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Assessing Rural-Urban Nurse Practitioner Supply and Distribution in 12 States Using Available Data Sources

KEY FINDINGS

- Among 12 study states, estimates of each state's nurse practitioner (NP) workforce supply percentage in rural areas were similar using data from state professional licenses and from National Provide Identifier (NPI) data, ranging from 60% to 10% in both sources.
- Estimates of state NP supply derived from state licensure data were higher than estimates derived from National Provider Identifier (NPI) data for most, but not all, study states.
- State license data and NPI data can be useful for health workforce planning, but their limitations should be acknowledged and workforce supply comparisons limited to estimates derived from the same types of data.

INTRODUCTION AND BACKGROUND

Prior to implementation of the Affordable Care Act, nearly one in five uninsured Americans under age 65 (approximately 7.8 million) lived in a rural area[1]—a larger proportion uninsured than is the case for urban residents. The demand for health care services is widely projected to increase in the U.S. over the next two decades due to a growing and aging population and improved access to healthcare services because of health insurance coverage expansion. The health workforce in rural areas, however, may have difficulty meeting the increased demand for services because recruiting and retaining providers to rural practice continues to be challenging.[2]

Nurse practitioners (NPs) have been recognized as an integral part of the health care workforce, particularly in primary care, but are frequently not included in estimates of state workforce supply.[3] Morgan et al. found that approximately 60% of 40 state workforce assessments between 2002 and 2008 did not include NPs (or physician assistants) in their provider counts, workforce projections or recommendations. Information about the number and distribution (including rural-urban distribution) of NPs is helpful for planning health workforce education, recruitment and retention strategies that will meet the increased demand for services under the nation's reformed health care system.

Health workforce planning is frequently hampered because there are few reliable sources of data from which workforce supply estimates can be drawn. More information about the distribution of NPs in rural and urban areas is needed to develop policies and funding initiatives that can promote NP practice, particularly for rural and underserved populations. The primary purpose of this study was to examine two sources of state and sub-state NP supply data, and to compare supply estimates derived from two sources: state license records and National Provider Identifier (NPI) data.

METHODS

License data were obtained in 2010 from each of 12 individual states' boards of nursing (Arizona, Idaho, Oregon, Georgia, Kentucky, Texas, Virginia, Iowa, Minnesota, Ohio, Maine and Vermont). The data were originally drawn to develop a sampling frame for a different study, and were selected to include states from as many Census divisions as possible, where NPs could be differentiated from other advanced practice nurse roles, with varying NP practice authority, where adequate information was available that could be used to identify rural from urban addresses, and where license records could be obtained free or at reasonably low cost. The analytic dataset excluded records for NPs with mailing addresses outside of the state of licensure. Only one state identified licensees' practice address separate from the license mailing address.

Rural-urban location of each NP was determined using the ZIP code associated with each license. All but one state listed only one address. Texas, the exception, included both the NP's residence address and, where applicable, a practice address. NP licensee ZIP codes (practice ZIP for the state where it was available) were linked to the ZIP code approximation of the Rural Urban Commuting Area (RUCA) codes, version 2.0. RUCA codes classify ZIP codes into 33 categories according to core population and work commuter flow patterns.[4] The RUCA codes assigned to each category were: Urban=1.0, 1.1, 2.0, 2.1, 3.0, 4.1, 5.1, 7.1, 8.1 and 10.1; Large Rural=4.0, 4.2, 5.0, 5.2, 6.0 and 6.1; Small Rural=7.0, 7.2, 7.3, 7.4, 8.0, 8.2, 8.3, 8.4, 9.0, 9.1 and 9.2; Isolated Small Rural=10.0, 10.2, 10.3, 10.4, 10.5 and 10.6. Any NP practice ZIP locations that did not link to the RUCA codes were attributed to RUCA codes by comparing the practice city, U.S. Postal Service city-ZIP lookup and the RUCA codes associated with the city ZIP codes.

The numbers of NPs per capita were calculated, by state, for rural and urban areas as well as for large rural, small rural, and isolated small rural areas. ZIP code-level data obtained from Neilson/Claritas, a commercial organization that supplies U.S. demographic data, supplied the 2011 population estimates used as the denominator for these calculations.[5]

Data from a study by the WWAMI Rural Health Research Center and the American Nurses Association using 2010 NPI data were used for comparisons with license data.[6,7] The NPI, a 10-digit number, is a record within the National Plan and Provider Enumeration System (NPPES) that covers both individuals such as NPs and institutional providers such as hospitals. NPs who directly bill Medicare, Medicaid, and some health insurers for services using electronic billing must obtain and use an NPI.

FINDINGS

Urban-Rural Distribution of NPs in 12 States Using State License and NPI Data

The statewide, urban and rural distribution of NPs in the 12 study states based on analyses of state license data is shown in Table 1. Among these states, only the data for Texas included a field to select those licensees who were actively working in their profession. Only one state, Vermont, had more NPs with addresses in rural areas than in urban. The distribution of NPs across types of rural area types varied by state, with some having more in large rural than in smaller rural area types, and others showing opposite patterns.

Table 1: Number of Rural and Urban NPs in 12 States in 2010 Based on License Data*

State (by Census Region)	Overall	Urban	Rural Overall	Sub-Rural Areas		
				Large Rural	Small Rural	Isolated Small Rural
West						
AZ	3,512	3,170	342	176	124	42
ID	542	429	113	37	43	33
OR	2,110	1,683	427	302	69	56
South						
GA	4,096	3,421	675	349	212	114
KY	2,285	1,287	998	472	312	214
TX†	5,823	5,191	632	367	166	99
VA	3,194	2,735	459	104	176	179
Midwest						
IA	1,183	746	437	119	169	149
MN	2,313	1,842	471	224	110	137
OH	4,501	3,922	579	413	126	40
Northeast						
ME	974	602	372	140	84	148
VT	316	130	186	50	59	77

* Licenses with addresses in the state of licensure.
† License data were obtained only for NPs actively working in their profession.

The number of NPs in 2010, overall and in urban and rural areas, calculated from NPI data is shown in Table 2.

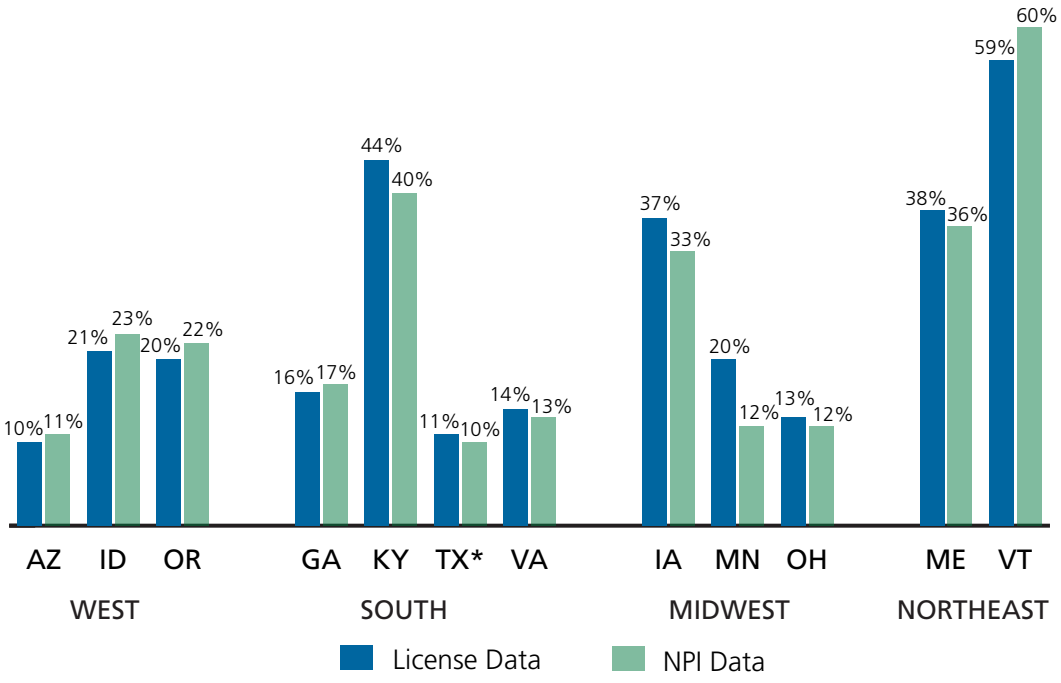
A comparison of the percent of NPs in each state that were in rural areas, calculated from state license data and NPI data, is shown in Figure 1. The percent rural ranged from a high of 60% to a low of 10%. In most states the estimates from license and NPI data were relatively similar, although there were some differences (as much as 8 percentage points in Minnesota) between the estimates for each state and the direction of the differences varied: the percent of NPs in rural estimated from NPI data was higher than from license data in 5 states and 7 had lower estimates from the NPI data.

Table 2: Number of Rural and Urban Nurse Practitioners (NPs) in 12 States in 2010 Based on National Provider Identifier Data*

State (by Census Region)	Overall	Urban	Rural Overall	Sub-Rural Areas		
				Large Rural	Small Rural	Isolated Small Rural
West						
AZ	2,242	1,985	257	136	99	22
ID	466	359	107	41	44	22
OR	1,580	1,240	340	246	58	36
South						
GA	2,875	2,372	503	306	125	72
KY	2,018	1,210	808	410	246	152
TX†	6,105	5,482	623	365	157	101
VA	2,737	2,378	359	75	150	134
Midwest						
IA	1,004	677	327	127	126	74
MN	3,199	2,827	372	198	82	92
OH	3,570	3,139	431	347	73	11
Northeast						
ME	837	533	304	127	83	94
VT	297	120	177	67	60	50

*Advanced practice nurses with NP specialty indicating practice location in the state, from the National Plan and Provider Enumeration System as referenced in Skillman et al., 2012.[6]
† License data were obtained only for NPs actively working in their profession.

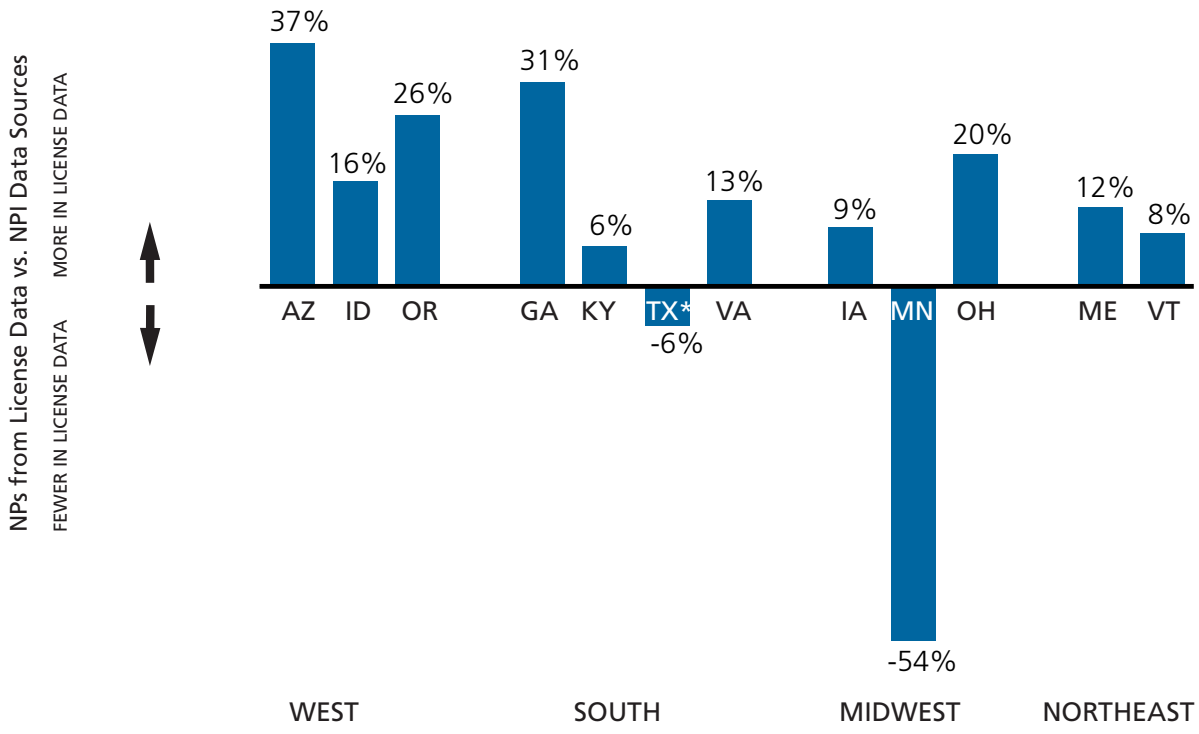
Figure 1: Percent of NPs in Rural Areas in Each of 12 States in 2010 Based on License and NPI Data



* License data were obtained only for NPs actively working in their profession.

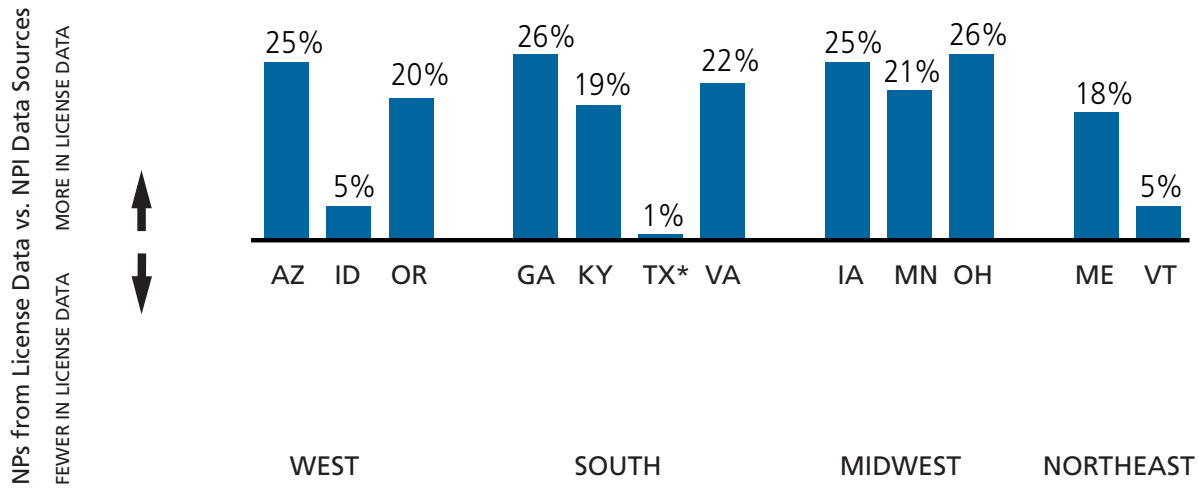
The number of NPs in the 12 study states that were identified using license data was compared with the number identified using NPI data from the same year. The differences in state urban and rural NP supply between these two data sources are shown in Figures 2 and 3. For most states the number of NPs identified from license data was higher than the number identified from NPI data -- ranging from 6% to 37% higher in urban and from 1% to 26% higher in rural areas than from NPI estimates. In two states, however, there were fewer urban NPs identified from license data than from NPI data: 6% fewer in Texas and 54% fewer in state Minnesota.

Figure 2: Urban NPs: Percent Difference Between Number of NPs Identified from License compared with NPI Data Sources in 2010 for 12 States



* License data were obtained only for NPs actively working in their profession.
NPI data source: Skillman et al., 2012.[6]

Figure 3: Rural NPs: Percent Difference Between Number of NPs Identified from License Compared with NPI Data Sources in 2010 for 12 States



* License data were obtained only for NPs actively working in their profession.
NPI data source: Skillman et al., 2012.[6]

CONCLUSIONS

State license data and NPI data show somewhat different estimates of NP supply and distribution across the 12 states. Estimates of NP supply using license data were generally higher than supply estimates derived from NPI data, with the exception of urban NPs in two states, Texas and Minnesota. With some exceptions (such as Texas among these study states), license data often cannot distinguish between clinically active (practicing) providers and those who are not clinically active. Because NPIs are identification numbers used for billing Medicare and Medicaid services, it could be expected that more providers identified using NPI data will be practicing and therefore show fewer NPs in a location than the number identified using license data.

The finding from Texas, where similar numbers of rural and urban NPs were identified from NPI and license data, reflects that the state's data represented practicing NPs only. These estimates of practicing NP supply should more closely align with estimates from identification numbers used for billing purposes (the NPIs). In Texas there were fewer urban NPs identified from license data than from NPI data, which could be due to limited incentives for providers to update information associated with their NPI numbers. For example, if providers move to a work location where they do not bill directly under their own NPI, without an incentive to keep the address associated with his or her NPI number updated, the NPI data may erroneously associate their location with an out-of-date work address. Similarly, if a provider quits practicing, there is currently little incentive to update the information associated with their NPI.

The findings for Minnesota, where there were 54% fewer urban NPs identified from licensing data in 2010 than from NPI data, are more difficult to explain. Minnesota's license data included only one address and no indication of practice status, so practicing NPs could not be distinguished from those who were not clinically active. In states with only license mailing address, the NP supply estimated from license data would be expected to be larger than from NPI data because it is presumed to include providers who are not in active practice. This was not the case, however, for the urban Minnesota NP supply estimate using license data which

was much lower than the urban estimate from NPI data. We explored several scenarios that might explain this anomaly.

Some error is likely to occur in assigning an NP to a rural or urban location using either professional license or NPI data. License mailing address often is the provider's home address, which may be in a different area type (rural or urban) than where the provider works. Over-assignment to rural location may account for some of the unexpected results we found for Minnesota, especially if many NPs commute from rural locations to work at urban sites (causing the number of licenses assigned to rural areas to be higher than if practice location had been available). But the overall (rural plus urban) license-derived estimate of NP supply for the state was 38% lower than the overall NPI-derived estimate, indicating inappropriate rural-urban assignment was not the sole reason for the unexpected result.

The number of NPs identified by this study using Minnesota state license data is comparable to those reported by the Minnesota Department of Public Health for 2010 (2,180 with in-state addresses from Minnesota's report compared with 2,313 reported here).[8] Upon further investigation, we found that between 2010 and 2014 the number of NPs with Minnesota practice addresses identified from NPI records increased by 5.1% (from 3,199 to 3,361) while across the same time period the number of NPs identified from state license records increased by 65.0% (from 2,313 to 3,817).[9] A comparison of NP supply using 2014 NPI and license data shows the relationship between the data sources to be more comparable to the other states in this study's 2010 data comparisons: with 13.4% more NPs represented by the Minnesota license data than identified NPs with NPIs and Minnesota practice addresses.

Upon further investigation, the answer to the unexpected difference between NP supply estimates from license versus NPI data for Minnesota appears to be related to the fact that NPs in Minnesota were not required to obtain a license separate from their RN license prior to January 2015 in order to practice as an NP. The Minnesota Board of Nursing required verification of national certification in order for NPs to practice, but that information was not automatically added to the RN's license and there were delays in updating those records. As a result, Minnesota's state health professions license database was not a reliable source for identifying all NPs in that state until the state legislature in 2014 amended the Nurse Practice Act to require licensure for advanced practice registered nurses (and removed the requirement for a collaborative management agreement and written prescribing agreement), effective January 1, 2015. As NPs obtained licenses in 2014 in order to become compliant with the law beginning in 2015, the number of NPs identifiable from Minnesota's state licensure records quickly increased to reflect a supply size relative to the NPI estimates that was more consistent with what we found in other states.

POLICY IMPLICATIONS

To be the most useful, data for state health workforce planning should identify providers who are actively practicing in the state as well as where they practice. Most sources of data on NP supply fall short of this goal, however. But despite these limitations, state license data and NPI data can be useful for planning purposes if their limitations are acknowledged. Comparisons of estimated supply of NPs and other health providers from one region to another should be made using estimates derived from the same types of data, or clearly acknowledge where different sources are used and the implications.

Understanding the validity of the data used to count NPs is important because of the ramifications of these data for health-workforce planning. NPs and physician assistants are currently not included in the calculations for Health Professions Shortage Area (HPSA) designation, however the Shortage Designation office within HRSA is creating a more streamlined Shortage Designation Management System (SDMS) that uses NPI data. Creating a more sensitive and comprehensive method for assessing primary care workforce distribution by enabling the national shortage designation process to include NPs is critical. But if NPs are to be added to the SDMS, it is very important to understand the credibility of NP supply counts that are obtained from NPI data.

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