

Impact of Dental Hygiene Scope of Practice in 2016 on a Population Oral Health Outcome: A Multilevel Logistic Modeling Analysis

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ABSTRACT

Objectives: Dental hygienists are preventive oral health specialists trained to provide oral health promotion and disease prevention services. Legal scopes of practice for dental hygienists vary considerably in states, impacting access to preventive oral health services. This study sought to quantify differences in scope of practice and describe its effect on an oral health outcome for the population.

Methods: A numerical scope of practice index was created to quantify the regulatory environment for dental hygienists, the tasks permitted, levels of required supervision, and the availability of direct reimbursement by state. Exploratory and confirmatory factor analyses were used to establish index validity. Individual-level information on outcome and potential confounders was extracted from the Behavioral Risk Factor Surveillance System. State-level confounders were drawn from a variety of data sources. Multilevel logistic modeling was used to assess the adjusted association between index scores and no teeth removed due to decay or disease.

Results: The factor analyses found the variables in the index were valid measures of the construct of scope of practice ($P<0.01$). The multilevel logistic analysis found that scope of practice for dental hygienists and the supply of dentists in a state played important roles in access to services and the prevention of dental decay and disease. Scope of practice was strongly and positively associated ($P<0.01$) with having no teeth removed due to decay or disease.

Conclusions: This study provides strong quantitative evidence that increasing dental hygienists' legal scope of practice can impact oral health outcomes in the US adult population.

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INTRODUCTION

In 2001, the Center for Health Workforce Studies (CHWS) received funding from the US Health Resources and Services Administration to study the state variation in scope of practice (SOP) for dental hygienists (DH) and to describe the impact of SOP on oral health services utilization and outcomes.

One research question was whether expanded SOPs in states where DHs were permitted to work under alternative supervision arrangements in public health settings impacted access to services and outcomes for people living in those states. At the time there was no metric to measure SOP.

METHODS

In 2001, CHWS created a numerical scoring instrument to quantify DH SOP. This process was guided by an advisory committee and informed by focus groups with more than 100 DHs across the US.

The DH Professional Practice Index (DHPPI) provided a state-specific score to measure SOP. Variables were grouped into 1 of 4 categories: regulation, supervision, tasks, and reimbursement.

The DHPPI score for each state was updated in 2014 based on statute and regulation governing SOP for DHs in that year. The update used the same instrument and the same score values as in 2001.

In 2014, the instrument was subjected to factor analysis to validate that it represented a single construct. Multilevel logistic modeling using state DHPPI scores and oral health surveillance data from the 2012 Behavioral Risk Factor Surveillance System (BRFSS) was conducted. The analysis controlled for state and individual level variables.

In 2016, CHWS created a new DHPPI instrument to better describe current and emerging practice for DHs in states. The composition of the new index was informed by focus groups with 37 DHs from 29 states. Factor analysis and multilevel modeling were again conducted using the DHPPI and the 2014 BRFSS data.

RESULTS

In 2001, state scores ranged from 10 in West Virginia to 97 in Colorado. Regression analysis using BRFSS data and DHPPI scores found that SOP was positively but not significantly associated with the percent of a population in a state having their teeth cleaned by a dentist or dental hygienist in the prior year.

In 2014, state scores ranged from 18 in Mississippi to 98 in Maine. The mean DHPPI score progressed from 43.5 in 2001 to 57.6 in 2014.

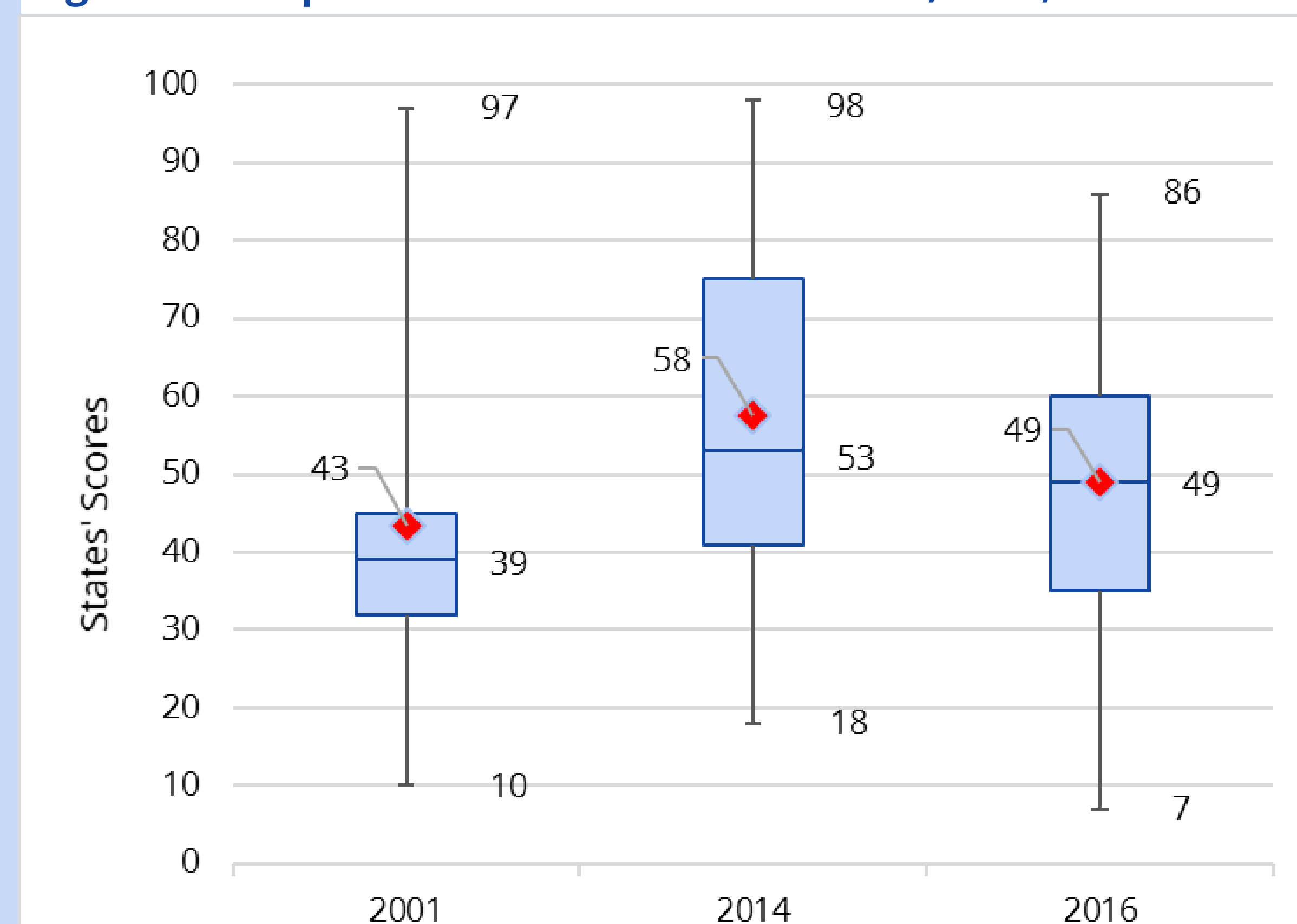
RESULTS (cont.)

Multilevel logistic modeling using the 2014 DHPPI and population oral health surveillance data from the BRFSS and controlling for state and individual level variables found that SOP in a state was positively and significantly associated ($P<0.05$) with an improved oral health outcome for a state's population, that of having no teeth removed due to decay or disease.

Emerging practice models including dental hygiene therapy and new technology were impacting DH practice such that the 2001 instrument was no longer a completely accurate measure. Five states scored at 95 or above in 2014, suggesting achievement of the ideal practice environment envisioned for DHs in 2001 when the DHPPI was created.

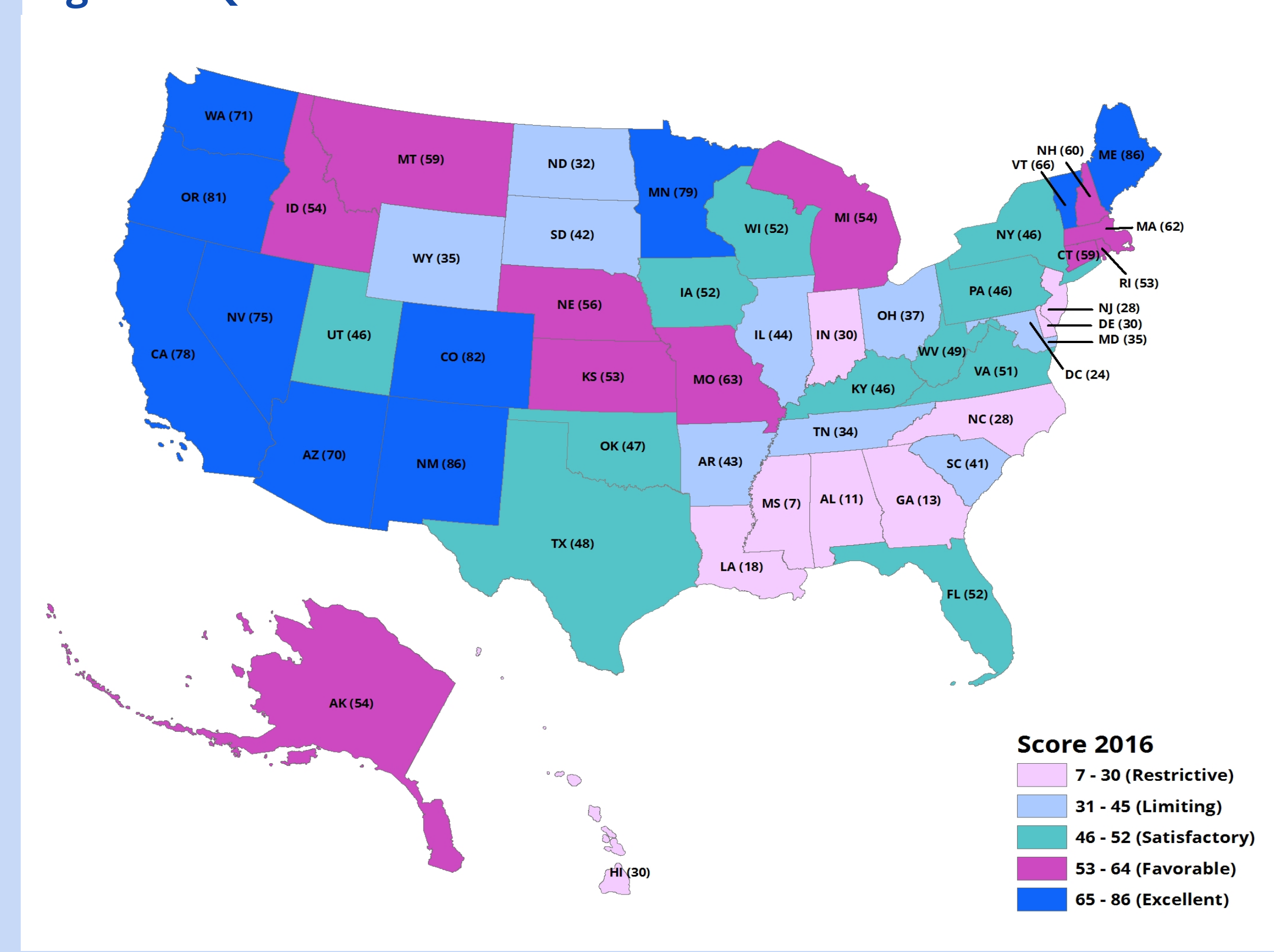
In 2016, a new DHPPI instrument was created to better capture aspects of DH SOP. Because the new instrument included some variables that described emerging practice for DHs that was not widely adopted in states it was expected that state scores in 2016 would be lower than in 2014. In 2016, state scores ranged from 7 in Mississippi to 86 in Maine and New Mexico. The mean score for states in 2016 was 48.9.

Figure 1. Comparison of DHPPI Scores in 2001, 2014, 2016



The 2016 state scores were sorted by quintile to describe practice environments for DHs as limiting, restrictive, satisfactory, favorable, or excellent based on DHPPI score.

Figure 2. Quintiles of State Scores on DHPPI in 2016



RESULTS (cont.)

Multilevel Logistic Modeling

The multilevel modeling used oral health data from the 2014 BRFSS and 2016 state DHPPI scores and controlled for both state and individual level variables.

SOP for DHs in a state was positively and significantly ($P<0.005$) associated with an improved oral health outcome in the population. Each 10-point increase in the DHPPI score was linked to a 3.5% increase in the odds of the population in the state to having no teeth removed due to decay or disease.

Table 1. Multivariable Association Between DHPPI Scores and Having No Teeth Removed Due to Decay or Disease in 2016

State Level	Mean, %	Odds Ratio	T value	P value
Intercept		1.1152	4.088	<0.001
Dental Hygienist Rate (per 100,000 population)	56	1.0003	0.153	0.879
Dentist Rate (per 100,000 population)	53	1.0025	0.873	0.388
Per Capita Income	\$42,492	1.0000	-1.367	0.178
Percent Urban	74	1.0035	1.202	0.236
Percent on Fluoridated Public Water Supply	71	1.0014	1.750	0.087
Scope of Practice Index 2016	48	1.0035	2.995	0.004
Individual Level				
Last Dental Visit to Dentist or Dental Hygienist: Within the Past Year	66%	1.1319	5.174	<0.001
Marital Status: Married or Cohabiting	55%	0.8811	-6.470	<0.001
Education: Bachelors Degree or Higher	26%	1.8485	22.067	<0.001
Income: \$50,000 a Year or Higher	45%	1.9130	21.824	<0.001
Gender: Male	49%	0.9398	-5.979	<0.001
Race/Ethnicity: White NH or Asian/PI NH	69%	1.3402	9.247	<0.001
Age: Age 45 or Higher	53%	0.2368	-108.074	<0.001

CONCLUSIONS

SOP is an important consideration for legislative and regulatory bodies. Understanding the actual impact of the changing roles and functions of DHs is of great value for patients, clinicians, policymakers, and advocates as they attempt to identify strategies to increase access to services and improve population oral health. DH SOP is positively and significantly associated with an improved oral health outcome.

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