs plus primary care physicians). Although we had information on the number of PAs licensed by state in each year, we choose to define primary care workforce using only physicians and NPs because our dependent variables did not include claims files by other types of providers.

We requested counts of claims and total reimbursement by State and year along two major dimensions: provider type and code set. For provider type, we obtained counts for NPs, all physicians, primary care physicians, and all providers combined. We constructed "inclusive" and "restrictive" code sets to determine what claims to analyze. The "inclusive" version included first visit claims from both the CMS Carrier and Outpatient claims files, while the "restrictive" version included only claims from the Carrier file. We tested different configurations of our dependent variables along these two dimensions. The patterns observed were consistent regardless of definition, so we elected to use the inclusive set of claim codes and NPs plus primary care physicians as the denominator to keep the focus on primary care.

As shown in Table 4, the NP share of the primary care workforce increased by an average of 9.74 percentage points between 2004 and 2012. Because workforce size is likely to drive volume of claims submitted, this share is used as a control variable in subsequent analysis. While we recognize that SOP may influence workforce size through migration or increased rates of graduation from NP schools, the close connection of NP workforce size to billing necessitates its use as a control variable in claims analysis. Regression results illustrate the extremely strong relationship between NP workforce size and NP share of first-visit claims, which would mask independent effects of SOP on billing if SOP also influences workforce size. Our data sources did not permit analysis of migration patterns or graduation rates from NP schools.

Table 4. NP Share of Primary Care Workforce, by year (N=51)

	Mean state share	Standard deviation	Minimum state share	Maximum state share
2004 NP share of workforce	30.32	6.81	17.83	43.07
2008 NP share of workforce	35.19	7.16	20.84	49.85
2012 NP share of workforce	40.05	7.03	26.93	58.97
Change in % NPs, 2004-2012	9.74	6.65	-3.85	33.42

Modeling Approaches

For each outcome, we examined bivariate and multivariate relationships between the outcomes and independent variables. Outcome measures were either dichotomous (working in patient care, working in primary care, having a panel, having hospital admitting privileges, seeing a high volume of patients each week, billing under own provider number, working without physician supervision, and working in a rural area) or continuous (percent of time spent in patient care). The nature of outcomes determined the types of statistics reported and the approaches selected for modeling.

For dichotomous outcomes, bivariate relationships were tested with the Wald chi-square statistic (categorical independent variables) and t statistic (continuous independent variables). Multivariate relationships were tested with logistic regression, and we reported estimated logits, odds ratios, predicted probabilities, and confidence intervals for predicted probabilities. For continuous outcomes, bivariate relationships were tested with analysis of variance (categorical independent variables) and Pearson correlations (continuous independent variables). Multivariate relationships were modeled using ordinary least squares (OLS) regression, with unstandardized and standardized coefficients reported.

The NSSNP dataset contains a set of 100 replicate weights designed to correct for non-response and ensure that results are representative of the 2012 NP population. To utilize these weights, we employed special procedures for complex survey designs using jackknife variance estimation. SAS 9.3 statistical software procedures SURVEYFREQ, SURVEYREG, and SURVEYLOGISTIC were used to conduct the analysis. Categorical predictors in logistic regression were included using CLASS statements rather than dummy coding for ease of predicted probability computation.

Using the Medicare Claims data we examined counts of claims by state and year and analyzed the point-in-time relationship between SOP and NP billing (in 2004, 2008, and 2012) as well as the impact of change in SOP on change in the NP share of first visit claims and reimbursement. We controlled for the size of the NP workforce in each state, since states with a larger NP workforce relative to that of physicians could be expected to produce more NP claims.

To examine the extent to which State SOP was related to increases in NP claims and reimbursement, we ran a series of linear regressions using PROC GLM in SAS. This procedure estimated means for our dependent variables by State SOP classification controlled for the NP share of the primary care workforce. It should be noted that because we were working with the universe of claims in each State and year, rather than a sample, we omitted presentation of inferential statistics (significance tests) in our analysis.

Findings

This project included a series of tasks designed to shed light on the nature and extent of barriers that limit the degree to which NPs are practicing to the full extent of their education and training. Finding from both qualitative and quantitative tasks are presented in this section, each in turn. Policy implications for consideration as a result of these findings overall are presented in the following section.

Qualitative Findings

Qualitative work conducted in support of this project included five state-level case studies as well as interviews with national stakeholders. Through these tasks a rich picture emerged of a changing landscape of health care delivery, with NPs providing services in varied contexts, but still constrained in many ways from being able to practice to the full extent of their education and training. Some clear differences in NP practice patterns were brought to light based on state SOP, institutional culture, and other factors. A summary of qualitative findings is presented in this section. Findings are organized by domain and include: care delivery, access to care, supply and migration of NPs, challenges to NP practice, and payment matters. The case study discussion guide is provided in Appendix B.

Care Delivery

Across all states selected for site visits, NPs work in a variety of settings regardless of state SOP laws, and practice in both rural and urban areas. Overall, there is wide variation in how NP care is organized and delivered. Many factors other than state SOP laws were reported to influence care delivery by NPs, including geographic location, practice setting (e.g., hospital, group specialty, solo practice), organizational bylaws, and local culture.

NPs tend to be concentrated in urban areas, and this was more pronounced in case study states with restrictive SOP laws. While there may be fewer total NPs in rural areas, NPs were reported to constitute a large proportion of the providers in these areas. NPs in any region of a state may find it burdensome and inefficient to meet requirements for physician collaboration, but this burden was suggested to be greater in rural areas as a result of a shortage of physicians. Although NPs in very

rural areas may practice with more autonomy than their urban counterparts, in states with SOP laws that require physician collaboration, NP practice may seem more feasible in urban areas, where it may be easier to meet requirements for physician collaboration. As a result of SOP barriers, opportunities for equitable and efficient care delivery in underserved, rural areas tend to be hampered in such states.

Participants reported that more positions for NPs were opening in settings outside of traditional first-contact primary care. There was, for instance, a reported increase in NPs going into specialty care settings, where the pay may be higher and physician collaboration (if required) may be more readily attained. This trend appeared to be independent of state SOP laws; participants working in health care delivery reported this shift across all states. NPs working in specialty practices or in hospitals may not be practicing to their full scope, even in states that grant full practice authority to NPs. In specialty practices, NPs may be viewed as "physician extenders," seeing patients for routine disease management and who present with less complex conditions, while reserving more complicated cases for specialty physicians.

In most cases, emerging and innovative models of care delivery including telehealth and care delivery through retail models – in which NPs can be utilized to a greater extent – were either underdeveloped or deemed unsustainable by interviewees. A few sites however, provide reason to believe new models may be adopted more widely in the future.

A representative from a national retail clinic indicated that over the past year, their organization has worked to identify specific care delivery models and roles for physicians and retail clinicians (including NPs) in an effort to be more aligned with individual state SOP. They instituted a flexible model of physician supervision, collaboration, or consultation, dependent on the SOP of the given state. That said, participants in Texas reported that NP practice restrictions in retail clinics within the state were more restrictive than the state SOP. Use of NPs in retails clinics in New Mexico was reported to be "in development".

In Washington and New Mexico, states with less restrictive SOP regulations, NP use of telehealth was more common than in states with more restrictive SOP. NPs in these states were also more likely to work in NMHCs. In Texas and Florida however, it was reported that NPs only rarely participated in telehealth services and the few NMHCs were facing operational challenges.

Again, one exception stands out as a possible direction for the future: a pilot of telehealth in some Texas retail clinics. In this pilot, patients were seen remotely by NPs via video calls. A nurse (usually

a licensed practical nurse) assisted the patient at the retail clinic to connect fiber-optic peripherals and Bluetooth stethoscopes to enable the NP to diagnose and treat remotely. While it was acknowledged that this may not work for all types of visits, this telehealth pilot suggests possibilities to expand care delivery to rural areas in the future.

In addition to the limits placed on NP practice by state SOP laws, NP practice was reported to be constrained by federal regulations and statutes. For example, under Medicare, NPs are not allowed to conduct assessments to admit patients to skilled nursing facilities, nor are they permitted to provide the initial certification for hospice care. While NPs may conduct examinations for home health care services, the evaluation report must be signed by a physician. Under federal law, NPs are also restricted from prescribing certain drugs for the treatment of opioid addiction, such as buprenorphine.[4] These limitations were reported to be more problematic in rural areas, as there are often fewer accessible physicians. The end effect was reported to be delays in care, and further health inequities in already underserved areas.[5]

An additional barrier, and perhaps the most commonly reported "local" obstacle to full use of NPs, was the effect of prevailing organizational culture. In the hospital setting, it was commonly reported that the organizational bylaws prevented NPs from practicing to their full practice scope, regardless of whether or not the state had restrictive SOP laws. It was also suggested that restrictions placed on NP practice at some hospitals may have reinforced beliefs that NPs were not qualified for autonomous practice.

Even in states where NPs can practice autonomously according to the legal SOP, it was clear from many interview participants that physicians may not always view NPs as equal colleagues and may not support full practice authority for NPs. In states with requirements for physician collaboration, NPs were often considered to be interchangeable with PAs, since physician involvement is required

[4] The Drug Addiction Treatment Act (DATA) only permits qualified physicians (not nurse practitioners) to treat narcotic dependence with schedules III-V narcotic controlled substances, such as buprenorphine. See DEA Requirements for DATA Waived Physicians, available at http://www.deadiversion.usdoj.gov/pubs/docs/dwp_buprenorphine.htm

[5] It is worth noting that there are some limited situations in which NPs have great liberty to practice autonomously in spite of state regulations and laws to the contrary. The federal Supremacy Clause in Article VI of the U.S. Constitution has been interpreted to mean federal law preempts state law, even when laws are in conflict. As a result, advanced practice nurses (including NPs) within the Indian Health Service have been able to practice to the full extent of their education and training for years because IHS regulations preempt state-based scope of practice limitations (Acquired June 24, 2015 from: http://www.ihs.gov/ihm/index.cfm?module=dsp_ihm_pc_p3c4#3-4.11). Similar practice freedoms are also allowed in the Public Health Service and U.S. Armed Forces (Acquired June 24, 2015 from: http://www.nursingworld.org/FunctionalMenuCategories/MediaResources/PressReleases/2015-NR/Bill-to-Increase-Veterans-Access-to-APRNs-Services.html).

for both NP and PA practice. In Texas, delegated NP practice with physician oversight entails rigid protocols that NPs must follow, contributing to a culture in which NPs may be viewed as "second-class providers." State medical boards in Texas and Florida strongly oppose full practice authority for NPs, and such opposition may be fairly ingrained in the medical community. In Nevada, a state that recently engaged in SOP reform, a new wave of health care leaders has helped create a more-inclusive culture that allows NPs greater autonomy.

Access to Care

Demand for primary care is expected to increase, in part because of newly insured Americans, but mostly as a result of population growth and aging. The supply of primary care physicians likely will not meet this growing demand (U.S. Department of Health and Human Services, 2013). Primary care physician shortages are especially severe in rural areas, where inadequate provider networks and geographic isolation may hamper efforts to meet health care needs. NPs could potentially help improve access in these areas, but restrictive state regulations and hospital bylaws may limit the degree to which NPs can do so. In states with restrictive NP SOP laws, the scarcity of primary care physicians in rural areas may make it especially difficult for NPs to find a physician willing to enter into a collaborative arrangement. Requirements for physician collaboration may be pushing NPs to practice in areas where opportunities for collaboration are more readily available (e.g., in urban areas, hospitals, specialty practices). In contrast, one participant suggested that the SOP reform in Nevada, which removed the physician collaboration requirement, may lead to more NPs practicing in rural areas.

Staffing in rural areas was reported to be very challenging for health care employers. In some cases, employers used headhunters or recruitment agencies, but vacancies often still persisted. Loan repayment programs were reported to be successful in enticing new NP graduates to start practicing in rural areas where few primary care providers were available. One participant however, reported that about half of NPs who participated in such programs in New Mexico left the rural area once their commitment was complete, creating a "revolving door" of providers.

NMHCs may be an effective way to improve access to health care in underserved areas, but this may be true only in states that permit full practice authority. In Washington, NMHCs were relatively common throughout rural areas of the state, and NPs participating in the National Health Service Corps constituted a large proportion of providers in these primary care health professional shortage

areas. Participants however reported concerns about the costs of operating NMHCs and sustainability particularly in very rural areas where the population was widely dispersed.

Supply and Migration

There may be some flux of NPs from states with restrictive SOP laws to states with less-restrictive SOP laws. For example, a small percentage of NPs (perhaps as many as 10 percent, according to an interview participant) were reported to be leaving Texas to practice with full authority in New Mexico. New Mexico's governor has been aggressively working to recruit NPs into New Mexico and working to ease the licensure process for out-of-state NPs (State of New Mexico, 2013). In general however, NPs were being drawn into in-state settings other than primary care and were receiving specialty training. In Washington, one participant noted that the supply of family NPs (FNPs) was being threatened in part by limited hands-on clinical training provided through the NP curriculum, which resulted in new graduates feeling unprepared to deliver the full spectrum of primary care. There were many reports of newly graduated FNPs, particularly those who had not previously practiced as RNs, struggling to meet expectations when they first transitioned into practice – these individuals often quit or chose to specialize rather than provide "front line" primary care.

A key element in the supply of NPs is in education and training. Given that all NP programs in the United States are now offered at the graduate level and are required to be accredited by a nationally recognized nursing accrediting body, there is increasing curriculum standardization across institutions. Some variation was noted however in the specialties and focus of particular streams of the NP programs by state. In Nevada, educators reported a focus on business and health care administration – appropriate for a state with newly expanded NP SOP. In New Mexico a current educational focus was reported to be provision of care to rural and underserved areas – also appropriate given state health care needs. Each state included in the case study research reported a recent growth in their NP programs as well as very competitive admissions. Expansion of NP education programs was reported to be held back by insufficient number of NP faculty members and the scarcity of preceptorships.

Across all states, a scarcity of clinical training opportunities or preceptorships was highlighted and presented as a critical impediment to the supply of NPs. In states that allow NPs full practice authority, a further educational obstacle was also reported. In these states, current attention is on a "residency" component of the curriculum that is similar to medical residency programs for physicians. According to several interview participants, the NP student population tends to be

younger and less clinically experienced than in previous decades. Following graduation, many new NPs reported feeling unprepared for the transition to practice, particularly autonomous practice as permitted under full SOP authority. A standardized residency component might help ensure that all NPs enter practice with a similar skill set and knowledge base. Having a more standardized clinical training component is viewed as critical for the future success of NPs in Washington and New Mexico. The need for a better developed infrastructure to support NP clinical training seems to be beginning to be heard. From 2012-2016 CMS is funding the Graduate Nurse Education Demonstration under which they are reimbursing 5 hospitals for providing clinical training to advance practice registered nurses, including NPs. HRSA is also providing Advanced Nursing Education grants in 2015 to develop and test innovative academic-practice partnership models for clinical training within graduate nursing education programs. Additionally, one national retail clinic leader indicated that in 2015, their organization will require clinicians with less than a year of experience to complete a fellowship program offered by this organization to refine their skills.

Overall demand for NPs was reported to be rising. In states that allow NPs full practice authority, participants suggested that employers prefer to hire NPs over PAs, because physician supervision is legally required for PA practice but not for NP practice. In states with restrictive SOP laws, employers may have no preference for hiring an NP over a PA, as both require physician oversight; however, some employers may still choose NPs over PAs because many previously worked as RNs and have direct patient care experience. Employers who participated in this study reported value in utilizing NPs for care delivery, including achieving improvements in quality metrics.

Challenges to NP Practice

Leveraging the NP workforce may be a viable solution for helping to meet the anticipated, growing demand for primary care nationally in the coming years. To realize the full potential for such a workforce solution, statutory SOP restrictions at the state level, hospital or facility bylaws, and federal regulations and statutes that prevent NPs from accessing or admitting to certain types of health care settings may need to be addressed. In states with restrictive SOP laws, NPs are legally required to follow a set of protocols under a supervising physician, including requirements for physician signatures, restrictions on prescriptive authority, and/or strict limits on professional judgment and the degree to which NPs may practice autonomously. These restrictions may limit the potential of NPs to improve health care access. During the case study work in Florida and Texas, where NPs also face opposition to SOP expansion from the state medical boards, organizational culture was sometimes noted to include the belief that NPs are "lesser" providers than physicians. Hence it may be difficult in states like these to overcome the forces that prevent NPs from

practicing to the full scope of their education and training. In particular, requirements for collaborative practice agreements may be a barrier for NPs. NPs may have difficulty finding a physician who will agree to a collaborative practice agreement, and even when a collaborating physician is secured, the cost of the collaborative practice agreement may be a significant barrier to practice. (See discussion of cost and reimbursement issues below.)

In Washington and New Mexico, states that grant NPs full practice authority, physician involvement is not required for any aspect of NP practice, including prescribing. However, hospital or facility bylaws may prohibit NPs from actions such as admitting patients, and may require physician sign-offs on paperwork. Furthermore, physicians may be misinformed or entirely uninformed about NP SOP, and some groups of physicians may strive to maintain a dynamic in which NPs are viewed as lesser providers rather than equal colleagues. Such barriers challenge the viability of NP practice, even in states allowing full practice authority for NPs.

Difficulties with establishing and maintaining an NMHC or nurse-led clinic also may impede the success of NPs, particularly in rural and other underserved areas. Many participants—both in states permitting full NP practice authority and in states with restrictive SOP laws—noted the challenge of operating a successful NMHC or nurse-led clinic. Doing so without the support of a large organization can require significant business acumen, and NPs may not receive any business training. Even participants from Washington, a state with more NMHCs than most other states, reported that NPs face a continuing struggle in this area. While the expansion of nurse-led retail clinics may present new opportunities for NPs that could limit the need for business acumen, these types of clinics are still relatively new and are primarily concentrated in high-density urban areas.

Across the nation, NP practice is restricted at the federal level. Federal regulations and statues such as those that bar NPs from conducting assessments to admit Medicare beneficiaries to skilled nursing facilities, providing the initial certification for hospice care, and signing evaluation reports for home health care services are particularly troubling for states allowing NP full practice authority. However, these federal-level barriers exist regardless of state SOP laws and limit the degree to which NPs may practice autonomously.

Participants reported a demand for NPs in nearly all settings. As previously mentioned, NPs are increasingly being drawn into specialty and acute care settings despite primary care physician shortages. Participants reported that more positions may be opening for NPs in specialty or inpatient care. Pay may be higher in these positions and thus more appealing to recent NP graduates.

In these settings, however, NP practice scope may be constrained and NPs may be utilized as "physician extenders."

Cost & Reimbursement Issues

Requirements for a collaborative practice agreement may be a significant financial barrier for NPs. In Texas, where collaborative practice agreements are required, the annual cost of the practice agreement may be a financial strain and may prevent NPs from expanding their practices. In Nevada, where SOP reform lifted this requirement, some employers may still be paying physicians for their collaboration with NPs in response to pressure from the physician community.

Billing procedures and reimbursement for NPs vary greatly, both in states allowing NPs full practice authority and in those with restrictive SOP laws. Even in states that grant NPs full practice authority, NPs may bill either independently or incident-to physicians. When NPs bill incident-to physicians, the money may go to the clinical department or unit with which the physician is associated, rather than to the hospital as a whole. NPs may be pressured to bill incident-to the physician if such billing yields greater revenue than billing independently.

Conclusion

Overall, NP practice is often constrained by factors beyond state SOP laws, and NPs generally are not practicing to their full potential. Many barriers stand in the way of NPs practicing to the top of their licensure, including hospital and facility bylaws, deep-rooted cultural beliefs, and federal regulations and statutes. Because of the full practice authority allowed in Washington and New Mexico, NPs may practice autonomously without legal requirements for physician involvement—though, as mentioned, NP practice is often constrained as a result of restrictive hospital bylaws and physicians' unawareness of NP SOP or beliefs that NPs should be supervised. In these states, adequate training to prepare NP students for a smooth transition into practice has emerged as a hot topic, since students often struggle with the transition to autonomous practice.

NPs in Texas and Florida face practice barriers stemming from legal requirements for physician involvement, and the challenges of restrictive protocols are magnified in rural areas. Expansion of practice scope for NPs in these states could lead to improvements in care delivery, access to care, and the viability of NP practice. Although the full effects of the SOP reform in Nevada are not yet

known, participants suggested that more NP-owned practices may be opening, and the full practice authority now permitted may boost the NP workforce in rural areas of the state.

Restrictive SOP laws and the other barriers described above (hospital and facility bylaws, physicians' beliefs and opposition, and federal regulations and statutes) impede the extent to which NPs may help improve access to primary care in the context of primary care physician shortages. In the absence of efforts to ease the SOP restrictions and other barriers, states may find it difficult to meet the growing demand for health care. Addressing SOP laws may be a first step toward reducing the barriers that hinder NP practice, potentially alleviating the effects of primary care physician shortages while improving access to timely health care.

Quantitative Findings

In this section we present findings from quantitative analysis conducted using data from the 2012 NSSNP and Medicare Claims data for NPs and other providers. To explore how NPs are utilized across the nation we relied primarily on data from the NSSNP. The NSSNP represent recent and rich data from licensed NPs about their work settings, specialties, job functions, degree of autonomy, education, and demographic characteristics. To flesh out the picture of NP contributions to care delivery in the United States, we examined claims volume over time using Medicare Claims data to assess the relationship between SOP and NP billing. NSSNP and Claims data were paired with state level data on NP SOP, supply of providers, and descriptors of the population to provide quantitative evidence of the impact of SOP on a number of distribution and practice outcomes for NPs. Detailed tables of quantitative results are presented in Appendix C and the Claims data request parameters are presented in Appendix D.

NPs Providing Patient Care and Primary Care

To determine the impact of SOP and other factors on the decision of licensed NPs to provide patient care in an NP position, we included the entire NSSNP sample (all individuals eligible to practice as NPs in one or more states). A sample of 12,163 NPs representing 144,948 NPs in the U.S. contained data for all variables in the analysis. To analyze predictors of practicing in primary care, we subset the data to NPs providing patient care in an NP position. Within this subset, we defined "working in primary care" as NPs who provided patient care in ambulatory care settings and

reported that the specialty of the practice/facility in which they work was Internal Medicine, Family Practice, Geriatrics, General Pediatrics, Adolescent Medicine, Women's Health, or School Health. A total of 9,687 cases (79.6 percent of all respondents) representing 115,655 NPs were providing patient care in an NP position and included data for all variables in the analysis.

Working in Patient Care

- SOP was a statistically significant predictor of NPs working in patient care, with other state and individual characteristics controlled in logistic regression. Licensed NPs in states with full practice and prescriptive authority were about 5 percentage points more likely to work in patient care than NPs in states with restricted practice and prescribing (Figure 1). NPs in states with full practice but not prescriptive authority were about 3 percentage points more likely to work in patient care compared with NPs in restricted states. This pattern suggests that both facets of SOP—practice and prescriptive authority—have independent and cumulative effects. States with the fewest restrictions appear to have the best chance of attracting NPs into patient care.

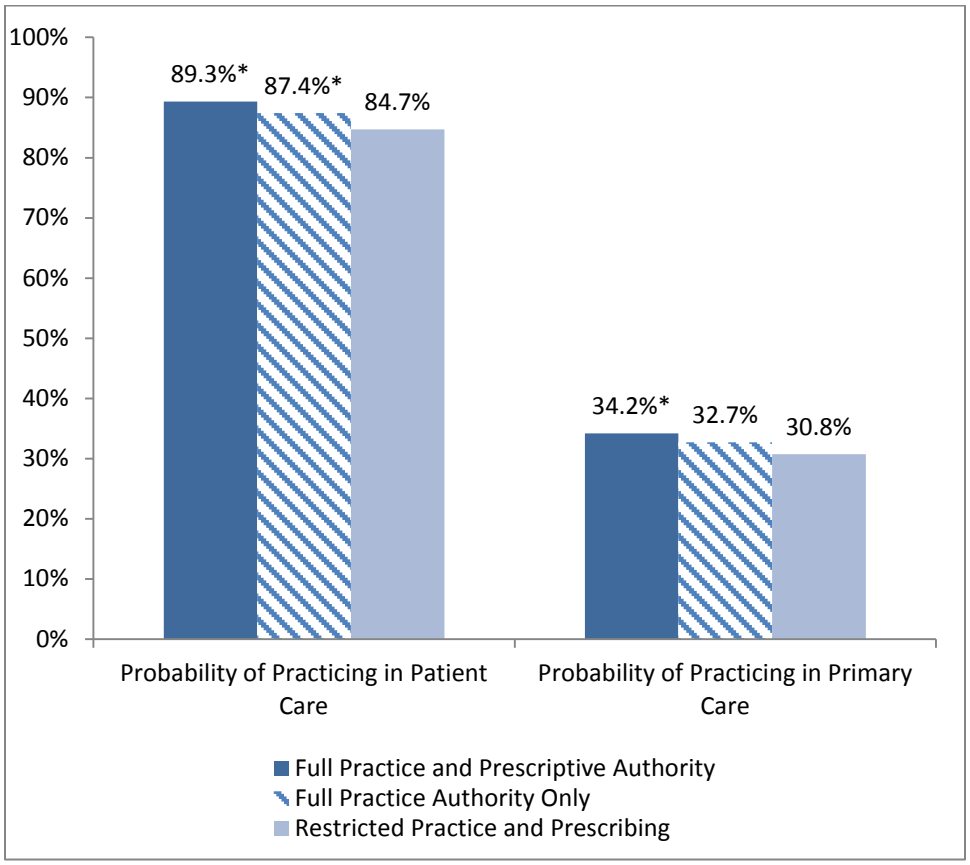
- Working as an NP in patient care was strongly influenced by age, as older NPs are more likely to be retired. The youngest cohort of NPs (aged 35 and under) had a 93 percent probability of working in patient care which declined in most successive age groups to 60 percent among NPs aged 65 and older.

- Male NPs, although representing only 7 percent of NPs overall nationally per the 2012 NSSNP data, were about 5 percentage points more likely than their female counterparts to be working as NPs in patient care.

- NPs who were Black were about 4 percentage points less likely than NPs who were White, not of Hispanic origin to be working in patient care. From the 2012 NSSNP data, 5 percent of NP nationally were noted to be Black, and 86 percent were White, not of Hispanic origin.

- NPs in rural areas were more likely to work as NPs in patient care. NPs in large rural cities and towns were 4 percentage points more likely than NPs in urban areas to work in patient care. NPs in small rural towns were 5.5 percentage points more likely. There was no difference between NPs in urban areas and isolated rural areas in the probability of working in patient care.

Figure 1. Impact of SOP on NP supply



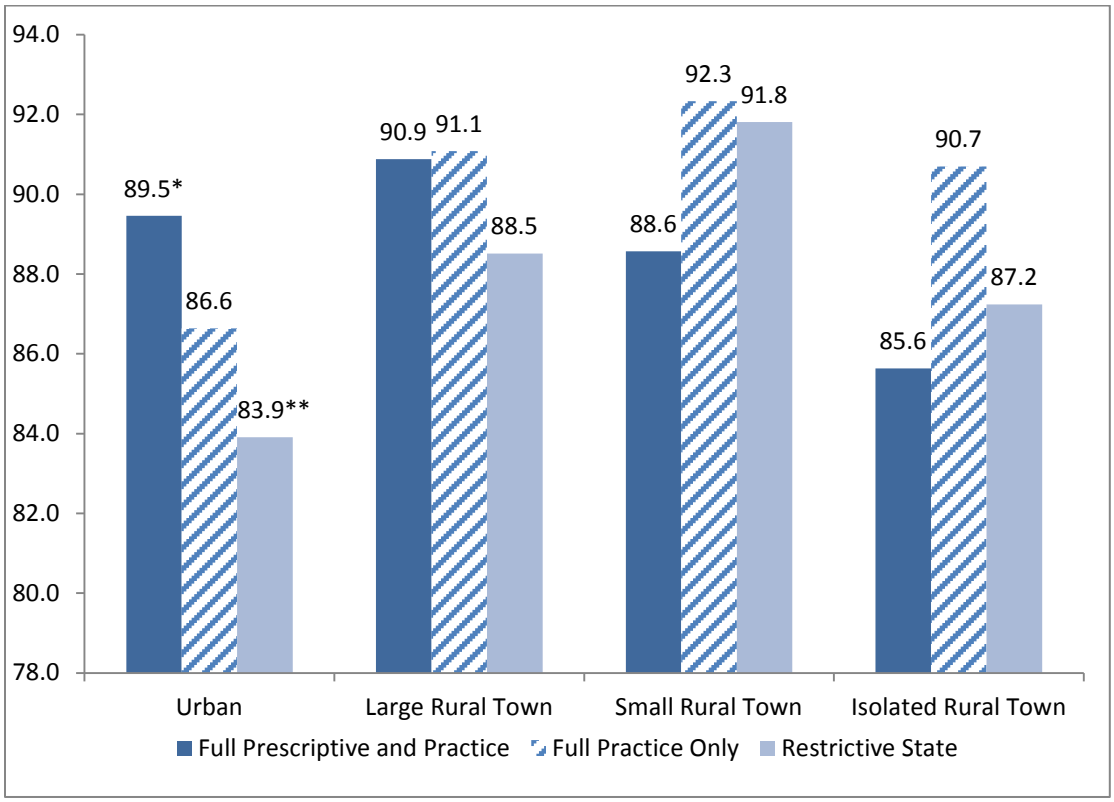
*Significantly different from restricted states.

Notes: Values are predicted probabilities controlling for all covariates in logistic regression. Post-hoc comparisons between all SOP categories within each dependent variable were performed using a Tukey test.

- There is evidence that scope of practice has different effects on the probability of working in patient care in rural versus urban areas (Figure 2). Scope of practice effects were more pronounced in urban areas when compared with rural areas. This suggests that relaxing scope of practice restrictions may be more beneficial in urban areas. Some state regulations permit more autonomous practice in rural areas (Dower, Christian and O'Neil, 2007), which may contribute to this finding.

- Two state characteristics in addition to SOP had a notable effect on the decision to work in patient care. As the percentage of the population in poverty increased, the probability of working in patient care increased slightly. The unemployment rate had a more pronounced effect; a 10 percent increase in unemployment over the sample mean (from 7.7 percent to 8.4 percent) yielded a 1.4 percentage point decrease in the probability of an NP practicing in patient care. Although the cause is not known with certainty, a weak state economy may lead to reduced employment opportunities for NPs as it does in other professions.

Figure 2. Probabilities of working as an NP in patient care by SOP and rurality



*Significantly different from urban areas in restrictive states

**Significantly different from small rural towns in restrictive states

Notes: Values are predicted probabilities for interaction terms controlling for other covariates in logistic regression. Post-hoc comparisons between all combinations of SOP and rurality were performed using a Tukey test.

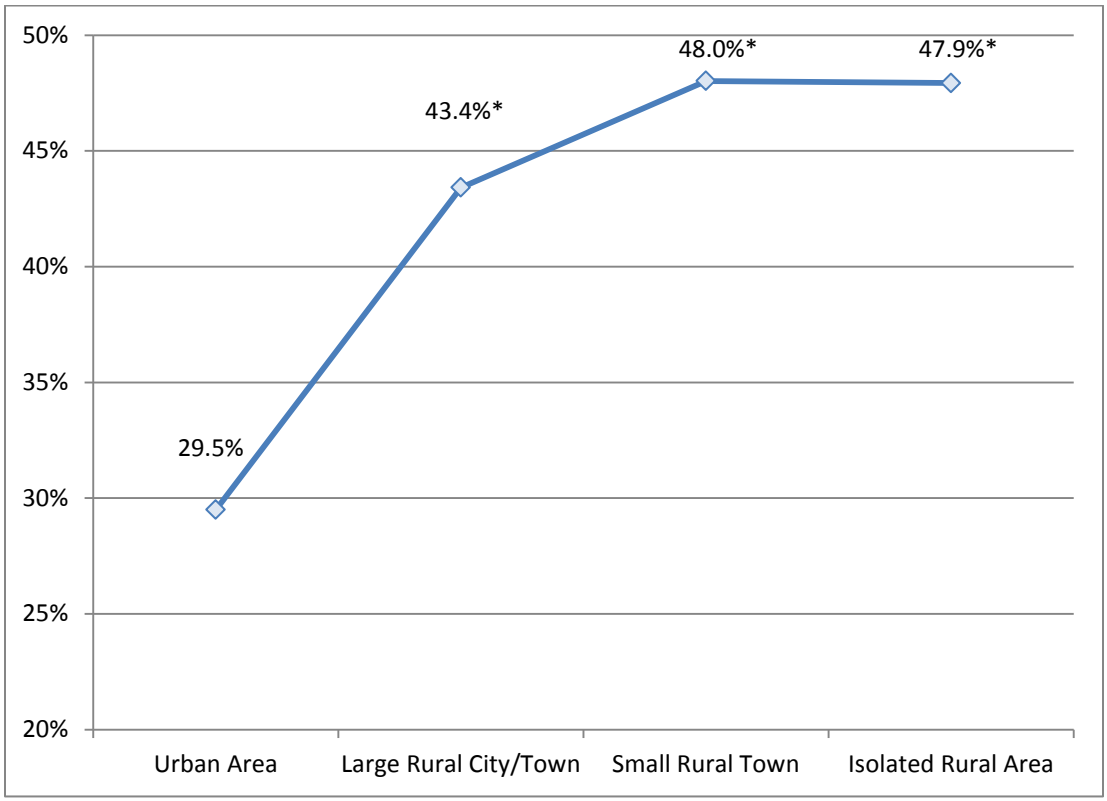
Working in Primary Care

- NPs in states with full practice and prescriptive authority were 3.4 percentage points more likely to practice in primary care than NPs in restricted states, with other state and individual characteristics controlled in logistic regression (Figure 1). However, there was not a statistically significant difference between restrictive states and those granting "full practice authority only" in the propensity of NPs to practice in primary care. This suggests that the added autonomy of independent prescriptive authority is important in the decision of NPs to practice in primary care.

- Female NPs were 9 percentage points more likely to practice in primary care than their male counterparts.

- Urban/rural location of NPs was an extremely strong predictor of practicing in primary care. NPs in small rural towns and isolated rural areas were almost 20 percentage points more likely to practice in primary care compared with NPs in urban areas (Figure 3).

Figure 3. Probability of working in primary care by urban/rural location



*Significantly different from urban areas

Notes: Values are predicted probabilities controlling for all covariates in logistic regression. Post-hoc comparisons between all categories were performed using a Tukey test.

- NPs were less likely to practice in primary care in states with a higher supply of primary care providers, but while statistically significant, the effect was extremely small.

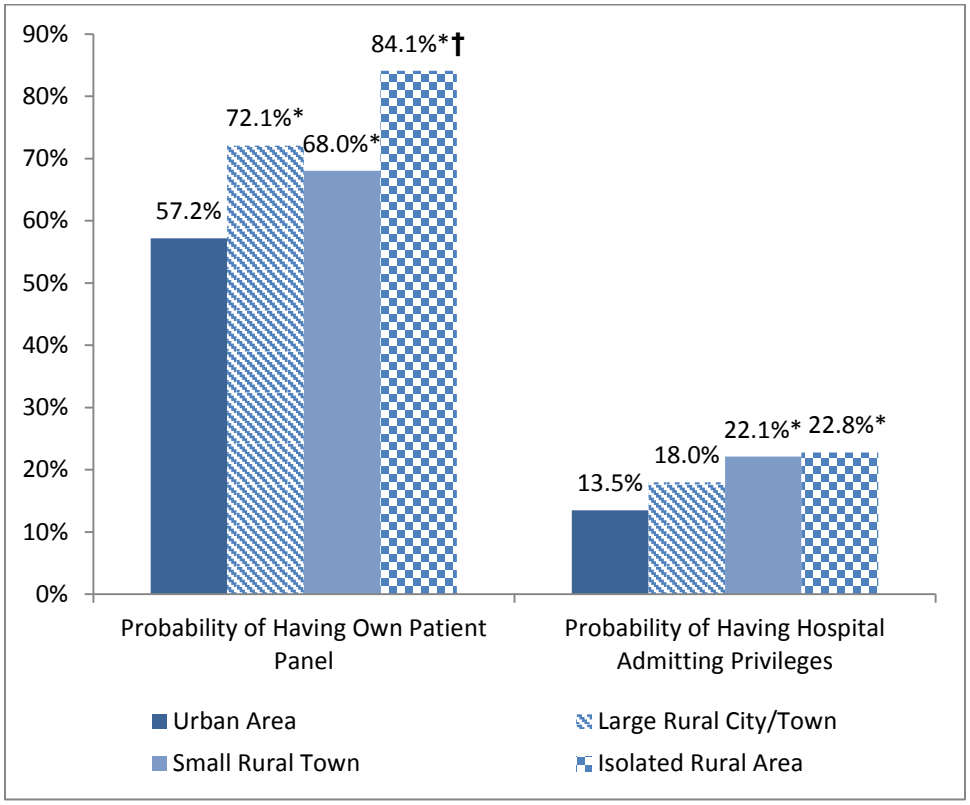
Having a Patient Panel and Hospital Admitting Privileges

The NSSNP subset analyzed for this section consists of NPs who were working in primary care and provided complete data for all variables in the analysis. A total of 3,057 cases representing 36,268 NPs were included. Models were run based on all NPs in patient care using specialty as a predictor variable. Practicing in primary care was a strong predictor of whether the NP had a patient panel, but it was not related to the odds of an NP having hospital admitting privileges. The effects of SOP and other variables were stronger among NPs practicing in primary care, but the general patterns observed were similar for both subsets.

Having a Patient Panel

- NPs in states with full practice and prescriptive authority had a 10 percentage point higher probability than NPs in restrictive states of having their own panel, holding demographic and state characteristics constant. However, there was no statistical difference between restrictive states and those with full practice authority only. This suggests that the added benefit of prescriptive authority is extremely important in determining whether NPs can feasibly care for their own panel of patients.
- There were few demographic differences in the likelihood of an NP having a patient panel. NPs without a graduate degree were 13 percentage points less likely to have their own patient panel than were NPs with a master's degree. NPs working full-time had a predicted probability 12 percentage points higher than NPs working part-time of having their own patient panel.
- NPs in more rural areas were far more likely to have their own patient panel, with other variables including practice scope controlled (Figure 4). Eighty-four percent of NPs in isolated rural towns were predicted to have their own panels, compared with only 57 percent in urban areas.

Figure 4. Having a panel and hospital admitting privileges by rural/urban location



*Significantly different from urban areas

†Significantly different from small rural towns

Notes: Values are predicted probabilities controlling for all covariates in logistic regression. Post-hoc comparisons between all geographic categories within each dependent variable were performed using a Tukey test.

Hospital Admitting Privileges

- In multivariate modeling, there were few significant predictors of NPs having hospital admitting privileges. Notably, scope of practice was unrelated.
- NPs who were Black and Asian were less likely than NPs who were White to have hospital admitting privileges, as were NPs who worked part-time.
- The strongest impact on admitting privileges was working in a rural area. About 23 percent of NPs working in isolated rural town were predicted to have admitting privileges, compared with only 13.5 percent of NPs in urban areas (Figure 4).

Percent of Time in Patient Care and Number of Patients per Week

The NSSNP subset analyzed for this research question consisted of NPs who were working as NPs in primary care. A total of 3,054 cases representing 36,245 NPs provided complete data for all variables in the analysis and were included. Models were also run based on all NPs in patient care and using specialty as a predictor variable. Practicing in primary care (versus other specialties) was a strong predictor of both percent of time spent in patient care and the number of patients seen per week (both higher among NPs practicing in primary care). To better disentangle the effects of SOP and other factors within primary care, only results within this subset are presented.

Fitting adequate models to these outcomes proved challenging, as neither the dependent variables nor model residuals were normally distributed. Ordinary least squares regression models did not perform well for either outcome, and selecting cut points for logistic models was conceptually difficult. We present OLS results for the percent of time spent in patient care with this caveat in mind. Comparison with results produced using logistic regression, arbitrarily cutting the dependent variable at its median and observing effects on whether NPs had "high" or "low" percentages of time in patient care, illustrated that scope of practice impacts were similar.

Linear modeling of the number of patients seen per week showed that the model did not fit well for NPs who saw large numbers of patients each week. Specifically, the residuals deviated from the regression line near the third quartile. This suggested that a fruitful cut point for logistic modeling was at the 75th percentile, such that the model discriminated between those with a very high patient load and all others. We present the logistic model for this outcome.

Percent of Time in Patient Care

- In general, our ability to predict this outcome was poor, with less than 4 percent of the variation in patient care time explained by our independent variables.
- With all else controlled, NPs in states with full practice and prescriptive authority spent about 2.2 percentage points more time in patient care. NPs in states with only full practice authority did not differ from NPs in more restrictive states.
- NPs working full-time spent about 2.8 percentage points less time in patient care compared with NPs working part-time, likely owing to increased administrative responsibilities for these nurses.
- NPs without a graduate degree spent about 3 percentage points more time in patient care than did those with a master's degree. NPs reporting Black or Asian race spent less time in patient care than their White counterparts, while NPs reporting two or more races spent more time.
- Neither urban/rural location nor state characteristics other than practice scope were associated with the percent of time spent in patient care.

Number of Patients Seen Per Week

- NPs in full practice and prescriptive authority states were 10 percentage points less likely to see a high volume of patients (defined as 90 patients or more per week) than were NPs in restricted states. There was no statistical difference between restricted and full practice only states in this outcome.
- NPs with doctoral degrees were about 23 percentage points more likely to see a high volume of patients each week compared with NPs having master's degrees. Those working full-time were about 26 percentage points more likely to see a high volume of patients each week.
- NPs in small rural towns were more likely to have a high volume of patients than their urban counterparts, but there was no difference for large rural cities or isolated rural towns.
- Two state control variables were related to seeing a high volume of patients. In states with a higher percent in poverty and a lower number of primary care providers per capita, NPs were more likely to see a high volume of patients.

NP Billing and Physician Supervision

The NSSNP subset analyzed for this section consisted of NPs who were working as NPs in primary care and provided complete data for all variables in the analysis. A total of 2,584 cases representing 30,720 NPs were included.

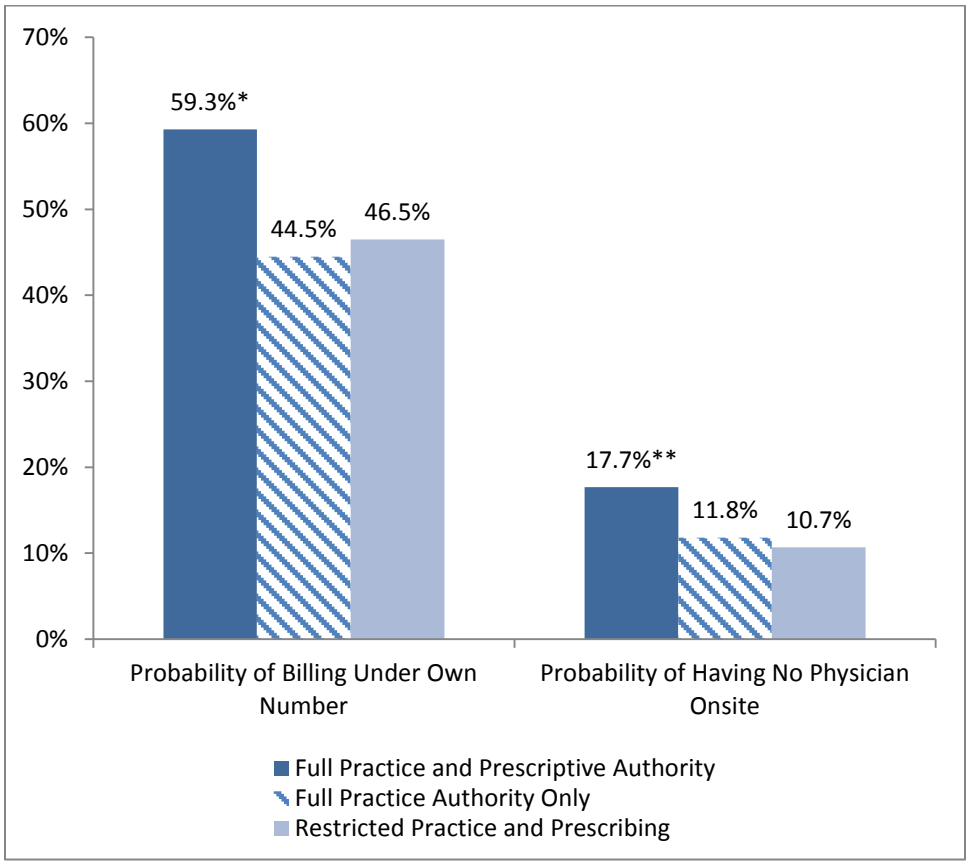
NPs were asked to select their *primary* billing arrangement from the following categories: bills under own National Provider Identifier (NPI) number, bills under physician number, bills under facility number, no billing (e.g., free or grant-supported clinic), unknown billing, mixed billing, or some other billing arrangement. The primary outcome of interest was whether NPs billed under their own provider numbers rather than physician numbers. Two different coding schemes were tested to determine the sensitivity of results to the treatment of other billing arrangements. In the first, facility billing was combined with physician billing and all other outcomes (no billing, unknown, mixed, or other) were treated as missing. In the second, facility billing was also treated as missing. The two coding schemes produced similar results. To retain more cases for analysis, the first coding scheme—combining facility with physician billing—was adopted.

NPs were asked about the percentage of time physicians were present on-site. The categories for selection were: 0 percent, 1 to 25 percent, 26 to 50 percent, 51 to 75 percent, and 76 to 100 percent. It is important to emphasize that these estimates of on-site physician supervision were reported by NPs. Models were tested treating the variable as categorical and also as dichotomous (using "no on-site physician presence" as the reference category and comparing that to "any level of on-site physician supervision"). The linear models based on the five-category outcome did not perform well; logistic regression results are presented here.

NP Billing Arrangement

- NPs in full practice and prescriptive authority states were more than 10 percentage points more likely to bill using their own number compared with NPs in restrictive states (Figure 5). There was no difference for NPs in full practice only states.
- NPs working part-time, NPs who were Hispanic or Asian, and NPs with less than a graduate degree were less likely to bill with their own NPI number.
- NPs in rural areas were far more likely to bill under their own number. The predicted probability of billing under own number was 45.3 percent in urban areas and nearly 60 percent in rural areas.

Figure 5. Impact of SOP on billing and physician supervision



*Significantly different from Full Practice Authority Only and Restricted Practice and Prescribing

**Significantly different from Restricted Practice and Prescribing

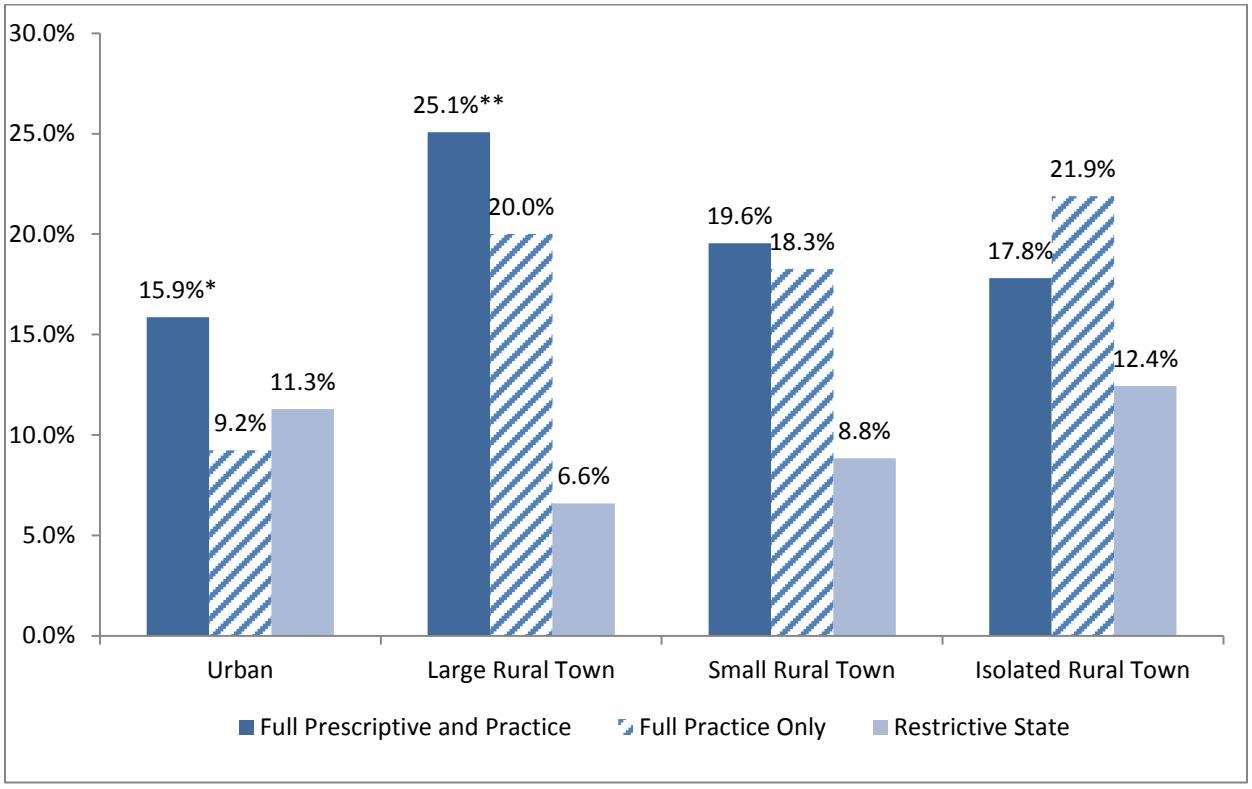
Notes: Values are predicted probabilities controlling for all covariates in logistic regression. Post-hoc comparisons between all SOP categories within each dependent variable were performed using a Tukey test.

Working Without Physician Supervision

- NPs in full practice and prescriptive authority states had a predicted probability of working without physician supervision 7 percentage points higher than NPs in restrictive states (Figure 5). There was no difference for NPs in full practice only states.
- Male NPs were far more likely to work without physician supervision (21.7 percent vs. 11.6 percent for women). NPs without a graduate degree were far less likely (7.3 percent vs. 12.4 percent for those holding a master's degree).
- No significant differences in the rate of physician supervision were found between rural and urban areas.
- Although rates of physician supervision were similar in rural and urban areas, SOP effects on physician supervision varied by urban vs. rural location (Figure 6). SOP

effects were larger in more rural areas, especially in rural towns. In these areas, far more NPs were practicing without supervision in full practice and prescriptive states compared with restrictive states. In contrast, in urban areas there was little difference in the probability of physician supervision across states with more or fewer restrictions.

Figure 6. Probabilities of no physician supervision by SOP and rurality



*Different from restrictive states in large rural towns

**Different from large rural cities in restrictive states and urban areas in full practice only and restrictive states

Notes: Values are predicted probabilities for interaction terms controlling for other covariates in logistic regression. Post-hoc comparisons between all combinations of SOP and rurality were performed using a Tukey test.

Working in a Rural Area

The NSSNP subset analyzed for this section consisted of NPs who were working as NPs in primary care and provided complete data for all variables in the analysis. A total of 3,185 cases representing 37,794 NPs were included.

NPs were considered to be working in a rural area if they worked in a large rural town/city, small rural town, or isolated rural area. To guard against the possibility that scope of practice effects on this outcome could be caused by a tendency of more rural states to have fewer SOP restrictions, we

incorporated another state control variable containing the percentage of the state's population living in a rural area. In this way, the effects of both state rurality and state SOP could be examined independently. It should be noted that state rurality may represent both supply and demand effects on the probability of an NP working in a rural area. On one hand, a state with more residents in rural areas has a greater demand for providers in rural areas, which may induce a larger supply of providers to meet that need. On the other hand, states with more residents in rural areas likely have more NPs who live in rural areas such that a higher supply is available precisely because of the state's rurality.

We attempted to analyze predictors of NPs working in a HPSA. We obtained from the Area Health Resources Files the HPSA status of each U.S. county and coded NPs who reported working in full-county HPSAs to be working in a HPSA, while those working in undesignated or part-county HPSAs were coded as not working in a HPSA. Almost 40 percent of NPs work in full-county HPSAs, and these areas were distributed across both urban and rural areas in every state across the country. Unfortunately, we found few meaningful relationships between predictors, including SOP, and whether an NP works in a HPSA. In this section, we present only results for rural location.

Rural Locations

- Bivariate statistics indicated that NPs in full practice and prescriptive authority states were 10 percentage points more likely to practice in a rural area compared with NPs in restricted states. However, bivariate statistics also showed that NPs working in rural areas tended to live in states with a higher proportion of the population living in rural areas (29.2 percent vs. 18.8 percent for NPs not working in rural areas).
- Multivariate analysis showed that both SOP *and* the rurality of the state had independent effects on whether NPs worked in rural areas. NPs in full practice and prescriptive authority states had a predicted probability of working in a rural area 6 percentage points higher than NPs in restrictive states, with other state characteristics controlled. There was no difference for NPs working in full practice only states. NPs in more rural states were also more likely to be practicing in rural areas, with SOP controlled. A 10 percent increase in the proportion of a state's population that is rural yielded a 2 percentage point increase in the predicted probability of an NP practicing in a rural area.
- NPs who were Hispanic or Black were less likely to be practicing in a rural area.
- There were no associations between rural practice and age, gender, or education.

Medicare First Visit Claims

Using the Medicare Claims data, we examined counts of claims by state and year to determine whether states with less restrictive SOP regulations had greater proportional rates of NP billing for first visits. Although Medicare claims data analysis aggregated in this way provides a window on the market share of first visits performed by NPs, it does not allow analysis of visit rates or characterize the full set of services provided by NPs. First visit claims, on the other hand, may be less affected by incident-to billing and have not been examined in previous work.

We analyzed the point-in-time relationship between SOP and NP billing (in 2004, 2008, and 2012) as well as the impact of change in SOP on change in the NP share of first visit claims and reimbursement. Table 5 shows the NP share of first visit claims and reimbursement over time. On average, the NP share of first visit claims increased by 18.79 percentage points between 2004 and 2012. Interestingly, NP share of reimbursement for this same period increased by 15.52 percentage points.

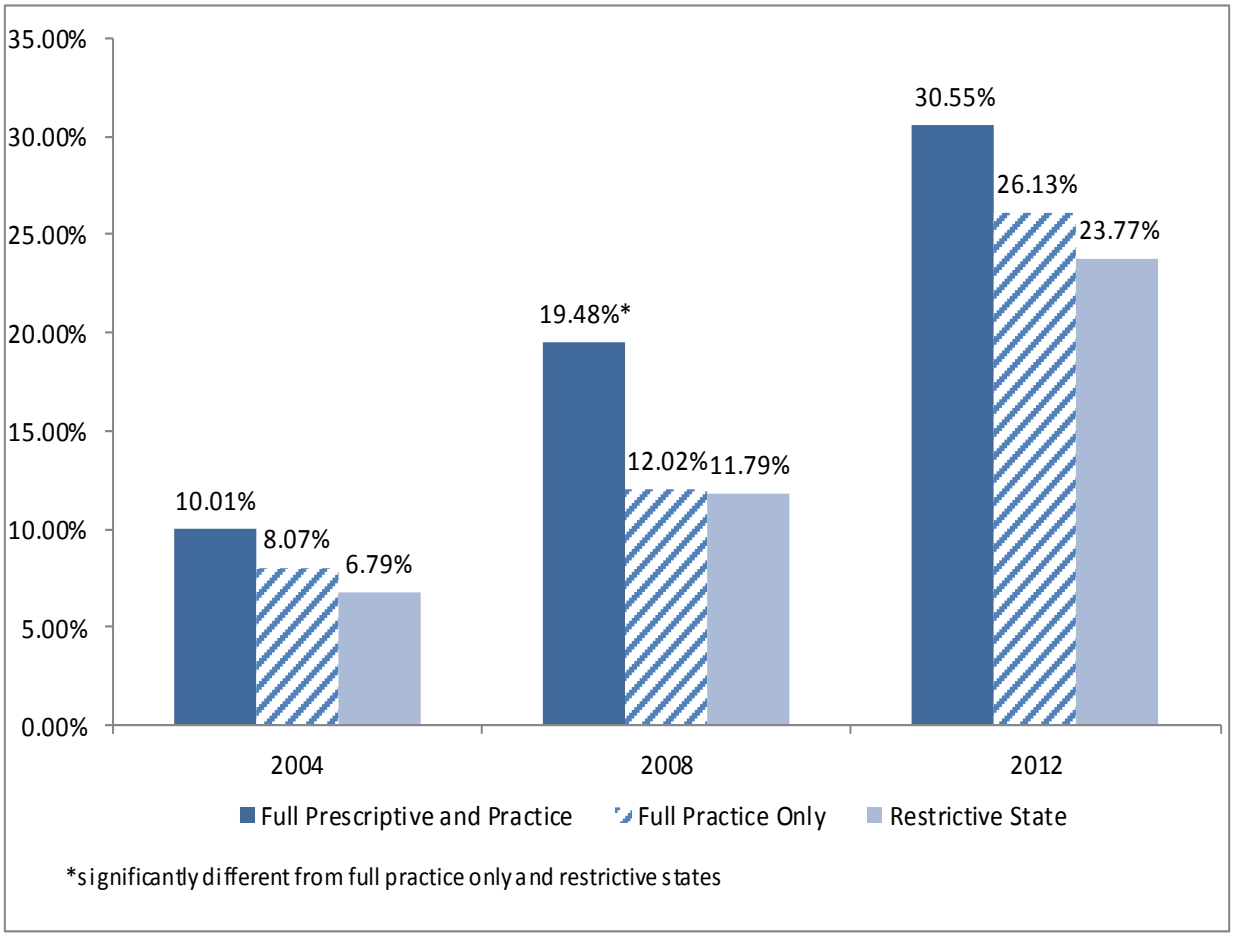
Table 5. Dependent variables: NP share of first visit claims and reimbursement

	Mean	Standard Deviation	Minimum	Maximum
2004 NP Share of Claims	7.87	5.11	1.50	24.09
2008 NP Share of Claims	13.80	8.98	2.96	47.19
2012 NP Share of Claims	26.66	14.34	5.77	78.05
2004-2012 Change in NP Share of Claims	18.79	11.20	1.79	60.15
2004 NP Share of Reimbursement	6.20	4.44	0.80	20.30
2008 NP Share of Reimbursement	11.49	8.33	1.65	44.32
2012 NP Share of Reimbursement	21.72	12.58	3.81	59.66
2004-2012 Change in NP Share of Reimbursement	15.52	9.83	1.21	44.36

Although our analysis reflects the universe of Medicare claims for first-visits, the structure of our data – aggregate counts of claims and reimbursed expenses by state and year – resulted in a small number of analytic units. As a result, statistical significance was difficult to achieve even for relatively large differences found within the population of Medicare claims. Although statistical significance is a concept typically used to identify the validity of generalizing sample results to a population, we

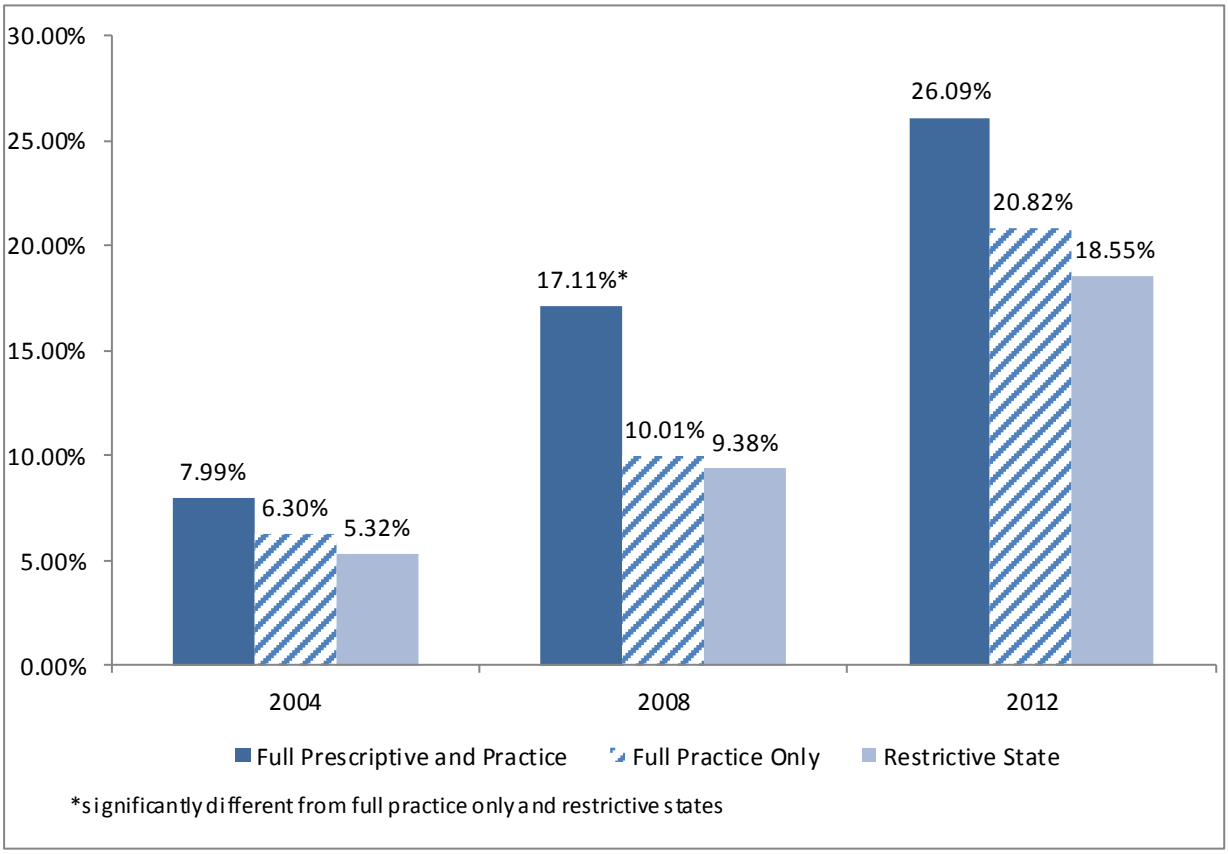
provide information on statistical significance in our figures for interested readers. Note, however, that a lack of statistical significance does not indicate that differences are small or cannot be generalized to the population of Medicare claims. When examined within each year, states with fewer SOP restrictions had a higher percentage of first-visit claims billed by NPs (Figure 7). The difference was most striking within 2008, where the average NP share of first-visit claims was 7 percentage points higher in full practice and prescriptive authority states than in full practice only states. Differences between full practice only states and restrictive states were consistent over time and small in magnitude. A very similar pattern is found for NP share of reimbursement in each year (Figure 8).

Figure 7. NP share of first-visit claims billed, by year and SOP



Notes: Values are controlled for differences in the size of the NP workforce across states.

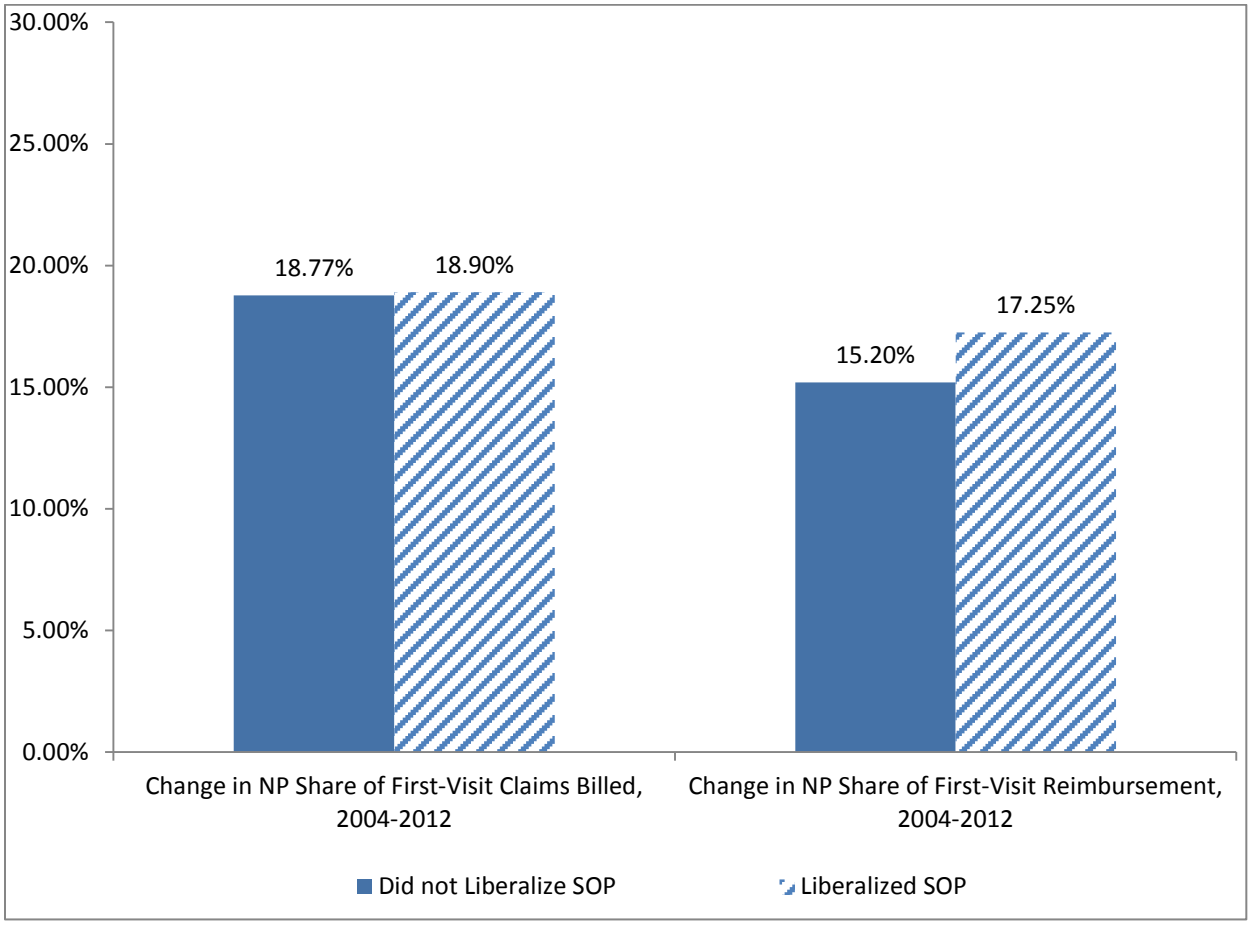
Figure 8. NP share of first-visit reimbursement, by year and SOP



Notes: Values are controlled for differences in the size of the NP workforce across states.

The strength of a longitudinal analysis is the ability to determine causality by seeing how change over time in an independent variable leads to change over time in a dependent variable. We computed the states' change in the share of NP billing and reimbursements for first visits and compared that with change over time in SOP regulations, controlling for change in the NP share of the primary care workforce (Figure 9). In this analysis, we found comparatively smaller effects. Less than one percentage point separated the growth in NP share of claims in states liberalizing their SOP regulations during the 8 years covered by this analysis. There was a slightly larger difference (2 percentage points) separating the growth in NP share of reimbursement, with liberalizing states growing more rapidly.

Figure 9. Change in NP share of first-visit claims billed and reimbursement, 2004-2012, by change in SOP



Notes: Values are controlled for differences in the size of the NP workforce across states.

Discussion and Conclusions

This analysis provides, for the first time, quantitative evidence of the impact of SOP on a number of distribution and practice outcomes for NPs. Prior research documented effects of SOP on the magnitude of the NP supply, but none had access to a data source capable of observing distribution and practice decisions at the individual level. Across the different outcomes, the general conclusion to be drawn is that *scope of practice matters for both NP workforce distribution and service provision*. With many other state and individual-level factors controlled, SOP emerged as a significant predictor of the likelihood of eligible NPs to provide patient care, practice in primary care, have their own patient panel, and spend more time in patient care.

Notably, the effects of prescriptive authority and practice authority were distinct. For the outcome of providing patient care, they appeared to be cumulative, with the highest probability of practice observed among states with both prescriptive and practice authority and the lowest among restrictive states. For the outcomes of NPs practicing in primary care and having their own patient panel, statistical differences were only observed for NPs in states granting prescriptive authority. Prescribing authority appears to be an important indicator of NPs' ability to provide comprehensive primary care to their own panel of patients. Even with full practice authority, without full prescriptive authority, it appears less feasible for NPs to contribute to the full extent of their education and training.

Even greater differences were found for most outcomes based on the rural or urban location of NPs. In rural areas, NPs were far more likely to work in primary care and to have more autonomy of practice (as measured by the likelihood of having a panel, hospital admitting privileges, and seeing more patients per week). These results suggest that NPs are extending access to care in rural areas. Additional analysis testing interactions between practice scope and rurality found that the effect of practice scope on propensity to practice in patient care is greater in urban areas, but our data source cannot pinpoint the cause of this relationship. Some states permit more autonomy in rural versus urban areas, which may account for the finding. Alternatively, it is possible that rural areas have a larger shortage of physicians providing basic primary care and thus employ NPs for this purpose, while urban areas have the populations to support higher degrees of specialization or facility-based roles for NPs. Interactions between practice scope and rurality were tested for all of the outcomes presented here, and in all cases but one they were not significant. Practice scope and rurality are, for the most part, independently related to the outcomes we studied.

Primary care NPs in states with full practice and prescriptive authority spent more of their time in patient care, controlling for other state and individual characteristics. Although the difference was not large, lessening SOP restrictions could increase the amount of patient care time NPs could provide to patients. On the other hand, primary care NPs in full practice and prescriptive authority states saw fewer patients per week, and the effect was stronger. The cause of this pattern is unclear but could result from NPs in full authority states providing a larger range of services and spending more time with patients. It could also occur if NPs in these states, who may be more likely to have their own practices, bear the full burden of both patient care and administrative paperwork. NPs in states with full practice authority only (not full prescriptive authority) did not differ from more restrictive states in either outcome.

Our analysis suggests that relaxing SOP restrictions—particularly those that limit NP prescribing—could increase the extent to which NPs choose to practice in patient care and primary care, and increase NP ability to care for a panel of their own patients and spend more time in patient care. Increasing the supply of NPs in patient care and primary care has obvious benefits for patient access. Increasing their ability to manage a patient panel may not have as obvious a benefit, as NPs could work alongside other providers to assist in providing care for another provider's panel. However, allowing greater flexibility in practice arrangements is a large potential benefit to independent practice and prescription authority—for example, in an independent state, NPs could spend a few days per week at a rural clinic with his/her own panel of patients while spending the rest of their time working in team-based care performing activities such as panel management, co-management of diabetics with a physician, or seeing patients for acute conditions if there is a sudden surge in demand. Such arrangements are likely to be considerably more difficult in more restrictive state, which might require two separate supervising physicians (for each segment of the NP's practice) and could therefore limit the NP in practicing to the full extent of his/her ability and license.

Medicare claims data analysis also point to the effects of state SOP regulation. We found that at a single point in time—whether 2004, 2008, or 2012—there was a clear association between state SOP regulations and NP share of first visit claims and reimbursement. This relationship was found even when controlling for NP share of the primary care workforce. When viewed longitudinally however, evidence was not strongly supportive of a causal relationship between SOP and first visit billing by NPs. Still, the point-in-time analysis suggests that less restrictive SOP is associated with a higher NP share of first visit claims and reimbursement. On the face of it, that finding is not extraordinary; one would expect that in states where NPs can operate more independently, they are likely to do more of their own billing. However, it is worth pointing out the implications of this finding for both patient access and Medicare savings. Given incident-to billing regulations, it is not legal for NPs to be the sole first-visit provider and still bill incident-to the services of a physician. This means that where NPs are not billing directly, some direct physician involvement is taking place. Second, where physician oversight is required, care provided by an NP and physician team will be billed to Medicare at 100 percent of the physician rate, versus 85 percent if the care were provided and billed by only an NP. Although there are arguments in favor of offering the same rates across provider types (assuming comparable quality of services), Medicare expenditures would be lower if NPs were able to practice to the full extent of their education and training and if NP services were billed on an independent basis rather than incident-to physician services.

Several limitations of the analysis herein presented warrant mention. First, the NSSNP data are cross-sectional nature and hence it is not possible to ensure with certainty the causality of relationships. For example, an association between SOP and the likelihood of an NP practicing in primary care may result from some unmeasured characteristic of restricted practice states that decreases the likelihood that NPs in the state choose primary care. To guard against that possibility, we have included controls for state characteristics that might be related to our outcomes, such as the number of other primary care providers (physicians, NPs, and PAs), the poverty and unemployment rate, and the age distribution of the population. Still, a stronger design would employ multiple years of data so that *changes* in SOP laws could be linked with *changes* in our outcome measures. If the NSSNP is re-administered in the future, such an analysis would be possible. Limitations of our Medicare Claims data analysis include the fact that analysis was conducted at three points in time (years) versus using continuous years of data, as well as the small sample size with states as the primary unit of analysis. Additionally, there is an unknown lag time between changes in SOP laws and implementation of new billing protocol that would be evident in billing practices in a state. Our use of first visit claims should protect against the influence of incident-to billing on our analysis, since regulations do not permit incident-to billing for first visits provided solely by NPs, but the extent to which practices adhere to this regulation is unknown.

Policy Implications

This project included a series of qualitative and quantitative research tasks aimed at exploring where and how NPs are practicing, and identifying barriers that limit the degree to which NPs are practicing to the full extent of their education and training. The goal of the project was to inform policymakers as they seek to remove barriers in order to fully utilize NP to support healthcare delivery in the United States. The project had several components: analysis of NP survey data to learn whether regulations affect practice; analysis of claims data; and five state-level case studies focusing on how, why, and under what conditions NPs are improving access to primary care in each state, taking into account state scope of practice laws and other factors. In this section we present some potential policy implications stemming from the research conducted.

Scope of Practice Regulations

Scope of practice regulations erect significant barriers to NP practice. These regulations thus may affect care delivery, access to care, and the outlook for the NP workforce.

- Many states require that NPs have supervisory agreements with physicians. In these states, NPs are reported to have to pay physicians to participate in collaborative relationships and to sign collaborative practice agreements. Federally-supported programs such as Medicare and Medicaid may want to consider the effect of these fees on their costs.

- Full NP practice authority is associated with a larger share of NPs providing primary care, and this impact is greater in rural areas. This suggests that the effect of SOP regulations may be greatest in rural areas where there has historically been a documented need for primary care services.

- There is less supply of physicians in rural areas, and thus supervisory and collaboration requirements can prohibit NPs from working in these areas. The quantitative analysis found that NPs in rural settings are more likely to provide primary care if they are allowed to practice with full authority. This finding was echoed in the case study interviews. NPs may be hampered by regulations requiring on site physician support for assessing new patients and prescribing, or other types of collaborative or supervisory requirements. State and federal agencies may consider exploring strategies to encourage rural practice and address barriers to such practice.

- Telehealth could help to address barriers associated with supervision and collaboration requirements, but it is not always clear how telehealth applies to NP practice

regulations. State regulations should be reviewed to determine whether current regulations and practices should be modified to accommodate telehealth.

- The case studies revealed that some (or many) physicians are concerned that, if NPs are allowed to practice with full authority, physicians will lose volume and experience a decline in income. However, the quantitative analysis found that in states with full practice authority, NPs are only 7 percent more likely to practice without physician collaboration. This suggests that NPs often practice in team-based settings, as opposed to competing against physicians. Further research could determine whether autonomous practice does, in fact, impact physician earnings; the findings of this project suggest the answer will be no.

- There was some indication that NPs move to states with less restrictive regulations. One interview participant in Texas estimated that as many as 10 percent of Texas-educated NPs may migrate to New Mexico to practice with full authority.

There are some specific regulations and statutes that warrant extra attention.

- Under Medicare, NPs are not authorized to perform several functions including conducting assessments to admit patients to skilled nursing facilities and providing the initial certification for home health and hospice care. Barring NPs from performing these functions can create significant barriers to access to care. These care delivery practices should be reviewed to determine whether there is evidence that they protect patients. If the evidence does not suggest that patients are protected by these practices, a legislative change could be considered to permit NPs to provide these services.

- In some states, NPs are not authorized to prescribe controlled substances, or can prescribe only from specific schedules. This can be a significant barrier to successful NP practice, particularly in primary care, oncology, surgery, behavioral health, and palliative care. State agencies should assess whether these regulations protect patients, and whether such protection is more important than limiting access to services. Additionally, federal statute prevents NPs (though not physicians) from prescribing certain drugs for the treatment of opioid addiction. Federal statute, regulated through the granting of administration, dispensing, and prescribing privileges by the Drug Enforcement Agency, supersedes state regulations granting full prescriptive authority and limits the ability of NPs in all states to serve independently as addiction treatment providers (U.S. Department of Justice, n.d.).

Organizational Practices

Organizational culture greatly affects the utilization of NPs. Within the organizations and settings in which NPs practice, there may be more restrictive policies than required by law. NP practice scope may even vary by department within a single organization.

- Some hospitals have bylaws that restrict NP practice, hampering seamless care delivery and creating challenges for NPs in rural areas. Federal and state agencies should explore whether they can influence these policies.

- In states where NPs can practice with full authority, some employers have identified hiring NPs advantageous to hiring PAs, because NPs can work with more flexibility regarding physician vacation time, schedules, and oversight expectations.

- NPs practicing in rural settings often have a wider practice scope than those in urban areas. The nature of rural settings demands more autonomy, even when collaborative or supervisory agreements are in place with physicians.

Education and Training

NP education is designed to prepare NPs for independent practice. However, NPs do not uniformly engage in an intensive multi-year residency program as primary care physicians do. Medicare Graduate Medical Education (GME) funds are not available for NP training. Were new legislation to be enacted to expand HHS's authority, the Department might consider establishing programs to train and recruit new graduate faculty and provide adequate pre-and-post graduation clinical training opportunities for NPs. Either approach could help strengthen the NP pipeline, especially for building up a ready workforce, particularly in areas of greatest need. This study also found:

- The supply of NPs is currently reported to be falling short of demand across states regardless of their SOP regulations. Expansion of NP education programs is being held back by an insufficient number of NP faculty members and the scarcity of preceptorships. If granted the proper statutory authority, federal agencies could consider funding initiatives to train and recruit new graduate faculty. They could also consider innovative ways to entice clinical sites, particularly those providing primary care, to offer preceptorships to NP students.

- In some states, it was reported that NP graduates often feel unprepared for the transition to practice, and some family NPs may either decide to quit clinical practice or to further specialize after only a few months. While HRSA is supporting the testing of innovative academic-practice partnership models for clinical training within graduate nursing education programs, and CMS is funding a demonstration with five hospitals providing clinical training to advance practice registered nurses, federal agencies could further explore whether offering GME-type funds for NP residencies would be a good investment and if this would fall within their statutory authority.

- NPs are capable of establishing their own autonomous practices, even in states with physician collaboration requirements, and independently-owned nurse-managed health centers are common in some states. However, NPs often struggle with maintaining them. Licensure as an NP requires at least master's level education, which does not

require coursework in financial management. To facilitate change in this area, federal agencies could explore whether existing statutes allow their use of funding levers to encourage programs to offer NPs such business and financial training.

- Attracting NPs to rural and underserved communities can be very challenging. NP education programs could work to ameliorate this problem by more actively recruiting the types of students who are most likely to practice in these locales.

Billing and Reimbursement

Under Medicare policy, NP services billed through the NP's identifier are paid at 85 percent of the physician fee schedule. As described by many case study participants this – paired with some state requirements that require coordination with physicians – results in some circuitous billing structures, and limits the degree to which independent practices are financially viable.

- The practice of billing NP services under a physician's billing identifier is thought to be common, due to the payment differential, but it is not known how frequently this occurs. This billing practice makes it difficult to identify the roles of NPs within health care practices. Limiting or prohibiting "incident to" billing would help to track the roles of providers in the provision of services and provide greater transparency.

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Appendix A

Environmental Scan

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Executive Summary

To better meet the health care needs of a growing and aging population, the Assistant Secretary for Planning and Evaluation (ASPE) is conducting a study of barriers to the use of nurse practitioners (NPs) in primary care, focusing particularly on the impact of scope of practice (SOP) laws. This report presents the methods and findings from an environmental scan of the relevant peer-reviewed and grey literature. It was undertaken to inform the larger study.

The scan revealed that although much has been written about state-level SOP regulations, little prior work has examined their effect on access to care. The literature identified several barriers to the effective use of NPs in primary care:

- Restrictive SOP regulations have been found to inhibit the growth and retention of NPs in a state. Less restrictive SOP regulations have been linked to increased use of primary and preventive care, although influences on the cost of care are less clear.
- Organizational policies and culture may hamper NP productivity. NPs are often provided with fewer resources and less assistance than their physician counterparts, and other staff in the organization are frequently unclear on the NP's role and responsibilities.
- Physicians continue to express concerns about the ability of NPs to practice autonomously and lead health care teams.
- Unlike physicians, who undergo lengthy residencies that prepare them to "hit the ground running," new graduate NPs face challenges during the transition to practice caused by a lack of structured support for bridging the education-practice gap.
- Refusal or reluctance by payers to recognize lower rates of NP reimbursement by Medicare, Medicaid, and many private insurers may jeopardize the financial viability of NP practices and foster dependence on physicians for billing.
- NPs in office-based general practice settings earn less than their NP counterparts in hospitals and specialty clinics.

The literature also highlighted areas of great potential for NP contributions to care:

- NPs are extending access to care in rural and underserved areas and are key providers in health centers.
- The supply of NPs is growing rapidly compared with the supply of physicians. The comparative availability of NPs is likely to increase their use.

- Patient satisfaction with and consumer acceptance of NPs are high, and clinical outcomes have repeatedly been found equivalent with those of physicians.

- NPs are key to the design of several emerging models of care, such as Nurse Managed Health Centers and Patient-Centered Medical Homes.

Introduction

With the population of the Unites States both growing and aging, and at a time when scope of practice (SOP) laws are rapidly changing, the Assistant Secretary for Planning and Evaluation (ASPE) is conducting a study of Nurse Practitioners (NPs), *Impact of State Scope of Practice Laws and other factors on the Practice and Supply of Primary Care Nurse Practitioners*. Conducted by Westat under contract to ASPE, the project's purpose is to explore the effects of NP SOP legislation on the distribution and practice characteristics of NPs as well as their billing practices. The goal is to understand where and how NPs are practicing, identify barriers that limit the degree to which NPs are practicing to the full extent of their education and training, and to inform policymakers as they seek to remove barriers in order to fully utilize NP to support healthcare delivery in the United States.

A recent study by the Health Resources and Services Administration (HRSA) found that the demand for primary care providers is expected to increase through 2020 due to population growth and aging, and to a lesser extent through expanded insurance coverage under the Affordable Care Act (ACA) (U.S.Department of Health and Human Services, 2013). The projected supply of primary care physicians is expected to fall short of projected demand, but the report argued that the growing supply of NPs and PAs could mitigate the projected physician shortage if they can be effectively integrated into the primary care delivery system.

To better understand the problems associated with integrating NPs, ASPE commissioned an environmental scan of the peer-reviewed and grey literature on the use of NPs in primary care. This report reviews the methods and findings of the scan, which identified both barriers to and facilitators of effective use of NPs.

Methodology

To identify articles for this environmental scan, Westat's Information Resources Center conducted a search of major article databases for studies on the factors that affect the use of NPs in primary care settings. Our keyword search strategy is detailed in Appendix A. Searches were conducted in PubMed, CINAHL (Combined Index to Nursing and Allied Health Literature), PsycInfo, ASSIA (Applied Social Sciences Index and Abstracts), Sociological Abstracts, Social Services Abstracts and PILOTS (a behavioral and physical health database sponsored by the Department of Veterans Affairs). Results were limited to English language and to documents published 2011-2013.

This search strategy yielded a total of 183 unique articles. To select articles for inclusion, all article abstracts were reviewed and rated (A, C, or F) for relevance to the environmental scan and ASPE's broader research goals for this study. An "A" rating indicated the articles was highly relevant to the study topic, included background information that is extremely helpful, or if less directly relevant, was of exceptionally high quality and made a unique or important point. A "C" rating indicated the article was somewhat relevant to the topic, had somewhat helpful background information, or if directly relevant to the study topic was of mediocre quality. An "F" rating indicated an article that was not at all relevant to the topic or was of poor quality. The final articles included in this environmental scan were all within the "A" rating category. Additional articles, though published prior to 2011, were known to project staff as seminal works in this area, and thus are included in this report.

Key Findings

Key findings from peer-reviewed and grey literature on the use of NPs in primary care are summarized below under subheadings of barriers to NP practice and potential enablers of NP practice. Barriers include scope of practice (SOP) laws or regulations, organizational culture, professional acceptance, education and preparation for practice, reimbursement and credentialing, and practice visibility. Potential enablers of NP practice include increasing practice in rural and underserved areas, positive comparative outcomes, and potential for NPs in alternative models of care.

Current Context

The supply of NPs is growing rapidly in the United States. The Health Resources and Services Administration reports that the number of students graduating from NP education programs grew 69 percent between 2001 and 2011; as a result of rapid growth in new graduates, it estimates that the total supply of primary care NPs will grow by 30 percent between 2010 and 2020 while physician supply will increase only 8 percent (U.S. Department of Health and Human Services, 2013). The combined supply of physician assistants (PAs) and NPs currently exceeds the supply of general and family practice MDs and is nearing the total number of primary care physicians (Stange, 2013).

Studies show that the number of Medicare beneficiaries receiving care from NPs increased fifteen-fold between 1998 and 2010. NP services billed to Medicare increased 6.2 percent for hospital care, 3.3 percent for ER services, and 9.5 percent in outpatient settings during this time period from a baseline of less than 1 percent each in 1998; Medicare beneficiaries who had an NP as their primary care provider increased from 0.2 percent in 1998 to 2.9 percent in 2010 (Kuo et al., 2013).

With a primary care physician shortage projected by some, the growing availability of NPs is encouraging. However, the statutorily prescribed set of activities that NPs can undertake in the performance of patient care – defined by their state's SOP – varies significantly across the country and may limit the ability of NPs to practice to the full extent of their education and training. SOP regulations affect several aspects of practice, including prescribing privileges, hospital admitting privileges, oversight, and chart reviews (Fairman, Rowe, Hassmiller, & Shalala, 2011). In 22 states, NPs are permitted to provide care without physician collaboration or supervision. However, in other states, NPs are not permitted to practice without physician collaboration or supervision, often

requiring written practice protocols, and sometimes including restrictions on the number of NPs with whom a physician may collaborate (National Council of State Boards of Nursing, 2013). Moreover, even when NPs can practice without physician supervision, they may be required to have a collaborative or supervisory relationship with a physician to prescribe medications (Christian, Dower, & O'Neil, 2007).

The Institute of Medicine recommended that Advanced Practice RNs such as NPs be permitted to practice to the highest level of their knowledge, and the National Governors Association has called for states to consider easing their SOP regulations to encourage NP practice in primary care (National Governor's Association, 2012). There has been a general trend over time toward allowing NPs greater practice authority (Fairman, 2008). With rising concerns about shortages of primary care providers, it is not surprising that after passage of the ACA, 28 states began to consider expanding the SOP for NPs (Institute of Medicine, 2011). Despite this trend, SOP remains a politically charged topic, pitting professional associations against one another. The American Association of Family Physicians and American Academy of Pediatrics have both argued that team-based care should be physician-led because of the advanced education and training held by physicians (American Academy of Family Physicians, 2012; Shugerman & Rimsza, 2013). Meanwhile, the American Academy of Nurse Practitioners, American Nurses Association, and National Council of State Boards of Nursing have argued for increased autonomy of NPs and greater support for nurse-led teams and health centers (American Association of Nurse Practitioners, 2014; American Nurses Association & National Council of State Boards of Nursing, 2008).

Barriers to NP Practice

Scope of Practice

Although much has been written about state SOP, evidence of its influence on access to care has to date been quite limited. Several studies have examined state SOP effects on NP supply growth and migration. Sekscenski et al. (1994) found that states with rules favorable to the full practice authority of NPs and certified nurse midwives had more of these providers on a per capita basis. Similarly, Raegan & Salsberry (2013) found that growth in NP supply is 25 percent higher in areas with relaxed SOP regulations. Their study classified states as having no restrictions, some restrictions, and high restrictions. Importantly, they only found a supply growth difference in states with no restrictions, and they concluded that changes to SOP should not be incremental but rather should follow the

model used in the least restrictive states to encourage NP supply growth. Kalist and Spurr (2004) looked at enrollment in Advanced Practice Registered Nursing (APRN) programs, including NP, certified nurse-midwife, nurse anesthetist, and clinical nurse specialist programs. They found that enrollment in APRN programs was 30 percent higher in states providing a high degree of practice authority for APRNs. As well, regulatory changes toward greater practice authority were associated with enrollment growth in APRN programs. SOP regulations also affect NPs' migration propensity. Perry (2012), using multiple years of data from the National Sample Survey of Registered Nurses (NSSRN), estimated that NPs are 46 percent less likely to move from a state that grants NPs prescriptive authority. In the NSSRN, respondents were asked about migration during the previous year. Using data from 1992, 1996, 2000, and 2004, Perry calculated the probability of migration based on the respondents' SOP in the year prior to survey completion.

A growing body of research has focused on the effect of SOP regulations on the utilization and prices of primary care services. Kleiner et al. (2012) found that changes in NP SOP from 2002 to 2007 permitting NPs to do more tasks were linked to lower prices for well-child visits and higher wages for NPs. Stange (2013) considered the effect of both the supply of NPs and their SOP on utilization, access, use of preventive health care services, and prices from 1996 through 2008 using data from the Medical Expenditure Panel Survey (MEPS). He found that increases in NP provider supply were associated with only modest increases in the number of primary care visits made by individuals in MEPS, but the effect of supply growth had a stronger effect on primary care utilization in states where NPs had greater practice autonomy. Highlighting the need to consider multiple facets of SOP, Stange also found a modest positive relationship between expansions in prescriptive authority and utilization. Visit prices and expenditures were not strongly affected by either NP supply or SOP regulations. Using data from 1996 through 2010, Traczynski and Udalova (2013) found that states relaxing restrictions on SOP experienced growth in the number of routine checkups, improvements in quality of care measures, and decreases in emergency room use by patients with ambulatory-care sensitive conditions. Finally, Kuo et al. (2013) found that Medicare patients were 2.5 times more likely to receive primary care from NPs in less restrictive states by 2010, although billing patterns discussed below may have influenced this finding.

An important question that has received little attention in the literature to date is whether SOP actually affects the types of services that NPs provide. SOP restrictions relate to the extent of physician supervision that is required to provide specific services, but the literature has not adequately explored whether restrictive SOP limits the kinds of services that NPs ultimately perform. A recent study from the Center for Studying Health System Change finds that the laws in and of themselves do not appear to restrict NPs from providing specific services (Yee, Boukus,

Cross, & Samuel, 2013). However, SOP was found to have a substantial *indirect* effect on service provision. Restrictive SOP laws may reduce NP efficiency, for example, by creating delays in securing prescriptions owing to physician review requirements. Restrictive SOP also appears to be associated with payer policies which determine whether NPs are credentialed by payers to provide care and with the level of reimbursement that NPs receive (Yee et al., 2013). These factors, discussed in more detail below, may limit the financial viability of NP practice.

Credentialing, Reimbursement, and NP Compensation

Payers exert substantial control over NP practice through credentialing and reimbursement policies. Credentialing, the formal recognition of a provider for payment purposes, is not uniform for NPs across payers. Many commercial health plans do not recognize NPs as primary care providers, which means they can decline to pay NPs directly for services (Yee et al., 2013). A recent survey of 258 health maintenance organizations (HMOs) found that one in four do not recognize NPs as primary care providers, and two HMOs reported that they only credential NPs as primary care providers if there is a physician shortage in a rural area or other special circumstance (Hansen-Turton, Ware, Bond, Doria, & Cunningham, 2013). Although there has been a substantial increase in credentialing since 2005, when only a third of HMOs credentialed NPs, there has been very little change in the credentialing rates by Medicaid managed care plans in recent years (Hansen-Turton et al., 2013). The National Nursing Centers Consortium (2007) reports that credentialing practices are inconsistent even in states with Any Willing Provider (AWP) laws, which prohibit discrimination against certain provider types.

Even when NPs are credentialed, they often receive lower reimbursement for the same services. Medicare, Medicaid, and commercial insurances generally reimburse NPs at 75 to 85 percent of a physician's rate for the same service (Naylor & Kurtzman, 2010), and insufficient reimbursement may make NPs' profession less attractive or their practices less sustainable (Schadewaldt et al., 2013). To avoid reduced reimbursement, some NPs bill "incident to" a physician – billing under the supervising physician instead of their own provider number. Medicare guidelines allow 100 percent of the physician fee if the NP has a supervising physician recorded as the patient provider. If the NP is the provider of record, this reimbursement drops to 85 percent. Private insurers also reimburse at lower rates; a recent survey of HMOs found that only 27 percent of those credentialing NPs reimburse them for all services at the physician rate (Hansen-Turton et al., 2013). Physician attitudes on reimbursement may also be an impediment to changing reimbursement policies; a recent survey

found that only 3.8 percent of physicians believe that NPs should be paid the same as physicians if they provide the same clinical services (Donelan et al., 2013).

NP salaries, like those of physicians and PAs, vary by specialty and setting. NPs working in non-primary care specialties and hospitals earn substantially more than do those working in primary care and in physician offices (American Academy of Nurse Practitioners, 2010). Although there is little evidence for trends over time in the NP workforce, physicians and physician assistants are increasingly practicing in more lucrative medical and surgical subspecialties (Coplan, Cawley, & Stoehr, 2013; Jolly, Erikson, & Garrison, 2013). At present, about half of NPs in the United States practice in primary care (Petterson, Phillips, Jr., Bazemore, Teevan, & Koinis, 2013). It is unclear whether this represents a decline from earlier rates of primary care practice, but it is reasonable to suspect that NPs, like PAs, are affected by salary differentials across specialties and settings. Another factor which may be affecting the delivery of primary care by NPs is the decreasing overall interest in providing such care in office-based settings. More research is needed in this area.

Organizational Culture and Physician Acceptance

Literature suggests that aside from state regulations, nurse practitioners may face barriers to practice stemming from organizational culture and policy. Common barriers to effective integration of NPs into a practice are a basic lack of awareness of NP capabilities or practice scope, and a lack of definition of the role NPs play as providers within the organization (Schadewaldt, McInnes, Hiller, & Gardner, 2013). In-depth interviews with NPs (Poghosyan, Nannini, Stone, & Smaldone, 2013; Poghosyan et al., 2013) have found that in some organizations, other medical and administrative staff appear to perceive NPs as registered nurses rather than independent providers. As a result, NPs report that they are not assisted by medical assistants and registered nurses with traditionally assigned tasks such as bringing patients back from the waiting room to the exam room and recording vital signs, height, and weight.

NPs perceive an organizational hierarchy that negatively influences their work, and power struggles regarding NP and physician roles within a practice are common (Schadewaldt et al., 2013). The needs of physicians are often prioritized over the needs of NPs, which reduces NP productivity. For example, NPs report being asked to send faxes or complete other administrative tasks that physicians would not be asked to do (Poghosyan et al., 2013). Additionally, NPs may not always have access to the same physical resources that other providers do. In one example, an NP reported

being given one exam room for patients yet was expected to see as many patients as a provider with two exam rooms (Poghosyan et al., 2013).

Some physicians believe NPs are not prepared to take on the required responsibility for patient care when they first enter practice. This creates barriers to effective collaboration with physicians, and for practice autonomy for NPs (Schadewaldt et al., 2013). In a recent survey of physicians and NPs about scope of work and attitudes about expanding NP roles in primary care, 66.1 percent of physicians agreed that physicians provide a higher quality of examination and consultation than NPs, while 75.3 percent of NPs disagreed (Donelan, DesRoches, Dittus, & Buerhaus, 2013). This study also finds that physicians overwhelmingly believe that NPs should not serve as practice leads within medical homes and that an increased supply of NPs would not have a positive effect on safety, effectiveness, or equity of care (Donelan et al., 2013). Dueker et al. (2005) suggest that physicians choose to hire fewer NPs in states where they have more autonomy, instead hiring more PAs.

Organizational barriers are noteworthy because ineffective use of NPs may be cost inefficient, which may further discourage the integration of NPs into primary care. Collaboration can be quite effective when NPs take on pieces of patient care such as follow ups and patient education, but physician workload may not decrease if intensive supervision is required or perceived as necessary (Schadewaldt et al., 2013). While some scholars report cost-savings associated with NPs handling between 9 and 18 percent of visits (Naylor & Kurtzman, 2010), others report that adding an NP to a solo primary care physician practice will only become cost-efficient once the NP handles 30 percent of the workload (Liu & D'Aunno, 2012). If administrators, physicians, and other medical staff believe NPs are inadequately prepared to practice without physician supervision, hiring them for more limited duties and heavily supervising them is not cost effective.

Finally, a restrictive organizational culture may lead to attrition of NPs from an organization or the profession. A study conducted on NP job satisfaction found that NPs cited lack of autonomy and limited internal advancement opportunity as reasons for intending to leave their position (De Milt, Fitzpatrick, & McNulty, 2011). If NPs are to help with the primary care provider shortage, their job satisfaction is highly important to keeping them in the field.

Education: Transition to Practice and the Push for Doctoral Entry

NPs typically enter their professional practice with some experience as a registered nurse, but transitioning from an expert registered nurse to a novice nurse practitioner can be challenging and

overwhelming (Gerhart, 2012; Harrington, 2011). After medical school, new physicians are required to complete residencies of three to four years prior to entering independent practice in primary care, during which they receive hands-on experience under the direction of a senior physician. Residencies are heavily subsidized by federal funding. In contrast, providers such as NPs have no such requirement, and their transitions to practice are often marked by anxiety, stress, role confusion, and emotional turmoil (Poronsky, 2013). Lack of structured residencies, orientations, mentorships, and other mechanisms to ease the transition from education to practice influence new NPs' job satisfaction and retention (Sargent & Olmedo, 2013).

In its 2010 report on the future of nursing, the IOM recommended residency training for all new APRNs, and the ACA funds demonstration grants for Family NP residencies. A key development has been the incorporation of residencies into Federally Qualified Health Centers, which serve a dual purpose of training new NPs for care in this important safety-net setting and providing care to vulnerable populations (Flinter, 2012). Although NP residencies show great promise, there remains no federal source of financial support for NP residency training. NPs can bill and provide services immediately upon entry into the profession, but NP residencies may still be costly for organizations because residency preceptors can see fewer of their own patients while training new NPs (Flinter, 2012). Although not federal support for NP residency training *per se*, the primary goal of the Graduate Nurse Education Demonstration at the Center for Medicare & Medicaid Innovation at CMS is to increase the provision of qualified training to APRN students. The supported work aimed to give them the clinical skills necessary to provide primary care, preventive care, transitional care, chronic care management, and other services appropriate for Medicare beneficiaries. Under this demonstration, CMS provided reimbursement in 2012 to five eligible hospitals for the reasonable cost of providing clinical training to APRN students added as a result of the demonstration.

In 2004, the American Association of Colleges of Nursing released a position statement advocating that the Doctorate of Nursing Practice (DNP) be the entry-level education for all APRNs by 2015 (American Association of Colleges of Nursing, 2004). This recommendation was met with significant controversy in the APRN community. Bellini and Cusson (2012) summarized the current status of the debate, noting that while DNP programs have grown significantly over the past decade, APRN professional organizations have been reluctant to adopt either the 2015 time frame or the requirement itself.

Arguments in favor of DNP entry include better parity with other practice disciplines such as medicine and physical therapy; the need for additional skills in policy, quality improvement, and

evidence-base practice; and the need to expand the pool of nurse educators. Arguments against DNP entry include a constriction in the APRN supply pipeline as training periods are lengthened, cost considerations, and a lack of evidence supporting the need for advanced education (Bellini & Cusson, 2012). If the DNP is adopted as a requirement for practice, the pool of NPs eligible to provide care will be diminished at least temporarily during the additional years of training required for new cohorts.

Potential Enablers of NP Practice

Rural/Underserved Areas

One area of growth potential for NP practice is providing care in rural and underserved areas. A recent study examined APRNs (of which 90 percent were NPs) in four Mississippi Delta states and found that 51 percent practiced in primary care, 24 percent practiced in a Health Professional Shortage Area, and 54 percent practiced in a rural area (Odell, Kippenbrock, Buron, & Narcisse, 2013). In 2010, 14.8 percent of Medicare beneficiaries in Alaska, one of the most rural states, considered an NP their primary care provider (Kuo et al., 2013). Another study found that states with the highest rate of NPs billing Medicare were rural states (DesRoches et al., 2013). This study also found that NPs were more likely to provide services to vulnerable Medicare beneficiaries than primary care physicians and that NPs were more often assigned beneficiaries who were dually eligible for Medicare and Medicaid (DesRoches et al., 2013). While NPs in rural and underserved areas are helping provide access to this population, some argue that expansions in NP practice scope are required to optimize access in rural areas (Odell et al., 2013).

Another potential for NP practice is in nurse managed health centers (NMHCs), where the majority of patients receiving health care are from uninsured, underinsured, and low income populations (Pron, 2013). NMHCs, traditionally affiliated with academic nursing programs, can provide a full range of primary care services and some specialty care services. Because of their traditional role in meeting needs of vulnerable populations, with the expansion of health care access due to ACA, Congress appropriated funding for NMHC growth in the delivery marketplace (Naylor & Kurtzman, 2010). HRSA awarded approximately $15 million in grant funding for NMHCs between September 30, 2010 and September 29, 2013 (U.S. Department of Health and Human Services, n.d.). Pron (2013) found that NPs working in NMHCs were satisfied with their jobs, and 98 percent would recommend that an NP work in an NMHC. These rates of job satisfaction are higher than similar

studies observing NPs not working in NMHCs. As access to care expands to meet the needs of previously uninsured or underinsured individuals, the need for NMHCs could fill part of the primary care shortage and reduce physician demand (Auerbach et al., 2013). Because of the financial support given to NMHCs and the rates of NP job satisfaction in NMHCs, these health centers are primed to help with primary care shortage, particularly in underserved areas.

Comparative Outcomes Are Positive

Many studies have found that NPs provide high quality care, consistent with that of physicians (National Governor's Association, 2012). For example, a recent study in a large physician group compared outcomes for two groups of diabetic patients – those receiving care in teams including NPs and PAs, and those receiving care from physicians only. Patients whose teams included PAs or NPs had equivalent outcomes in thirteen out of twenty cases, better outcomes in four cases, and worse outcomes in three cases (Everett et al., 2013), indicating that PAs and NPs can have a positive effect on team-based care outcomes. Similarly, a study of primary care NPs in seven VA hospitals found that NPs are providing hypertension and diabetes care that is comparable to the care provided by physicians (Fletcher, Copeland, Lowery, & Reeves, 2011).

Newhouse and colleagues (2011) conducted a comprehensive review of evidence through 2008, uncovering more than 100 studies comparing the patient outcomes of APRNs and physicians. This review found strong evidence that NPs achieved patient outcomes comparable to those of physicians for nine different outcomes: patient satisfaction, patient perceptions of health, functional status, glucose control, lipid control, blood pressure control, rates of visits to emergency departments, hospitalization rates, and mortality. However, not all studies report positive outcomes for NPs. A recent study of referrals to general internists at the Mayo Clinic found that physician referrals were less likely than those from NPs or PAs to be evaluated as unnecessary, and physician referrals contained higher quality information about the patient's condition (Lohr et al., 2013).

Recent research finds that NP care yields high levels of patient satisfaction and that consumers are positively predisposed towards NPs and PAs. Naylor and Kurtzman (2010) reported that patients who saw NPs were more satisfied with their care. A recent national survey shows that 70 percent of consumers favor making it easier to choose NPs as their health care providers and 85 percent of consumers support allowing NPs to provide more services under Medicare (American Association of Nurse Practitioners, 2013). Consumer acceptance may also be affected by other aspects of care, such as wait times to see a physician. Dill et al. (2013) found that patients would prefer to see an NP

or PA if they could see these providers sooner than a physician. Further, prior exposure to NPs or PAs increased the likelihood that patients would be amenable to seeing these types of practitioners again (Dill et al., 2013).

Alternative Models of Care

There are several emerging care models that emphasize the NP role. Retail clinics, for example, have grown rapidly within the health care marketplace and are commonly staffed by NPs. By 2015, some estimates suggest that retail clinics will account for 10 percent of outpatient primary care visits (Spetz, Parente, Town, & Bazarko, 2013). Ahmed and Fincham (2011) studied patient preference when presented with choices of price, appointment wait time, care setting and provider type, and illness acuity. They found that the cost savings and convenience found in retail clinics were very important to consumers. Further, 95 percent of study participants were satisfied with retail clinic care and 98 percent of participants would seek care at a retail clinic again (Ahmed & Fincham, 2011). Using administrative claims data, Spetz et al. (2013) found that care from retail clinics was associated with lower costs when compared to cost received in non-retail clinic settings. This cost savings was greater in states where NPs were allowed to practice without physician collaboration or supervision.

With a primary care physician shortage predicted by many, primary care teams that include NPs or PAs are of growing interest as alternatives to the traditional physician-staffed office practice. Some researchers estimate that NPs and PAs could deliver up to 70 percent of office-based primary care (Green, Savin, & Lu, 2013). A prime example of team-based care in which NPs, as well as PAs and nurse midwives, figure prominently is the community health center (CHC). According to a recent study, almost one-third of patient visits to CHCs were seen by NPs and PAs and in most of these visits, the patient did not see a physician (Hing, Hooker, & Ashman, 2011). As reported for other settings, NP and PA outcomes are positive in CHCs (Hing et al., 2011). It is possible that CHCs provide more opportunity for NP and PA independent practice as care at these sites is reimbursed through a bundled payment made to the facility (through the Federally Qualified Health Center Prospective Payment System), as opposed to having reimbursement going directly to a provider.

Another growing team-based model of care is the patient-centered medical home (PCMH). The Agency for Healthcare Research and Quality has defined a PCMH as a site that provides comprehensive care that is patient-centered and coordinated, provides accessible services, and demonstrates a commitment to quality and safety (U.S.Department of Health and Human Services, 2011). A recent study published by Auerbach et al. (2013) examined different scenarios for

expanding the medical home model and found that this staffing model is not drastically different than traditional models of care because it continues to emphasize the role of physicians. While the medical home model can have a positive effect on the primary care shortage, Auerbach and his colleagues found that "even if the medical home model expanded to provide 45 percent of primary care in the United States, up from approximately 15 percent today, the projected shortage of primary care physicians would be reduced only modestly" (Auerbach et al., 2013: 1939).

Accountable Care Organizations (ACOs) are a third, widely-discussed alternative model of care delivery. ACOs are groups of health care providers and facilities that work as a team to coordinate care for patients across a range of settings. They are accountable for constraining costs and achieving positive patient outcomes. The ACA supports ACOs providing care for Medicare recipients, but regulations do not permit assignment to ACOs for beneficiaries whose care is only provided by an NP (Medicare Program; Medicare Shared Savings Program: Accountable Care Organizations; Final Rule 2011). Although NPs can provide services to patients as part of an ACO, the American Association of Nurse Practitioners (2012) and Nursing Alliance for Quality Care have both called for the regulations to be revised to allow ACO assignment for patients seen exclusively by NPs. ACOs are promising vehicles for the integration of NPs in primary care, but to date, research has not thoroughly examined the contributions of NPs to ACOs or the effects on patients of restrictions in beneficiary assignments.

As previously discussed in the context of rural health care, the NMHC represents an alternative model of care delivery with great promise for NPs. Auerbach and colleagues (2013), comparing the NMHC to the PCMH, argue that expansion of this model has a greater likelihood of mitigating the projected shortage of primary care physicians owing to its greater reliance on the rapidly growing supply of NPs. They found that the primary care shortage could be eliminated with modest growth in the NMHC model and some growth in the PCMH model, including a 20 percent increase in medical home panel size (Auerbach et al., 2013).

Authority through the Affordable Care Act and subsequent appropriations allowed expansion of operating NMHCs with the goal of increasing primary care access for vulnerable populations (Naylor & Kurtzman, 2010). As of 2013, approximately $15 million had been awarded in HRSA grants to NMHCs (U.S. Department of Health and Human Services, n.d.). This financial assistance and direct recognition in legislation may facilitate expansion of this alternative model of care.

Environmental Scan Search Parameters

Terms from columns A and B were combined and used in all searches. Terms within columns C through I were used only in combination with column A and B terms. For example: (Nurse practitioner* AND primary care) AND (billing* OR payment* OR reimbursement* OR insurance OR Medicare OR Medicaid)

Please note that the use of the asterisk (*) indicates a wildcard character meant to detect search results with variations in tense or plurality.

A. Nurse terms	B. Practice terms	C. Models of Care terms	D. Value terms	E. Payment Type terms	F. Geographic terms	G. Manpower terms	H. Education terms	I. Other terms
Nurse practitioner*	Primary health care	Medical home*	Patient satisfaction	Billing*	HPSA	Supply and Distribution [subheading]	Education	Scope of practice
Physicians' assistant*	Primary care	Health home*	Client satisfaction	Payment*	Rural	Manpower [subheading]	Education* program*	Gap*
	General practice*	Care home*	Patient acceptance	Reimbursement*	Underserved	Manpower	Certificat*	Barrier*
	Generalist*	Patient centered care	Patient preference*	Insurance	Migrat*	Supply		Standards [subheading]
	Family medicine/practice	Accountable care	Physician acceptance	Medicare		Demand		Trends [subheading]
		Accountable care organizations [MH]	Physician satisfaction	Medicaid		Shortage*		
		Specialty choice	Physician's practice patterns[MH]					
		Pilot projects[MH]	Physician-nurse relations[MH]					
		Model*						

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Appendix B

Case Study Discussion Guide

Appendix B
Case Study Discussion Guide

Welcome and Consent

Thank you for agreeing to participate in this discussion today. My name is [INTERVIEWER'S name] and I work for Westat. Today we would like to talk with you about Nurse Practitioners (NPs) in [STATE]. The U.S. Department of Health and Human Services' Office of the Assistant Secretary for Planning and Evaluation (ASPE) contracted with Westat to conduct the project: "Impact of State Scope of Practice Laws and other factors on the Practice and Supply of Primary Care Nurse Practitioners."

We are interested in exploring whether increasing access to care can be achieved by addressing issues that constrain NP practice. We want to get a picture of how NPs work in your state. Your responses today will be kept confidential. The results will be reported in summary form, and your name will not be associated with anything you say.

Today's discussion is expected to last for 60 minutes and is completely voluntary. If you would like to stop at any time, please tell me and we will stop immediately.

We would like to record this interview so we can make sure we don't miss anything. The recording will only be reviewed by members of the project team in order to put together a summary of what we have learned and will be deleted within 3 months.

Do you have any questions before we begin?

Do I have your consent to record our discussion?

Introduction

Thank you again for agreeing to speak with us today. We are conducting a case study in [STATE] to learn about how, why, and under what conditions Nurse Practitioners (NPs) may be increasing access to primary care. We are interested to learn about barriers that may exist in urban or rural settings, and obstacles that may impede the use of NPs in the delivery of primary care. Additionally,

we're interested to hear how barriers are being overcome, new or novel ways NPs are working in [STATE], and anything else that you think may help us get a picture of how NPs work here.

I have some specific questions to get us started, but let's approach this as an open discussion so I can learn the greatest amount from you in this next hour.

Supply and distribution (Care Delivery)

I would like to begin by asking you about how NPs deliver care in your state.

- Where and how are NPs practicing in [STATE]?

  If needed

  - In which settings do NPs primarily work?
  - Are NPs more likely to be employed in specific types of practices or models of care?
  - Are there primary care settings or models where you don't see NPs?
- How do NPs work with physicians and other healthcare professionals?
  - How does this impact how NPs deliver care?

  If appropriate

  - Can you describe the types of collaborative relationships that exist?
- Have there been changes in how NPs work in [STATE] over the past few years?
- How about changes in how primary care is delivered regardless of whether this impacts NPs?
- How does NP practice vary from urban to rural areas of the state?
- How are NPs contributing to primary care through new or emerging models of care? For example, use of technology and Telehealth?
  - Are there Retail clinics in your area? How do these use NPs? And how does that change how primary care is delivered?
  - Are there other new approaches to delivery of primary care in [STATE]? For example new approaches to reaching populations in rural areas?

If appropriate (care delivery only)

- How are NPs being utilized/delivering care in your organization?
- How does NP practice vary in your organization/system?
- How do other members of your healthcare workforce view NPs/NP practice?

Access to Care

I would also like to ask you about access to care in [STATE]. In every state, there is uneven distribution of healthcare providers across areas. We're wondering how this looks in [STATE] and how NPs may be playing a role.

- How would you describe access to primary care in [STATE]?
- How has this changed over the past few years?
- Are there particular population groups that NPs are reaching that may not otherwise have had access to healthcare?
- How about geographic areas that NPs are reaching that may not otherwise have access to healthcare?

Supply of NPs

Shifting gears now, how about access to NPs – or the supply of NPs in [STATE]?

- Is demand for NPs changing?
  - How so across different areas/settings?
- Why do you (or others) hire NPs vs. other types of providers? (physicians, RN, others)
- Why do NPs go into primary care? And why into specialty practices?

If applicable (educators and those who work with new NPs)

- Where are new NP graduates gaining employment?
  - What are their roles?
  - How prepared are new NP graduates? To what extent are preceptor opportunities available to NP students?

Migration

Across all healthcare professionals, there is migration across states – and many proposed reasons for this migration.

- Do you have a sense of whether NPs are coming to [STATE]? And if so, why?
- And what about migration out of [STATE]? Any sense that is happening, and if so, the reasons?

  If needed, is migration impacted by:

  - SOP
  - Payment policies
  - Loan forgiveness
  - Job availability
- Are there efforts to lure NPs to [STATE] or particular areas in [STATE]?
  - How successful are these efforts?

Viability

- What barriers do NPs face in practicing in [STATE]?

  If appropriate

  - Are there an adequate number of available collaborating physicians?
  - What are the costs associated with physician collaboration?
- What barriers do NPs face in establishing nurse led clinics?
  - What role does availability of financial capital play as NP consider establishing their own practices?

Costs and Reimbursement Levels

I would ask you now to think about the costs associated with NP practice.

If this hasn't been covered ask – else summarize what has been said to date on cost.

- What types of costs are barriers to NPs providing primary care?
  - Cost barriers to establishing nurse-led clinics?
  - Cost barriers to obtaining physician collaboration?

- How much of a barrier is the cost of NP education and preceptoring?

- In [STATE] how do NPs bill for their work?

  If needed

  - Bill directly
  - Physician bills
  - Other

- Does malpractice insurance play a role in how billing is conducted?
- How does NP rate of reimbursement effect how and where they work?
- Do you think that NPs are containing or reducing costs of delivering primary care in [STATE]?

SOP Enactment

[Finally,] I would ask you now to think about the legal scope of practice (SOP) that governs how NPs can provide care in [STATE].

If time permits:

- How does [STATE] SOP effect how NPs work?

  If needed

  - Access to primary care
  - Access to Rx
  - Practice structure
  - Hiring
  - Diversity of NP practice settings
  - Billing
  - Costs

- What SOP factors do you think have the greatest effect on NPs?
  - Does this differ by setting (e.g. small practice vs. large, hospital?)
- What SOP factors do you think have the greatest effect on employers?
- Have SOP laws in other states had an impact on:
  - Telehealth?
  - Multi-state systems/clinics?

Personal Experience (if an NP)

Finally I would like to ask you about how what led you to work as an NP in this state.

- Were you educated in [STATE]?
  - If not, what led you to move here?
  - If yes, what drew you to becoming an NP here?
- Were you aware of the differences between [STATE]'s scope of practice and that of [where you went to school]/[other neighboring states]?
- Did the scope of practice affect your decision to [move here/stay here]?
- Describe the setting and patients where you work now. (size, other staff)
  - What motivated you to practice in the setting in which you work now?

  Prompts
  - Wanted this type of patient population?
  - It's where a job was available?
  - Wanted independence/team/etc.

That brings me to the end of my list of discussion topics. What didn't I ask about? What else should I know to better understand the role of NPs in [STATE]?

Is there anyone else that you recommend that I speak with to learn more about NPs in [STATE]?

Thank you so much for taking the time to speak with me today.

Appendix C

Detailed Tables of Quantitative Results

Appendix C
Detailed Tables of Quantitative Results

Table C-1. Descriptive Statistics for Practicing in Patient Care (n=12,163)

Descriptive Statistics	Works in Patient Care	Does Not Work in Patient Care
n (Weighted %)	10,230 (84.2%)	1,933 (15.8%)
Categorical Independent/Control Variables	**Weighted Row Percentage**	**Weighted Row Percentage**
State Scope of Practice Regulations* **		
Full Practice and Prescriptive Authority	87.9	12.1
Full Practice Authority Only	85.5	14.5
Restricted Practice and Prescribing	83.0	17.0
NP Age* **		
Less than 35	92.2	7.8
35-39	88.3	11.7
40-44	87.6	12.4
45-49	87.8	12.2
50-54	87.5	12.5
55-59	83.5	16.5
60-64	77.5	22.5
65 and older	57.6	42.4
Gender* **		
Male	89.9	10.1
Female	83.8	16.2
Highest NP Degree Received* **		
Certificate program	72.6	27.4
Master's degree	85.4	14.6
Post masters cert	83.7	16.3
Doctoral	89.2	10.8
Race/Ethnicity		
Hispanic/Latino, any race	82.9	17.1
White, not of Hispanic origin	84.5	15.5
Black/African Am, not of Hispanic origin	80.9	19.1
Asian/Nat Haw. Pac. Isl., not of Hispanic origin	82.9	17.1
American Indian/AK Native, not of Hispanic origin	87.2	12.8
Two or more race, not of Hispanic origin	87.0	13.0
Location of NP Practice* (Primary Position)**		
Urban	83.5	16.5
Large Rural City/Town	88.8	11.2
Small Rural Town	90.0	10.0
Isolated Rural Town	86.1	13.9

Table C-1. Descriptive Statistics for Practicing in Patient Care (n=12,163) (continued)

Continuous Independent/Control Variables	Works in Patient Care Mean (Range)	Does Not Work in Patient Care Mean (Range)
PC Providers per 100,000 population in State**	182.6 (121.5 – 422.9)	185.8 (121.5 – 422.9)
Percent of State Population in Poverty	15.7 (10.0 – 24.2)	15.6 (10.0 – 24.2)
Percent of State Population 65 +	13.9 (8.5 – 18.2)	14.0 (8.5 – 18.2)
State Unemployment Rate***	7.6 (3.1 – 10.8)	8.0 (3.1 – 10.8)

Notes: Significance determined by Wald Chi-Square (categorical) and t-test of means (continuous) using SURVEYFREQ and SURVEYREG procedures in SAS with replicate weights. Asterisks indicate that the variable as a whole is significantly related to the outcome, but multiple comparisons between variable categories are not shown.

*p<.05

**p<.01

***p<.001

Table C-2. Logistic Regression on Odds of Practicing as an NP in Patient Care, Main Effects Model (n=12,163)

Independent/Control Variables	Model 1: Main Effects Only				
	Logit Estimate	Odds Ratio	Predicted Probability	PP 95% LCL	PP 95% UCL
Intercept	3.434***				
State Scope of Practice Regulations					
Full Practice and Prescriptive Auth.	0.411***	1.508	0.893	0.876	0.908
Full Practice Auth. Only	0.224***	1.252	0.874	0.860	0.887
Restricted Practice and Prescribing (ref)			0.847	0.840	0.854
Demographics					
Age					
Less than 35	0.531***	1.701	0.927	0.913	0.940
35-39	0.049	1.050	0.887	0.869	0.904
40-44	-0.016	0.984	0.881	0.861	0.898
45-49 (ref)			0.882	0.862	0.900
50-54	-0.030	0.971	0.879	0.864	0.893
55-59	-0.365**	0.694	0.839	0.821	0.855
60-64	-0.734***	0.480	0.783	0.761	0.803
65 or older	-1.626***	0.197	0.596	0.560	0.631
Gender					
Female	-0.474***	0.623	0.856	0.849	0.863
Male (ref)			0.905	0.884	0.923
Race/Ethnicity					
White (ref)			0.864	0.857	0.870
Hispanic	-0.220	0.802	0.835	0.795	0.869
Black, not of Hispanic origin	-0.280**	0.756	0.827	0.796	0.854
American Indian, AK Native, not of Hispanic origin	0.280	1.323	0.893	0.766	0.955
Asian/Nat. Haw. Pac. Isl., not of Hispanic origin	-0.212	0.809	0.837	0.800	0.868
Two or more races, not of Hispanic origin	0.117	1.125	0.877	0.799	0.927
Highest NP Degree					
Certificate	-0.169*	0.844	0.837	0.814	0.857
Master's (ref)			0.858	0.852	0.865
Post-master's certificate	0.179*	1.196	0.879	0.861	0.894
Doctoral Degree	0.313	1.367	0.892	0.833	0.932
Urban-Rural Location					
Urban (ref)			0.854	0.846	0.861
Large Rural City/Town	0.359**	1.432	0.893	0.872	0.911
Small Rural Town	0.542**	1.719	0.909	0.878	0.933
Isolated Rural Town	0.117	1.124	0.868	0.829	0.899

Table C-2. Logistic Regression on Odds of Practicing as an NP in Patient Care, Main Effects Model (n=12,163) (continued)

Independent/Control Variables	Model 1: Main Effects Only				
	Logit Estimate	Odds Ratio	Predicted Probability	PP 95% LCL	PP 95% UCL
State Control Variables					
Predicted Probability at Means			0.860	0.854	0.867
PC Providers per 100,000 Population (PP at 10% Increase)	-0.002**	0.998	0.855	0.849	0.862
Percent of State in Poverty (PP at 10% Increase)	0.029*	1.029	0.866	0.857	0.873
Percent Age 65+ (PP at 10% Increase)	-0.003	0.997	0.860	0.851	0.868
State Unemployment Rate (PP at 10% Increase)	-0.148***	0.862	0.846	0.838	0.853
C Statistic	**0.683**				
-2 Log Likelihood	**117393.32**				

Note: Logistic regressions were performed with the SURVEYLOGISTIC procedure and replicate weights in SAS.

*p<.05

**p<.01

***p<.001

Table C-3. Logistic Regression on Odds of Practicing as an NP in Patient Care, Interactions Model (n=12,163)

Categorical Independent/Control Variables	Model 2: Interaction Effects				
	Logit Estimate	Odds Ratio	Predicted Probability	PP 95% LCL	PP 95% UCL
Intercept	3.421***				
State Scope of Practice Regulations					
Full Practice and Prescriptive Auth.	0.487***				
Full Practice Auth. Only	0.218**				
Restricted Practice and Prescribing (ref)					
Demographics					
Age					
Less than 35	0.532***	1.703	0.928	0.913	0.940
35-39	0.049	1.050	0.888	0.869	0.904
40-44	-0.017	0.984	0.881	0.861	0.898
45-49 (ref)			0.883	0.862	0.900
50-54	-0.028	0.973	0.880	0.865	0.893
55-59	-0.363**	0.696	0.839	0.822	0.856
60-64	-0.732***	0.481	0.783	0.762	0.803
65 or older	-1.623***	0.197	0.597	0.561	0.632
Gender					
Female	-0.474***	0.622	0.857	0.849	0.863
Male (ref)			0.906	0.884	0.923
Race/Ethnicity					
White (ref)			0.864	0.857	0.870
Hispanic	-0.214	0.808	0.837	0.796	0.870
Black, not of Hispanic origin	-0.275**	0.760	0.828	0.798	0.855
American Indian, AK Native, not of Hispanic origin	0.277	1.319	0.893	0.764	0.956
Asian/Nat. Haw. Pac. Isl., not of Hispanic origin	-0.206	0.814	0.838	0.801	0.869
Two or more races, not of Hispanic origin	0.120	1.127	0.877	0.800	0.927
Highest NP Degree					
Certificate	-0.169*	0.845	0.837	0.814	0.858
Master's (ref)			0.859	0.852	0.865
Post-master's certificate	0.178*	1.195	0.879	0.862	0.895
Doctoral Degree	0.304	1.355	0.892	0.832	0.932
Urban-Rural Location					
Urban (ref)					
Large Rural City/Town	0.390**				
Small Rural Town	0.765***				
Isolated Rural Town	0.271				

Table C-3. Logistic Regression on Odds of Practicing as an NP in Patient Care, Interactions Model (n=12,163) (continued)

Categorical Independent/Control Variables	Model 2: Interaction Effects				
	Logit Estimate	Odds Ratio	Predicted Probability	PP 95% LCL	PP 95% UCL
State Control Variables					
Predicted Probability at Means			0.860	0.854	0.867
PC Providers per 100,000 Population (PP at 10% Increase)	-0.002**	0.998	0.856	0.849	0.862
Percent of State in Poverty (PP at 10% Increase)	0.027*	1.028	0.866	0.857	0.873
Percent Age 65+ (PP at 10% Increase)	-0.001	0.999	0.860	0.851	0.869
State Unemployment Rate (PP at 10% Increase)	-0.149***	0.862	0.846	0.839	0.853
Interactions					
Full P&P*Isolated	-0.624		0.856	0.767	0.915
Full P&P*Large Rural	-0.229		0.909	0.865	0.939
Full P&P*Small Rural	-0.856*		0.886	0.802	0.937
Full P&P*Urban			0.895	0.877	0.910
Full P Only*Isolated	0.138		0.907	0.762	0.968
Full P Only*Large Rural	0.064		0.911	0.856	0.946
Full P Only*Small Rural	-0.147		0.923	0.838	0.966
Full P Only*Urban			0.866	0.850	0.881
Neither*Isolated			0.872	0.823	0.909
Neither*Large Rural			0.885	0.855	0.909
Neither*Small Rural			0.918	0.879	0.946
Neither*Urban			0.839	0.831	0.847
C Statistic	**0.685**				
-2 Log Likelihood	**117301.36**				
Likelihood Ratio Model 1:Model 2 (df)	**91.96 (6)*** **				

Note: Logistic regressions were performed with the SURVEYLOGISTIC procedure and replicate weights in SAS.

**p<.05*

***p<.01*

****p<.001*

Table C-4. Descriptive Statistics for Practicing in Primary Care (n=9,687)

Descriptive Statistics	Works in Primary Care	Does Not Work in Primary Care
n (Weighted %)	3,132 (32.1%)	6,555 (67.9%)
Categorical Independent/Control Variables	**Weighted Row Percentage**	**Weighted Row Percentage**
State Scope of Practice Regulations*		
Full Practice and Prescriptive Authority	34.6	65.4
Full Practice Authority Only	32.5	67.5
Restricted Practice and Prescribing	31.4	68.6
NP Age*		
Less than 35	33.6	66.4
35-39	29.1	70.9
40-44	32.5	67.5
45-49	32.3	67.7
50-54	32.7	67.3
55-59	30.2	69.8
60-64	34.2	65.8
65 and older	34.8	65.2
Gender***		
Male	24.3	75.7
Female	32.8	67.2
Highest NP Degree Received***		
Certificate program	39.3	60.7
Master's degree	32.2	67.8
Post masters cert	28.2	71.8
Doctoral	31.8	68.2
Race/Ethnicity***		
Hispanic/Latino, any race	30.0	70.0
White, not of Hispanic origin	32.5	67.5
Black/African Am, not of Hispanic origin	34.3	65.7
Asian/Nat Haw. Pac. Isl., not of Hispanic origin	22.1	77.9
American Indian/AK Native, not of Hispanic origin	43.7	56.3
Two or more race, not of Hispanic origin	33.5	66.5
Location of NP Practice* (Primary Position)**		
Urban	29.6	70.4
Large Rural City/Town	44.5	55.5
Small Rural Town	49.4	50.6
Isolated Rural Town	48.9	51.1
Continuous Independent/Control Variables	**Mean (Range)**	**Mean (Range)**
PC Providers per 100,000 population in State***	179.7 (121.5 – 422.9)	184.0 (121.5 – 422.9)
Percent of State Population in Poverty***	15.8 (10.0 – 24.2)	15.6 (10.0 – 24.2)
Percent of State Population 65 +	13.9 (8.5 – 18.2)	14.0 (8.5 – 18.2)
State Unemployment Rate**	7.6 (3.1 – 10.8)	7.6 (3.1 – 10.8)

Notes: Significance determined by Wald Chi-Square (categorical) and t-test of means (continuous) using SURVEYFREQ and SURVEYREG procedures in SAS with replicate weights. Asterisks indicate that the variable as a whole is significantly related to the outcome, but multiple comparisons between variable categories are not shown.

*p<.05
**p<.01
***p<.001

Table C-5. Logistic Regression on Odds of Practicing in Primary Care (n=9,687)

Independent/Control Variables	Logit Estimate	Odds Ratio	Predicted Probability	PP 95% LCL	PP 95% UCL
Intercept	-0.645*				
State Scope of Practice Regulations					
Full Practice and Prescriptive Auth.	0.157*	1.170	0.342	0.321	0.364
Full Practice Auth. Only	0.091	1.096	0.327	0.306	0.350
Restricted Practice and Prescribing (ref)			0.308	0.296	0.320
Demographics					
Age					
Less than 35	0.077	1.080	0.337	0.313	0.362
35-39	-0.142	0.868	0.290	0.265	0.315
40-44	0.022	1.022	0.324	0.298	0.352
45-49 (ref)			0.320	0.294	0.347
50-54	0.012	1.013	0.322	0.300	0.346
55-59	-0.118	0.888	0.295	0.276	0.314
60-64	0.032	1.033	0.327	0.300	0.355
65 or older	0.064	1.067	0.334	0.298	0.372
Gender					
Female	0.451***	1.569	0.324	0.314	0.333
Male (ref)			0.234	0.202	0.269
Race/Ethnicity					
White (ref)			0.318	0.309	0.328
Hispanic	-0.044	0.957	0.309	0.261	0.362
Black, not of Hispanic origin	0.159	1.173	0.354	0.312	0.398
American Indian, AK Native, not of Hispanic origin	0.371	1.449	0.404	0.254	0.574
Asian/Nat. Haw. Pac. Isl., not of Hispanic origin	-0.430***	0.650	0.233	0.192	0.279
Two or more races, not of Hispanic origin	0.065	1.067	0.333	0.252	0.425
Highest NP Degree					
Certificate	0.246***	1.279	0.374	0.343	0.406
Master's (ref)			0.318	0.308	0.329
Post-master's certificate	-0.205**	0.815	0.276	0.252	0.301
Doctoral Degree	0.008	1.008	0.320	0.248	0.402
Urban-Rural Location					
Urban (ref)			0.295	0.286	0.304
Large Rural City/Town	0.607***	1.834	0.434	0.399	0.470
Small Rural Town	0.792***	2.208	0.480	0.428	0.533
Isolated Rural Town	0.788***	2.200	0.479	0.416	0.544

Table C-5. Logistic Regression on Odds of Practicing in Primary Care (n=9,687) (continued)

Independent/Control Variables	Logit Estimate	Odds Ratio	Predicted Probability	PP 95% LCL	PP 95% UCL
State Control Variables					
Predicted Probability at Means			0.317	0.308	0.326
PC Providers per 100,000 Population (PP at 10% Increase)	-0.003***	0.997	0.306	0.295	0.318
Percent of State in Poverty (PP at 10% Increase)	0.014	1.014	0.322	0.311	0.332
Percent Age 65+ (PP at 10% Increase)	-0.013	0.987	0.313	0.300	0.326
State Unemployment Rate (PP at 10% Increase)	-0.024	0.976	0.313	0.302	0.324
C Statistic	**0.594**				

Note: Logistic regressions were performed with the SURVEYLOGISTIC procedure and replicate weights in SAS.

*p<.05

**p<.01

***p<.001

Table C-6. Descriptive Statistics for Having Own Patient Panel (n=3,057)

Descriptive Statistics	Has Own Patient Panel	Does Not Have Own Patient Panel
n (Weighted %)	1,842 (60.2%)	1,215 (39.8%)
Categorical Independent/Control Variables	**Weighted Row Percentage**	**Weighted Row Percentage**
State Scope of Practice Regulations* **		
Full Practice and Prescriptive Authority	69.6	30.4
Full Practice Authority Only	56.4	43.6
Restricted Practice and Prescribing	58.4	41.6
NP Age**		
Less than 35	55.0	45.0
35-39	64.3	35.7
40-44	64.2	35.8
45-49	63.1	36.9
50-54	63.0	37.0
55-59	58.8	41.2
60-64	57.3	42.7
65 and older	51.5	48.5
Gender		
Male	64.7	35.3
Female	59.9	40.1
Employment Status* **		
Full time	64.5	35.5
Part time	52.4	47.6
Highest NP Degree Received* **		
Certificate program	46.5	53.5
Master's degree	60.6	39.4
Post masters cert	66.7	33.3
Doctoral	67.6	32.4
Race/Ethnicity		
Hispanic/Latino, any race	54.9	45.1
White, not of Hispanic origin	61.0	39.0
Black/African Am, not of Hispanic origin	52.2	47.8
Asian/Nat Haw. Pac. Isl., not of Hispanic origin	52.7	47.3
American Indian/AK Native, not of Hispanic origin	61.6	38.4
Two or more race, not of Hispanic origin	63.0	37.0
Location of NP Practice (Primary Position)* **		
Urban	56.5	43.5
Large Rural City/Town	72.6	27.4
Small Rural Town	69.2	30.8
Isolated Rural Town	84.2	15.8

Table C-6. Descriptive Statistics for Having Own Patient Panel (n=3,057) (continued)

Descriptive Statistics	Has Own Patient Panel	Does Not Have Own Patient Panel
Continuous Independent/Control Variables	**Mean (Range)**	**Mean (Range)**
PC Providers per 100,000 population in State	180.4 (121.5 – 422.9)	178.9 (121.5 – 422.9)
Percent of State Population in Poverty	15.8 (10.0 – 24.2)	15.9 (10.0 – 24.2)
Percent of State Population 65 +	13.9 (8.5 – 18.2)	13.9 (8.5 – 18.2)
State Unemployment Rate**	7.5 (3.1 – 10.8)	7.6 (3.1 – 10.8)

Notes: Significance determined by Wald Chi-Square (categorical) and t-test of means (continuous) using SURVEYFREQ and SURVEYREG procedures in SAS with replicate weights. Asterisks indicate that the variable as a whole is significantly related to the outcome, but multiple comparisons between variable categories are not shown.

*p<.05

**p<.01

***p<.001

Table C-7. Logistic Regression on NPs Having Own Patient Panel (n=3,057)

Independent/Control Variables	Logit Estimate	Odds Ratio	Predicted Probability	PP 95% LCL	PP 95% UCL
Intercept	0.540				
State Scope of Practice Regulations					
Full Practice and Prescriptive Auth.	0.447***	1.564	0.697	0.653	0.738
Full Practice Auth. Only	-0.141	0.868	0.561	0.516	0.605
Restricted Practice and Prescribing (ref)			0.596	0.575	0.616
Demographics					
Age					
Less than 35	-0.301*	0.740	0.565	0.524	0.605
35-39	0.111	1.117	0.662	0.607	0.713
40-44	0.050	1.052	0.649	0.591	0.702
45-49 (ref)			0.637	0.592	0.679
50-54	-0.042	0.959	0.627	0.576	0.676
55-59	-0.247	0.781	0.578	0.532	0.623
60-64	-0.210	0.810	0.587	0.538	0.635
65 or older	-0.370	0.691	0.548	0.465	0.629
Gender					
Female	-0.054	0.947	0.609	0.589	0.628
Male (ref)			0.622	0.539	0.698
Employment Status					
Full time	0.485***	1.624	0.650	0.627	0.673
Part time (ref)			0.534	0.501	0.566
Race/Ethnicity					
White (ref)			0.616	0.597	0.636
Hispanic	-0.168	0.845	0.576	0.456	0.688
Black, not of Hispanic origin	-0.337	0.714	0.534	0.448	0.619
American Indian, AK Native, not of Hispanic origin	0.050	1.051	0.628	0.378	0.824
Asian/Nat. Haw. Pac. Isl., not of Hispanic origin	-0.288	0.749	0.546	0.430	0.658
Two or more races, not of Hispanic origin	0.131	1.140	0.647	0.459	0.798
Highest NP Degree					
Certificate	-0.537***	0.584	0.479	0.411	0.549
Master's (ref)			0.612	0.591	0.632
Post-master's certificate	0.287*	1.332	0.677	0.625	0.725
Doctoral Degree	0.331	1.393	0.687	0.557	0.793

Table C-7. Logistic Regression on NPs Having Own Patient Panel (n=3,057) (continued)

Independent/Control Variables	Logit Estimate	Odds Ratio	Predicted Probability	PP 95% LCL	PP 95% UCL
Urban-Rural Location					
Urban (ref)			0.572	0.550	0.594
Large Rural City/Town	0.657***	1.929	0.721	0.676	0.762
Small Rural Town	0.465**	1.593	0.680	0.613	0.741
Isolated Rural Town	1.377***	3.962	0.841	0.755	0.901
State Control Variables					
Predicted Probability at Means			0.610	0.591	0.628
PC Providers per 100,000 Population (PP at 10% Increase)	0.001	1.001	0.613	0.593	0.633
Percent of State in Poverty (PP at 10% Increase)	-0.006	0.994	0.607	0.583	0.631
Percent Age 65+ (PP at 10% Increase)	-0.034	0.967	0.598	0.575	0.621
State Unemployment Rate (PP at 10% Increase)	0.001	1.001	0.610	0.588	0.632
C Statistic	**0.642**				

Note: Logistic regressions were performed with the SURVEYLOGISTIC procedure and replicate weights in SAS.

*p<.05

**p<.01

***p<.001

Table C-8. Descriptive Statistics for Having Hospital Admitting Privileges (n=3,057)

Descriptive Statistics	Has Admitting Privileges	Does Not Have Admitting Privileges
n (Weighted %)	477 (15.5%)	2,580 (84.5%)
Categorical Independent/Control Variables	**Weighted Row Percentage**	**Weighted Row Percentage**
State Scope of Practice Regulations		
Full Practice and Prescriptive Authority	14.2	85.8
Full Practice Authority Only	15.6	84.4
Restricted Practice and Prescribing	15.8	84.2
NP Age		
Less than 35	14.2	85.8
35-39	17.3	82.7
40-44	14.9	85.1
45-49	17.9	82.1
50-54	14.4	85.6
55-59	17.0	83.0
60-64	13.8	86.2
65 and older	12.6	87.4
Gender		
Male	11.5	88.5
Female	15.7	84.3
Employment Status**		
Full time	17.0	83.0
Part time	12.8	87.2
Highest NP Degree Received		
Certificate program	14.7	85.3
Master's degree	15.1	84.9
Post masters cert	18.6	81.4
Doctoral	14.2	82.8
Race/Ethnicity***		
Hispanic/Latino, any race	10.1	89.9
White, not of Hispanic origin	16.5	83.5
Black/African Am, not of Hispanic origin	9.6	90.4
Asian/Nat Haw. Pac. Isl., not of Hispanic origin	5.2	94.8
American Indian/AK Native, not of Hispanic origin	6.0	94.0
Two or more race, not of Hispanic origin	6.2	93.8
Location of NP Practice (Primary Position)**		
Urban	13.9	86.1
Large Rural City/Town	19.3	80.7
Small Rural Town	23.4	76.6
Isolated Rural Town	23.7	76.3

Table C-8. Descriptive Statistics for Having Hospital Admitting Privileges (n=3,057) (continued)

Continuous Independent/Control Variables	Has Admitting Privileges Mean (Range)	Does Not Have Admitting Privileges Mean (Range)
PC Providers per 100,000 population in State	179.9 (121.5 – 278.4)	179.8 (121.5 – 422.9)
Percent of State Population in Poverty	15.6 (10.0 – 24.2)	15.9 (10.0 – 24.2)
Percent of State Population 65 +	13.9 (8.5 – 18.2)	13.9 (8.5 – 18.2)
State Unemployment Rate*	7.4 (3.1 – 10.8)	7.6 (3.1 – 10.8)

Notes: Significance determined by Wald Chi-Square (categorical) and t-test of means (continuous) using SURVEYFREQ and SURVEYREG procedures in SAS with replicate weights. Asterisks indicate that the variable as a whole is significantly related to the outcome, but multiple comparisons between variable categories are not shown.

*p<.05

**p<.01

***p<.001

Table C-9. Logistic Regression on NPs Having Hospital Admitting Privileges (n=3,057)

Independent/Control Variables	Logit Estimate	Odds Ratio	Predicted Probability	PP 95% LCL	PP 95% UCL
Intercept	-0.986				
State Scope of Practice Regulations					
Full Practice and Prescriptive Auth.	-0.215	0.806	0.126	0.099	0.160
Full Practice Auth. Only	-0.017	0.983	0.150	0.124	0.180
Restricted Practice and Prescribing (ref)			0.152	0.135	0.170
Demographics					
Age					
Less than 35	-0.242	0.785	0.143	0.111	0.181
35-39	-0.037	0.963	0.170	0.129	0.220
40-44	-0.211	0.810	0.147	0.114	0.186
45-49 (ref)			0.175	0.139	0.217
50-54	-0.313	0.732	0.134	0.107	0.167
55-59	-0.160	0.853	0.153	0.128	0.182
60-64	-0.386	0.680	0.126	0.095	0.165
65 or older	-0.480	0.619	0.116	0.075	0.175
Gender					
Female	0.410	1.506	0.149	0.136	0.164
Male (ref)			0.104	0.069	0.155
Employment Status					
Full time	0.328**	1.388	0.162	0.145	0.180
Part time (ref)			0.122	0.103	0.145
Race/Ethnicity					
White (ref)			0.160	0.144	0.176
Hispanic	-0.469	0.625	0.106	0.052	0.204
Black, not of Hispanic origin	-0.592*	0.553	0.095	0.057	0.153
American Indian, AK Native, not of Hispanic origin	-1.074	0.342	0.061	0.015	0.218
Asian/Nat. Haw. Pac. Isl., not of Hispanic origin	-1.211**	0.298	0.053	0.022	0.122
Two or more races, not of Hispanic origin	-1.086	0.338	0.060	0.015	0.214
Highest NP Degree					
Certificate	0.072	1.074	0.151	0.109	0.206
Master's (ref)			0.142	0.128	0.158
Post-master's certificate	0.237	1.267	0.174	0.140	0.213
Doctoral Degree	0.233	1.262	0.173	0.087	0.315

Table C-9. Logistic Regression on NPs Having Hospital Admitting Privileges (n=3,057) (continued)

Independent/Control Variables	Logit Estimate	Odds Ratio	Predicted Probability	PP 95% LCL	PP 95% UCL
Urban-Rural Location					
Urban (ref)			0.135	0.120	0.151
Large Rural City/Town	0.344*	1.411	0.180	0.142	0.226
Small Rural Town	0.599**	1.820	0.221	0.163	0.292
Isolated Rural Town	0.642**	1.901	0.228	0.156	0.321
State Control Variables					
Predicted Probability at Means			0.146	0.133	0.160
PC Providers per 100,000 Population (PP at 10% Increase)	-0.002	0.998	0.142	0.128	0.159
Percent of State in Poverty (PP at 10% Increase)	-0.050*	0.951	0.136	0.121	0.154
Percent Age 65+ (PP at 10% Increase)	0.003	1.003	0.147	0.131	0.164
State Unemployment Rate (PP at 10% Increase)	-0.015	0.985	0.145	0.130	0.161
C Statistic	**0.619**				

Note: Logistic regressions were performed with the SURVEYLOGISTIC procedure and replicate weights in SAS.

*p<.05

**p<.01

***p<.001

Table C-10. Descriptive Statistics for Percent Time in Patient Care (n=3,054)

Descriptive Statistics	Percent of Time in Patient Care
Weighted Mean	83.4
Categorical Independent/Control Variables	**Weighted Mean**
State Scope of Practice Regulations	
Full Practice and Prescriptive Authority	85.4**
Full Practice Authority Only	83.5
Restricted Practice and Prescribing	82.8
NP Age	
Less than 35	84.3***
35-39	82.2
40-44	81.5
45-49	81.5
50-54	82.4
55-59	85.4
60-64	86.8
65 and older	82.1
Gender	
Male	81.6
Female	83.5
Employment Status	
Full time	82.3***
Part time	85.3
Highest NP Degree Received	
Certificate program	86.9***
Master's degree	83.0
Post masters cert	84.6
Doctoral	77.2
Race/Ethnicity	
Hispanic/Latino, any race	78.8***
White, not of Hispanic origin	84.1
Black/African Am, not of Hispanic origin	76.4
Asian/Nat Haw. Pac. Isl., not of Hispanic origin	80.0
American Indian/AK Native, not of Hispanic origin	80.4
Two or more race, not of Hispanic origin	84.7
Location of NP Practice (Primary Position)	
Urban	83.2
Large Rural City/Town	84.6
Small Rural Town	84.0
Isolated Rural Town	82.1
Continuous Independent/Control Variables	**Pearson Correlation**
PC Providers per 100,000 population in State	0.03
Percent of State Population in Poverty	-0.04*
Percent of State Population 65 +	0.01
State Unemployment Rate**	0.01

Notes: Significance determined by ANOVA (categorical) and t-test of means (continuous) using the SURVEYREG procedure in SAS with replicate weights. The ANOVA tests shown here indicate significant differences across categories but do not show the significance of differences between categories for variables with more than two categories.

*p<.05
**p<.01
***p<.001

Table C-11. OLS Regression Predicting Percent Time in Patient Care (n=3,054)

Categorical Independent/Control Variables	% Time in Patient Care	
	Beta	Std. Beta
Intercept	81.934***	0.000
State Scope of Practice Regulations		
Full Practice and Prescriptive Auth.	2.242**	0.051
Full Practice Auth. Only	0.366	0.007
Restricted Practice and Prescribing (ref)		
Demographics		
Age		
Less than 35	2.796*	0.058
35-39	0.731	0.013
40-44	-0.024	-0.000
45-49 (ref)		
50-54	0.504	0.010
55-59	3.015*	0.064
60-64	3.702**	0.068
65 or older	-1.841	-0.024
Female (vs. male)	0.746	0.010
Race/Ethnicity		
White (ref)		
Hispanic	-4.344	-0.043
Black, not of Hispanic origin	-5.772***	-0.078
American Indian, AK Native, not of Hispanic origin	-4.803	-0.032
Asian/Nat. Haw. Pac. Isl., not of Hispanic origin	-4.631*	-0.050
Two or more races, not of Hispanic origin	8.994***	0.062
Highest NP Degree		
Certificate	3.096**	0.050
Master's (ref)		
Post-master's certificate	1.613**	0.029
Doctoral Degree	-4.693	-0.036
Urban-Rural Location		
Urban (ref)		
Large Rural City/Town	1.346	0.025
Small Rural Town	0.912	0.012
Isolated Rural Town	-1.782	-0.020
Employment Status		
Full-time (vs. part-time)	-2.843***	-0.079

Table C-11. OLS Regression Predicting Percent Time in Patient Care (n=3,054) (continued)

Categorical Independent/Control Variables	% Time in Patient Care	
	Beta	Std. Beta
State Control Variables		
PC Providers per 100,000 Population (unit=10 providers)	-0.003	-0.007
Percent of State in Poverty	-0.170	-0.028
Percent Age 65+	0.071	0.007
State Unemployment Rate	0.401	0.032
R-square	**0.038**	

Note: OLS regressions were performed with the SURVEYREG procedure and replicate weights in SAS.

*p<.05

**p<.01

***p<.001

Table C-12. Descriptive Statistics for High Volume of Patient Per Week (n=3,054)

Descriptive Statistics	Sees 90+ Patients Per Week	Sees Less Than 90 Patients Per Week
n (Weighted %)	870 (28.8%)	2,184 (71.2%)
Independent/Control Variables	**Weighted Row Percentage**	**Weighted Row Percentage**
State Scope of Practice Regulations* **		
Full Practice and Prescriptive Authority	16.8	83.2
Full Practice Authority Only	30.1	69.9
Restricted Practice and Prescribing	31.9	68.1
NP Age* **		
Less than 35	31.0	69.0
35-39	25.7	74.3
40-44	28.8	71.2
45-49	32.7	67.3
50-54	31.0	69.0
55-59	28.3	71.7
60-64	28.0	72.0
65 and older	15.6	84.4
Gender **		
Male	42.7	57.3
Female	28.0	72.0
Employment Status* **		
Full time	38.5	61.5
Part time	11.6	88.4
Percent of Time in Pt Care		
90% or more	27.2	72.8
Less than 90%	30.6	69.4
Highest NP Degree Received*		
Certificate program	27.8	72.2
Master's degree	27.7	72.3
Post masters cert	34.0	66.0
Doctoral	48.6	51.4
Race/Ethnicity		
Hispanic/Latino, any race	40.4	59.6
White, not of Hispanic origin	28.4	71.6
Black/African Am, not of Hispanic origin	30.3	69.7
Asian/Nat Haw. Pac. Isl., not of Hispanic origin	22.0	78.0
American Indian/AK Native, not of Hispanic origin	44.6	55.4
Two or more race, not of Hispanic origin	30.7	69.3
Location of NP Practice (Primary Position)*		
Urban	27.7	72.3
Large Rural City/Town	31.5	68.5
Small Rural Town	39.3	60.7
Isolated Rural Town	26.8	73.2

Table C-12. Descriptive Statistics for High Volume of Patient Per Week (n=3,054) (continued)

Descriptive Statistics	Sees 90+ Patients Per Week	Sees Less Than 90 Patients Per Week
Continuous Independent/Control Variables	**Mean (Range)**	**Mean (Range)**
PC Providers per 100,000 population in State***	171.0 (121.5 – 422.9)	183.6 (121.5 – 422.9)
Percent of State Population in Poverty***	16.6 (10.0 – 24.2)	15.5 (10.0 – 24.2)
Percent of State Population 65 +	13.8 (8.5 – 18.2)	13.9 (9.5 – 18.2)
State Unemployment Rate	7.6 (3.1 – 10.8)	7.5 (3.1 – 10.8)

Notes: Significance determined by Wald Chi-Square (categorical) and t-test of means (continuous) using SURVEYFREQ and SURVEYREG procedures in SAS with replicate weights. Asterisks indicate that the variable as a whole is significantly related to the outcome, but multiple comparisons between variable categories are not shown.

*p<.05

**p<.01

***p<.001

Table C-13. Logistic Regression on High Volume of Patients Per Week (n=3,054)

Independent/Control Variables	Logit Estimate	Odds Ratio	Predicted Probability	PP 95% LCL	PP 95% UCL
Intercept	-1.557*				
State Scope of Practice Regulations					
Full Practice and Prescriptive Auth.	-0.627***	0.534	0.163	0.134	0.197
Full Practice Auth. Only	0.090	1.095	0.285	0.244	0.331
Restricted Practice and Prescribing (ref)			0.267	0.247	0.288
Demographics					
Age					
Less than 35	-0.028	0.973	0.283	0.242	0.329
35-39	-0.296	0.744	0.232	0.181	0.292
40-44	-0.239	0.788	0.243	0.194	0.299
45-49 (ref)			0.289	0.239	0.345
50-54	-0.162	0.850	0.257	0.222	0.295
55-59	-0.274	0.760	0.236	0.201	0.275
60-64	-0.261	0.770	0.239	0.198	0.284
65 or older	-0.845**	0.430	0.149	0.102	0.212
Gender					
Female	-0.389	0.678	0.244	0.227	0.262
Male (ref)			0.322	0.247	0.408
Employment Status					
Full time	1.543***	4.678	0.365	0.342	0.388
Part time (ref)			0.109	0.090	0.132
Percent of Time in Patient Care					
90% or more	-0.009	0.991	0.247	0.226	0.270
Less than 90%			0.249	0.224	0.275
Race/Ethnicity					
White (ref)			0.250	0.233	0.268
Hispanic	0.298	1.347	0.310	0.221	0.416
Black, not of Hispanic origin	-0.227	0.797	0.210	0.154	0.280
American Indian, AK Native, not of Hispanic origin	0.715	2.044	0.405	0.182	0.677
Asian/Nat. Haw. Pac. Isl., not of Hispanic origin	-0.463	0.629	0.174	0.107	0.268
Two or more races, not of Hispanic origin	0.020	1.020	0.254	0.140	0.416
Highest NP Degree					
Certificate	0.337	1.401	0.299	0.234	0.373
Master's (ref)			0.233	0.216	0.251
Post-master's certificate	0.314*	1.369	0.294	0.242	0.352
Doctoral Degree	1.047***	2.850	0.464	0.321	0.614

Table C-13. Logistic Regression on High Volume of Patients Per Week (n=3,054) (continued)

Independent/Control Variables	Logit Estimate	Odds Ratio	Predicted Probability	PP 95% LCL	PP 95% UCL
Urban-Rural Location					
Urban (ref)			0.242	0.224	0.262
Large Rural City/Town	0.048	1.049	0.252	0.212	0.295
Small Rural Town	0.381*	1.464	0.319	0.250	0.398
Isolated Rural Town	0.026	1.026	0.247	0.169	0.347
State Control Variables					
Predicted Probability at Means			0.250	0.234	0.267
PC Providers per 100,000 Population (PP at 10% Increase)	-0.004*	0.996	0.236	0.216	0.256
Percent of State in Poverty (PP at 10% Increase)	0.078***	1.081	0.274	0.253	0.296
Percent Age 65+ (PP at 10% Increase)	-0.038	0.963	0.240	0.218	0.263
State Unemployment Rate (PP at 10% Increase)	0.015	1.015	0.252	0.234	0.271
C Statistic	**0.731**				

Note: Logistic regressions were performed with the SURVEYLOGISTIC procedure and replicate weights in SAS.

*p<.05

**p<.01

***p<.001

Table C-14. Descriptive Statistics for NP Billing (n=2,584)

Descriptive Statistics	Bills Under Own NPI Number	Does Not Bill Under Own Number
n (Weighted %)	1,267 (48.6%)	1,317 (51.4%)
Categorical Independent/Control Variables	**Weighted Row Percentage**	**Weighted Row Percentage**
State Scope of Practice Regulations* **		
Full Practice and Prescriptive Authority	60.4	39.6
Full Practice Authority Only	47.0	53.0
Restricted Practice and Prescribing	45.5	54.5
NP Age*		
Less than 35	52.7	47.3
35-39	47.6	52.4
40-44	47.1	52.9
45-49	49.3	50.7
50-54	48.6	51.4
55-59	52.2	47.8
60-64	42.4	57.6
65 and older	41.0	59.0
Gender		
Male	49.5	50.5
Female	48.5	51.5
Employment Status**		
Full time	51.3	48.7
Part time	43.8	56.2
Highest NP Degree Received**		
Certificate program	37.7	62.3
Master's degree	50.0	50.0
Post masters cert	47.7	52.3
Doctoral	38.4	61.6
Race/Ethnicity***		
Hispanic/Latino, any race	32.1	67.9
White, not of Hispanic origin	50.2	49.8
Black/African Am, not of Hispanic origin	38.9	61.1
Asian/Nat Haw. Pac. Isl., not of Hispanic origin	27.4	72.6
American Indian/AK Native, not of Hispanic origin	43.0	57.0
Two or more race, not of Hispanic origin	58.0	42.0
Location of NP Practice (Primary Position)***		
Urban	45.0	55.0
Large Rural City/Town	59.4	40.6
Small Rural Town	64.2	35.8
Isolated Rural Town	58.6	41.4

Table C-14. Descriptive Statistics for NP Billing (n=2,584) (continued)

	Bills Under Own NPI Number	Does Not Bill Under Own Number
Continuous Independent/Control Variables	**Mean (Range)**	**Mean (Range)**
Percent of Time in Patient Care	83.9 (0.0 – 100.0)	83.9 (0.0 – 100.0)
PC Providers per 100,000 population in State**	181.7 (121.5 – 422.9)	176.8 (121.5 – 422.9)
Percent of State Population in Poverty**	15.7 (10.0 – 24.2)	16.0 (10.0 – 24.2)
Percent of State Population 65 +*	14.0 (8.5 – 18.2)	13.8 (8.5 – 18.2)
State Unemployment Rate***	7.4 (3.1 – 10.8)	7.6 (3.1 – 10.8)

Notes: Significance determined by Wald Chi-Square (categorical) and t-test of means (continuous) using SURVEYFREQ and SURVEYREG procedures in SAS with replicate weights.

*p<.05

**p<.01

***p<.001

Table C-15. Logistic Regression on Primary Billing Arrangement (n=2,584)

Independent/Control Variables	Logit Estimate	Odds Ratio	Predicted Probability	PP 95% LCL	PP 95% UCL
Intercept	-0.193				
State Scope of Practice Regulations					
Full Practice and Prescriptive Auth.	0.518***	1.678	0.593	0.544	0.641
Full Practice Auth. Only	-0.079	0.924	0.445	0.398	0.494
Restricted Practice and Prescribing (ref)			0.465	0.440	0.490
Demographics					
Age					
Less than 35	0.110	1.116	0.530	0.489	0.570
35-39	-0.064	0.938	0.487	0.426	0.547
40-44	-0.127	0.881	0.471	0.422	0.521
45-49 (ref)			0.503	0.447	0.558
50-54	-0.088	0.916	0.481	0.435	0.526
55-59	0.043	1.044	0.513	0.465	0.562
60-64	-0.325	0.722	0.422	0.362	0.484
65 or older	-0.397	0.673	0.405	0.317	0.499
Gender					
Female	0.008	1.008	0.486	0.466	0.506
Male (ref)			0.484	0.388	0.581
Employment Status					
Full time	0.265**	1.303	0.510	0.483	0.537
Part time (ref)			0.444	0.410	0.478
Race/Ethnicity					
White (ref)			0.500	0.480	0.520
Hispanic	-0.604*	0.547	0.354	0.250	0.474
Black, not of Hispanic origin	-0.352	0.703	0.413	0.327	0.505
American Indian, AK Nat., non-Hisp.	-0.291	0.747	0.428	0.204	0.686
Asian/Nat. Haw. Pac. Isl., not of Hispanic origin	-0.926***	0.396	0.284	0.195	0.394
Two or more races, not of Hispanic origin	0.400	1.492	0.599	0.411	0.762
Highest NP Degree					
Certificate	-0.441*	0.644	0.390	0.318	0.468
Master's (ref)			0.499	0.476	0.522
Post-master's certificate	-0.070	0.932	0.481	0.421	0.542
Doctoral Degree	-0.470	0.625	0.383	0.254	0.532

Table C-15. Logistic Regression on Primary Billing Arrangement (n=2,584) (continued)

Independent/Control Variables	Logit Estimate	Odds Ratio	Predicted Probability	PP 95% LCL	PP 95% UCL
Urban-Rural Location					
Urban (ref)			0.453	0.432	0.474
Large Rural City/Town	0.514***	1.672	0.581	0.519	0.641
Small Rural Town	0.751***	2.120	0.637	0.554	0.713
Isolated Rural Town	0.474*	1.606	0.571	0.471	0.666
State Control Variables					
Predicted Probability at Means			0.485	0.466	0.504
Percent of Time in Patient Care (PP at 10% Increase)	-0.001	0.999	0.482	0.460	0.505
PC Providers per 100,000 Population (PP at 10% Increase)	0.000	1.000	0.485	0.464	0.507
Percent of State in Poverty (PP at 10% Increase)	-0.036*	0.964	0.470	0.448	0.494
Percent Age 65+ (PP at 10% Increase)	0.042	1.043	0.500	0.475	0.524
State Unemployment Rate (PP at 10% Increase)	-0.002	0.998	0.485	0.462	0.507
C Statistic	**0.629**				

Note: Logistic regressions were performed with the SURVEYLOGISTIC procedure and replicate weights in SAS.

*p<.05

**p<.01

***p<.001

Table C-16. Descriptive Statistics for Physician Supervision (n=2,584)

Descriptive Statistics	Physician Never Present On-Site	Physician Present On-Site
n (Weighted %)	344 (13.1%)	2,240 (86.9%)
Categorical Independent/Control Variables	**Weighted Row Percentage**	**Weighted Row Percentage**
State Scope of Practice Regulations**		
Full Practice and Prescriptive Authority	17.7	82.3
Full Practice Authority Only	11.9	88.1
Restricted Practice and Prescribing	12.1	87.9
NP Age		
Less than 35	10.2	89.8
35-39	12.4	87.6
40-44	13.7	86.3
45-49	13.3	86.7
50-54	12.8	87.2
55-59	13.9	86.1
60-64	13.8	86.2
65 and older	19.8	80.2
Gender**		
Male	23.8	76.2
Female	12.5	87.5
Employment Status		
Full time	13.0	87.0
Part time	13.5	86.5
Highest NP Degree Received		
Certificate program	9.4	90.6
Master's degree	13.3	86.7
Post masters cert	14.0	86.0
Doctoral	19.7	80.3
Race/Ethnicity		
Hispanic/Latino, any race	15.8	84.2
White, not of Hispanic origin	13.0	87.0
Black/African Am, not of Hispanic origin	14.2	85.8
Asian/Nat Haw. Pac. Isl., not of Hispanic origin	12.8	87.2
American Indian/AK Native, not of Hispanic origin	8.2	91.8
Two or more race, not of Hispanic origin	12.5	87.5
Location of NP Practice (Primary Position)		
Urban	12.9	87.1
Large Rural City/Town	12.5	87.5
Small Rural Town	14.0	86.0
Isolated Rural Town	17.6	82.4

Table C-16. Descriptive Statistics for Physician Supervision (n=2,584) (continued)

Descriptive Statistics	Physician Never Present On-Site	Physician Present On-Site
Continuous Independent/Control Variables	**Mean (Range)**	**Mean (Range)**
Percent of Time in Patient Care* **	77.8 (0.0 – 100.0)	84.8 (0.0 – 100.0)
PC Providers per 100,000 population in State	179.2 (121.5 – 422.9)	179.2 (121.5 – 422.9)
Percent of State Population in Poverty	15.7 (10.0 – 24.2)	15.9 (10.0 – 24.2)
Percent of State Population 65 +	14.0 (8.5 – 18.2)	13.8 (8.5 – 18.2)
State Unemployment Rate	7.5 (3.1 – 10.8)	7.5 (3.1 – 10.8)

Notes: Significance determined by Wald Chi-Square (categorical) and t-test of means (continuous) using SURVEYFREQ and SURVEYREG procedures in SAS with replicate weights. Asterisks indicate that the variable as a whole is significantly related to the outcome, but multiple comparisons between variable categories are not shown.

*p<.05

**p<.01

***p<.001

Table C-17. Logistic Regression on Physician Supervision without Interactions (n=2,584)

Independent/Control Variables	Model 1: Without Interactions				
	Logit Estimate	Odds Ratio	Predicted Probability	PP 95% LCL	PP 95% UCL
Intercept	0.345				
State Scope of Practice Regulations					
Full Practice and Prescriptive Auth.	0.586***	1.796	0.177	0.142	0.219
Full Practice Auth. Only	0.107	1.113	0.118	0.088	0.155
Restricted Practice and Prescribing (ref)			0.107	0.088	0.129
Demographics					
Age					
Less than 35	-0.225	0.798	0.097	0.070	0.134
35-39	-0.100	0.904	0.109	0.077	0.151
40-44	-0.011	0.989	0.118	0.083	0.164
45-49 (ref)			0.119	0.087	0.161
50-54	-0.046	0.955	0.114	0.084	0.153
55-59	0.108	1.114	0.131	0.100	0.169
60-64	0.207	1.230	0.142	0.103	0.194
65 or older	0.545	1.725	0.189	0.122	0.280
Gender					
Female	-0.752***	0.471	0.116	0.099	0.135
Male (ref)			0.217	0.154	0.298
Employment Status					
Full time	-0.175	0.840	0.113	0.095	0.135
Part time (ref)			0.132	0.107	0.163
Race/Ethnicity					
White (ref)			0.119	0.105	0.134
Hispanic	0.215	1.239	0.144	0.087	0.228
Black, not of Hispanic origin	0.104	1.110	0.130	0.081	0.204
American Indian, AK Native, not of Hispanic origin	-0.483	0.617	0.077	0.000	1.000
Asian/Nat. Haw. Pac. Isl., not of Hispanic origin	-0.089	0.915	0.110	0.056	0.205
Two or more races, not of Hispanic origin	0.010	1.011	0.120	0.048	0.269
Highest NP Degree					
Certificate	-0.588*	0.555	0.073	0.045	0.117
Master's (ref)			0.124	0.106	0.144
Post-master's certificate	0.062	1.064	0.131	0.090	0.186
Doctoral Degree	0.314	1.369	0.162	0.084	0.291

Table C-17. Logistic Regression on Physician Supervision without Interactions (n=2,584)

Independent/Control Variables	Model 1: Without Interactions				
	Logit Estimate	Odds Ratio	Predicted Probability	PP 95% LCL	PP 95% UCL
Urban-Rural Location					
Urban (ref)			0.118	0.099	0.139
Large Rural City/Town	0.054	1.055	0.123	0.090	0.167
Small Rural Town	0.078	1.081	0.126	0.077	0.199
Isolated Rural Town	0.262	1.299	0.148	0.089	0.235
State Control Variables					
Predicted Probability at Means			0.120	0.103	0.140
Percent of Time in Patient Care (PP at 10% Increase)	-0.021***	0.979	0.102	0.087	0.120
PC Providers per 100,000 Population (PP at 10% Increase)	-0.004	0.996	0.114	0.096	0.134
Percent of State in Poverty (PP at 10% Increase)	-0.049	0.952	0.112	0.095	0.132
Percent Age 65+ (PP at 10% Increase)	0.071*	1.073	0.131	0.110	0.155
State Unemployment Rate (PP at 10% Increase)	0.078	1.081	0.126	0.108	0.148
C Statistic	**0.666**				
-2 Log Likelihood	**22784.999**				

Note: Logistic regressions were performed with the SURVEYLOGISTIC procedure and replicate weights in SAS.

*p<.05

**p<.01

***p<.001

Table C-18. Logistic Regression on Physician Supervision with Interactions (n=2,584)

Independent/Control Variables	Model 2: With Interactions				
	Logit Estimate	Odds Ratio	Predicted Probability	PP 95% LCL	PP 95% UCL
Intercept	0.615				
State Scope of Practice Regulations					
Full Practice and Prescriptive Auth.	0.393*				
Full Practice Auth. Only	-0.223				
Restricted Practice and Prescribing (ref)					
Demographics					
Age					
Less than 35	-0.229	0.795	0.096	0.069	0.132
35-39	-0.120	0.887	0.106	0.075	0.148
40-44	-0.037	0.964	0.114	0.080	0.160
45-49 (ref)			0.118	0.086	0.159
50-54	-0.066	0.937	0.111	0.082	0.149
55-59	0.083	1.087	0.127	0.097	0.164
60-64	0.235	1.265	0.145	0.105	0.196
65 or older	0.538	1.713	0.186	0.120	0.278
Gender					
Female	-0.782***	0.457	0.113	0.097	0.132
Male (ref)			0.218	0.155	0.299
Employment Status					
Full time	-0.184	0.832	0.111	0.093	0.132
Part time (ref)			0.130	0.105	0.161
Race/Ethnicity					
White (ref)			0.117	0.103	0.132
Hispanic	0.178	1.195	0.137	0.082	0.219
Black, not of Hispanic origin	0.102	1.107	0.128	0.079	0.201
American Indian, AK Native, not of Hispanic origin	-0.397	0.672	0.082	0.000	1.000
Asian/Nat. Haw. Pac. Isl., not of Hispanic origin	-0.104	0.901	0.107	0.055	0.198
Two or more races, not of Hispanic origin	0.072	1.074	0.125	0.049	0.282
Highest NP Degree					
Certificate	-0.620*	0.538	0.069	0.042	0.112
Master's (ref)			0.122	0.104	0.141
Post-master's certificate	0.089	1.093	0.131	0.090	0.188
Doctoral Degree	0.377	1.458	0.168	0.086	0.303

Table C-18. Logistic Regression on Physician Supervision with Interactions (n=2,584)

Independent/Control Variables	Model 2: With Interactions				
	Logit Estimate	Odds Ratio	Predicted Probability	PP 95% LCL	PP 95% UCL
Urban-Rural Location					
Urban (ref)					
Large Rural City/Town	-0.589*				
Small Rural Town	-0.270				
Isolated Rural Town	0.110				
State Control Variables					
Predicted Probability at Means			0.118	0.101	0.137
Percent of Time in Patient Care (PP at 10% Increase)	-0.022***	0.978	0.100	0.085	0.118
PC Providers per 100,000 Population (PP at 10% Increase)	-0.003	0.997	0.112	0.094	0.132
Percent of State in Poverty (PP at 10% Increase)	-0.057	0.944	0.109	0.091	0.129
Percent Age 65+ (PP at 10% Increase)	0.065*	1.067	0.128	0.108	0.151
State Unemployment Rate (PP at 10% Increase)	0.085	1.089	0.125	0.106	0.146
Interactions					
Full P&P*Isolated	0.029		0.178	0.067	0.395
Full P&P*Large Rural	1.163**		0.251	0.168	0.357
Full P&P*Small Rural	0.524		0.196	0.079	0.408
Full P&P*Urban			0.159	0.122	0.204
Full P Only*Isolated	0.902		0.219	0.080	0.474
Full P Only*Large Rural	1.488**		0.200	0.101	0.357
Full P Only*Small Rural	1.057		0.183	0.085	0.350
Full P Only*Urban			0.092	0.064	0.133
Neither*Isolated			0.124	0.058	0.248
Neither*Large Rural			0.066	0.040	0.106
Neither*Small Rural			0.088	0.040	0.183
Neither*Urban			0.113	0.092	0.138
C Statistic	**0.672**				
-2 Log Likelihood	**22613.040**				
Likelihood Ratio Model 1:Model 2 (df)	**171.959*** (6)**				

Note: Logistic regressions were performed with the SURVEYLOGISTIC procedure and replicate weights in SAS.

*p<.05

**p<.01

***p<.001

Table C-19. Descriptive Statistics for Working in a Rural Area (n=3,185)

Descriptive Statistics	Works in a Rural Area	Does Not Work in a Rural Area
n (Weighted %)	689 (21.4%)	2,796 (78.6%)
Categorical Independent/Control Variables	**Weighted Row Percentage**	**Weighted Row Percentage**
State Scope of Practice Regulations* **		
Full Practice and Prescriptive Authority	28.6	71.4
Full Practice Authority Only	24.7	75.3
Restricted Practice and Prescribing	18.4	81.6
NP Age		
Less than 35	17.5	82.5
35-39	21.5	78.5
40-44	22.4	77.6
45-49	21.4	78.6
50-54	21.3	78.7
55-59	22.0	78.0
60-64	22.9	77.1
65 and older	24.1	75.9
Gender		
Male	21.8	78.2
Female	21.4	78.6
Highest NP Degree Received		
Certificate program	23.0	77.0
Master's degree	21.4	78.6
Post masters cert	19.8	80.2
Doctoral	20.5	79.5
Race/Ethnicity***		
Hispanic/Latino, any race	7.1	92.9
White, not of Hispanic origin	23.4	76.6
Black/African Am, not of Hispanic origin	5.7	94.3
Asian/Nat Haw. Pac. Isl., not of Hispanic origin	6.3	93.7
American Indian/AK Native, not of Hispanic origin	23.9	76.1
Two or more race, not of Hispanic origin	17.4	82.6
Continuous Independent/Control Variables	**Mean (Range)**	**Mean (Range)**
Percent of State Population in a Rural Area* **	29.2 (0.0 – 61.3)	18.8 (5.0-61.3)
PC Providers per 100,000 population in State	179.6 (121.5 – 278.4)	179.7 (121.5 – 422.9)
Percent of State Population in Poverty* **	16.4 (10.0 – 24.2)	15.7 (10.0 – 24.2)
Percent of State Population 65 +* **	14.1 (8.5 – 18.2)	13.8 (8.5 – 18.2)
State Unemployment Rate* **	7.2 (3.1 – 10.8)	7.6 (3.1 – 10.8)

Notes: Significance determined by Wald Chi-Square (categorical) and t-test of means (continuous) using SURVEYFREQ and SURVEYREG procedures in SAS with replicate weights. Asterisks indicate that the variable as a whole is significantly related to the outcome, but multiple comparisons between variable categories are not shown.

*p<.05

**p<.01

***p<.001

Table C-20. Logistic Regression on Working in a Rural Area (n=3,185)

Independent/Control Variables	Logit Estimate	Odds Ratio	Predicted Probability	PP 95% LCL	PP 95% UCL
Intercept	-2.929***				
State Scope of Practice Regulations					
Full Practice and Prescriptive Auth.	0.383**	1.467	0.230	0.194	0.269
Full Practice Auth. Only	-0.152	0.859	0.149	0.121	0.181
Restricted Practice and Prescribing (ref)			0.169	0.154	0.185
Demographics					
Age					
Less than 35	-0.340	0.712	0.137	0.108	0.173
35-39	-0.080	0.924	0.171	0.134	0.215
40-44	-0.037	0.964	0.177	0.148	0.211
45-49 (ref)			0.183	0.147	0.225
50-54	-0.070	0.933	0.172	0.146	0.203
55-59	-0.005	0.995	0.182	0.151	0.218
60-64	0.105	1.110	0.199	0.161	0.242
65 or older	0.264	1.303	0.226	0.164	0.301
Gender					
Female	0.100	1.105	0.176	0.163	0.190
Male (ref)			0.162	0.120	0.215
Race/Ethnicity					
White (ref)			0.197	0.183	0.213
Hispanic	-1.022*	0.360	0.081	0.038	0.165
Black, not of Hispanic origin	-1.626***	0.197	0.046	0.026	0.081
American Indian, AK Native, not of Hispanic origin	-0.272	0.762	0.158	0.055	0.375
Asian/Nat. Haw. Pac. Isl., not of Hispanic origin	-0.853*	0.426	0.095	0.043	0.195
Two or more races, not of Hispanic origin	-0.196	0.822	0.168	0.087	0.301
Highest NP Degree					
Certificate	0.138	1.148	0.196	0.147	0.258
Master's (ref)			0.176	0.160	0.192
Post-master's certificate	-0.150	0.861	0.155	0.120	0.198
Doctoral Degree	0.150	1.162	0.198	0.118	0.313

Table C-20. Logistic Regression on Working in a Rural Area (n=3,185) (continued)

Independent/Control Variables	Logit Estimate	Odds Ratio	Predicted Probability	PP 95% LCL	PP 95% UCL
State Control Variables					
Predicted Probability at Means			0.174	0.162	0.188
Percent of State Population in Rural Area (PP at 10% Increase)	0.059***	1.061	0.193	0.180	0.207
PC Providers per 100,000 Population (PP at 10% Increase)	-0.000	1.000	0.174	0.158	0.190
Percent of State in Poverty (PP at 10% Increase)	0.074***	1.076	0.192	0.176	0.208
Percent Age 65+ (PP at 10% Increase)	0.008	1.008	0.176	0.159	0.195
State Unemployment Rate (PP at 10% Increase)	-0.138**	0.871	0.160	0.144	0.178
C Statistic	**0.751**				

Note: Logistic regressions were performed with the SURVEYLOGISTIC procedure and replicate weights in SAS.

*p<.05

**p<.01

***p<.001

Table C-21. Models of NP Percentage of First Visit Claims and Reimbursement

Parameters	Models of NP Percentage of First Visit Claims Billed		Models of NP Percentage of First Visit Reimbursement	
	Estimate	Standard Error	Estimate	Standard Error
First Visit Claims and Reimbursement in 2012				
Intercept	-0.209*	0.099	-0.183*	0.087
Full practice and prescriptive authority in 2012	0.068	0.037	0.075*	0.032
Full practice only in 2012	0.024	0.049	0.023	0.043
Restrictive in 2012 (reference)				
NP share of primary care providers in 2012	1.115***	0.241	0.921***	0.212
R-square	0.344***		0.339***	
First Visit Claims and Reimbursement in 2008				
Intercept	-0.071	0.052	-0.074	0.048
Full practice and prescriptive authority in 2008	0.077**	0.025	0.077**	0.023
Full practice only in 2008	0.002	0.026	0.006	0.024
Restrictive in 2008 (reference)				
NP share of primary care providers in 2008	0.538***	0.146	0.477***	0.135
R-square	0.402***		0.407***	
First Visit Claims and Reimbursement in 2004				
Intercept	-0.026	0.031	-0.030	0.027
Full practice and prescriptive authority in 2004	0.032	0.016	0.027	0.014
Full practice only in 2004	0.013	0.015	0.010	0.013
Restrictive in 2004 (reference)				
NP share of primary care providers in 2008	0.310**	0.100	0.274**	0.087
R-square	0.293***		0.293***	
Change in First Visit Claims and Reimbursement, 2004-2012				
Intercept	0.135**	0.041	0.129***	0.036
State SOP did not liberalize, 2004-2012	-0.001	0.043	-0.020	0.038
State SOP liberalized, 2004-2012 (reference)				
Change in NP share of PCPs, 2004-2012	0.551*	0.236	0.447*	0.209
R-square	0.106		0.087	

Note: OLS regressions were performed with the GLM Procedure in SAS.

*p<.05

**p<.01

***p<.001

Appendix D

Claims Data Request: Counts by State and Claim Type each for 2004, 2008, 2012

Appendix D
Claims Data Request: Counts by State and Claim Type each for 2004, 2008, 2012

Overview of Outcomes

- # First-visit claims billed by NPs
- # First-visit claims billed by physicians
- Total # first-visit claims

- Total payments for first-visit claims billed by NPs
- Total payments for first-visit claims billed by physicians
- Total payments for first-visit claims

Specifications:

Files:

- Carrier RIF (see documentation at: http://www.resdac.org/cms-data/files/carrier-rif/data-documentation)
- Outpatient RIF (see documentation at: http://www.resdac.org/cms-data/files/op-rif/data-documentation)

Selecting providers:

- NPs
  - HCFASPCL=50
- Physicians 1: Primary Care Physicians:
  - HCFASPCL=1, 8, 11
- Physicians 2: All Physicians
  - HCFASPCL codes 1-40 EXCEPT 17-19 and 35, and
  - HCFASPCL codes 46,68,70,72,78,79, 81-86, 90-93, 98,99
- All providers

Selecting claim codes for first visit:

- Restrictive version: Carrier files only
  - HCPCS_CD 99201-99205
- Inclusive version: Carrier files + Outpatient files
  - Carrier files: BETOS = M1A, and
  - Outpatient Files: HCPCS_CD = 99201-99205, 99381-99387, 0500F, G0101, G0245, G0248, G0344 and G0402

Exclusions:

- Exclude claims coded "denied"

Selecting states:

- Count claims in subset by provider state (PRVSTATE)

Payment code:

- PROV_PMT

Table series 1. (each for 2004, 2008, 2012): Number of claims

State	NPs, restrictive claim codes	NPs, inclusive claim codes	Primary care physicians: restrictive claim codes	All Physicians: restrictive claim codes	Primary care physicians: inclusive claim codes	All Physicians: inclusive claim codes	All providers, restrictive claim codes	All providers, inclusive claim codes
Alabama								
Wyoming								

Table series 2. (each for 2004, 2008, 2012): Total dollar amount of claims

State	NPs, restrictive claim codes	NPs, inclusive claim codes	Primary care physicians: restrictive claim codes	All Physicians: restrictive claim codes	Primary care physicians: inclusive claim codes	All Physicians: inclusive claim codes	All providers, restrictive claim codes	All providers, inclusive claim codes
Alabama								
Wyoming								