Does State Level Dental Hygiene Scope of Practice Affect Individual Oral Health Outcomes?: A Multilevel Modeling Analysis Across Time

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ABSTRACT

Dental hygienists increasingly provide community outreach to underserved populations, serving as case finders and care managers who refer for dental treatment services and encourage establishment of dental homes. Scope of practice (SOP) parameters in some states limit the ability of dental hygienists to effectively provide services in public health settings.

Objective: In 2001, a numerical index describing dental hygiene SOP, called the Dental Hygiene Professional Practice Index (DHPPI) was created and scored. The DHPPI was rescored in 2014 to update the indices based on state-specific SOP for dental hygienists in that year. This study not only accomplished the update but also assessed the validity of the DHPPI scale and the impact of SOP on oral health outcomes in the population.

Methods: Factor analysis and multi-level logistic modeling were used to evaluate the relationship between individual state DHPPI scores and oral health outcomes in the adult population in each state in 2001 and 2014, respectively.

Results: Dental hygiene SOP exerted a positive and significant impact on oral health outcomes in both 2001 (p<.001) and 2014 (p=.011).

Conclusions: The DHPPI is a useful tool for comparative analysis of SOP for dental hygienists across states. The update revealed that the ideal practice environment envisioned in 2001 has nearly been achieved in some states.

BACKGROUND

- The DHPPI index is composed of individual variables, each of which is grouped into 1 of 4 categories (regulatory, supervision, tasks, and reimbursement).
- Each variable coincides with a score which is awarded if the condition or task is permitted in governing statute or regulation in the state.
- Scores from all variables were compiled to achieve a composite DHPPI score (from 0 to 100) for each state to quantify SOP for dental hygienists in 2001 and 2014.
- Higher scores on the DHPPI were associated with greater autonomy for dental hygienists to provide educational, preventive, and prophylactic oral health services in public health settings in states.

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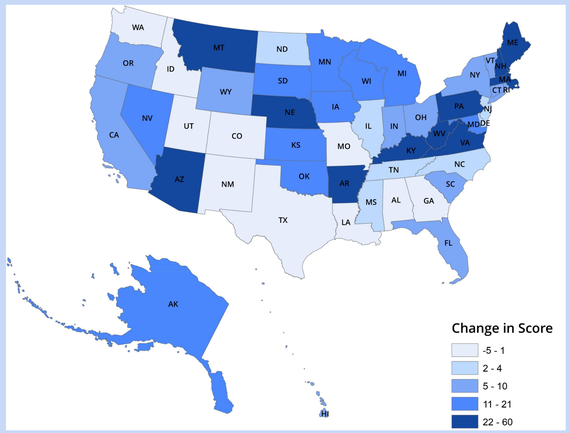
METHODS

- Dental practice acts and associated regulation effective in 2014 in each state were reviewed in detail to inform the revision of the DPPPI index scores.
- Exploratory and confirmatory factor analyses of the 2001 and 2014 DHPPI indices were completed to demonstrate that the variables in the DHPPI, taken as a whole, constituted a valid construct for measuring dental hygiene SOP.
- Multilevel logistic modeling was completed to understand the impact of contextual factors including dental hygiene SOP, the supply of dentists and dental hygienists, community water fluoridation, urban/rural geography, and personal demographics on oral health outcomes in a state.
- Population data to describe oral health outcomes for adults by state was extracted from the Behavioral Risk Factor Surveillance System (BRFSS).
- Ten multilevel modeling equations were run using the 2001 and 2014 composite DHPPI scores and each of the four constituent parts.

RESULTS

- SOP for dental hygienists broadened in many states between 2001 and 2014 but remained relatively unchanged in others.
- High scoring states in 2001 continued to be high scoring in 2014.
- Several lower scoring states in 2001 showed little change in dental hygiene SOP in 2014.
- Noticeable change in SOP occurred in states that implemented new dental hygiene practice models that build on the foundational competencies, skills, and functions of dental hygienists. Some examples include dental hygiene therapy in Maine, public health dental hygiene and collaborative practice in Massachusetts, and advanced dental therapy in Minnesota.

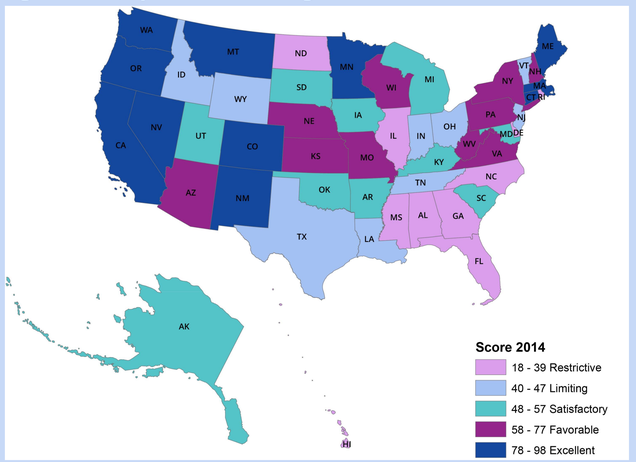
Figure 1. Change in DHPPI Scores by State, 2001 and 2014



RESULTS (cont.)

- In 2001 and 2014 states were ranked on a scale from excellent to restrictive to describe the relative practice environment for dental hygienists based on their total score on the DHPPI.

Figure 2. Comparative Ranking of States' DHPPI Scores, 2014



- Exploratory and confirmatory factor analyses validated that the 4 groupings of variables in the DHPPI were dimensions of a single overarching concept of SOP.
- Reliability estimates remained high in all models in the multi-level logistic modeling (over 90%), and the chi-square values for each of the 10 models were highly statistically significant, indicating an excellent model fit.
- In the multilevel modeling equations, the DHPPI exerted a positive and significant impact on the oral health outcome in the population of having no teeth removed due to decay or disease, holding constant all relevant state and individual-level factors in both 2001 (p<.001) and in 2014 (p=.011).

Figure 3. Results of The Multilevel Logistic Modeling of Composite DHPPI Scores on Having No Teeth Removed Due to Decay or Disease, 2001 and 2014

Variable	2001 Model		2014 Model	
	Odds Ratio	P-value	Odds Ratio	P-value
STATE LEVEL				
Intercept	0.921216	0.011	0.921065	0.016
Scope of Practice Index	1.005161	<0.001**	1.002744	0.011*
Dental Hygienist Rate	1.004925	0.009**	1.003614	0.057
Dentist Rate	1.003856	0.040*	1.003154	0.215
% Fluoridated Water	1.002542	0.039*	1.001726	0.053
Per Capita Income	0.999978	0.006**	0.999988	0.05*
% Urban	1.004195	0.098	1.004863	0.028*
INDIVIDUAL LEVEL				
Age	0.939298	<0.001**	0.947811	<0.001**
Sex	1.074283	0.001**	0.938606	<0.001**
Marital Status	0.951859	0.005**	0.931333	0.003**
Education	2.167903	<0.001**	2.122161	<0.001**
Employed	0.917515	0.001**	1.133762	<0.001**
Income	1.804209	<0.001**	1.669391	<0.001**
Black NH	1.017108	0.613	0.540519	<0.001**
Asian/PI NH	0.959888	0.560	0.711551	<0.001**
American Indian/Alaskan Native NH	1.195283	0.026*	0.642701	<0.001**
Other/2 or More Races NH	0.980379	0.868	0.797761	<0.001**
Hispanic	0.923882	0.062	0.804444	<0.001**
Last Dental Visit	1.140513	<0.001**	1.175174	<0.001**

* Statistically significant at or below the .05 probability level.
** Statistically significant at or below the .01 probability level.
Source: OHWRC, CHWS, 2015.

DISCUSSION

- Health promotion, risk assessment, and disease prevention are considered core competencies for dental hygienists, who function as preventive oral health specialists. Dental hygienists are often the first point of contact, providing evaluation and assessment of patients' oral health status, oral health education and preventive care, and referral to dental providers for necessary treatment services.
- The multilevel modeling demonstrated that SOP exerted a positive and significant impact on oral health outcomes in the population.
- Permitting dental hygienists to work to the full extent of their professional competency facilitates access to services, especially for underserved populations. Professional regulation that enables use of an array of skills can support innovation while still protecting patient safety and ensuring quality of care.
- Observation of the changes in SOP for dental hygienists over recent years suggests increasing standardization and gradual convergence in SOP across states. The mean DHPPI score increased from 43.5 in 2001 to 57.6 in 2014. Changes in SOP across states between 2001 and 2014 included lower levels of required supervision and an increasing number of tasks permitted to dental hygienists in public health settings.
- Measures of population oral health were limited, so the full extent of the impact of dental hygiene interventions on outcomes is not ascertainable. The BRFSS, which provides the most current oral health surveillance data, reduced the number of oral health questions fielded to patients between 2001 and 2014. In 2002 data were collected from survey participants about dental hygiene visits, but questions about these visits have subsequently been eliminated.

CONCLUSIONS

- Dental hygiene SOP impacts oral health outcomes in the population as demonstrated by these analyses.
- In the more than 10 years since the DHPPI was originally constructed, SOP for dental hygienists has changed.
- The scale was developed in 2001 based on the premise that lower levels of required supervision would increase access to preventive oral health services. In 2014, dental hygiene practice has moved beyond boundaries recognized in 2001.
- A new emphasis in states on enabling team based oral health service delivery, especially in public and community health settings, and an expansion of allowable tasks for dental hygienists suggests the need to build a modified index to appropriately measure emerging SOP for the profession.
- A new scale that includes the move to higher-level practice models built on basic dental hygiene competencies would better reflect the ongoing evolution in practice for dental hygienists.