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

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ABSTRACT

Dental hygienists are often the first point of contact for patients, and increasingly provide community outreach to underserved populations. They provide evaluation and risk assessment of patients’ oral health status, oral health education, preventive care, and referrals for dental providers for necessary treatment services. Scope of practice (SOP) parameters in some states limit the ability of dental hygienists to effectively provide services to the full extent of their training and ability.

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 provided an update and assessed the validity of the DHPPI scale and the impact of SOP on oral health outcomes in the population.

Methods: Factor analysis was conducted to establish the validity of the index to measure SOP. Multilevel modeling was used to evaluate the relationship between individual state DHPPI scores and oral health outcomes in the adult population for each state in 2001 and 2014, respectively.

Results: Factor analysis of the DHPPI statistically confirmed its validity as a measure of SOP. Multi-level logistic modeling revealed that SOP exerted a positive and significant effect on individual oral health outcomes in the population for both 2001 and 2014.

Conclusions: The DHPPI is a useful tool for comparative analysis of SOP for dental hygienists across states. The professional practice environment for dental hygienists has important ramifications for population oral health.

BACKGROUND

Variation in states’ governing regulations and statutes may limit the ability of dental hygienists to effectively provide services in public health settings. Prior literature examining the relationship between state-level dental hygiene SOP and population oral health outcomes indicates that restrictive practice environments may decrease access to care and limit improvements in population oral health.

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METHODS

- 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 contributes to a score which is awarded if the condition or task is permitted in governing statute or regulation in the state.

- Since 2001, the DHPPI index has been updated to reflect changes in dental hygiene practice environments (SOP). The DHPPI was rescored in 2014 to update the indices based on state-specific SOP for dental hygienists in that year.

- Scores from all variables were compiled to achieve a composite DHPPI score (from 0 to 100) for each state to quantify dental hygiene SOP in 2001 and 2014. Higher scores were associated with greater autonomy for dental hygienists to provide educational, preventive, and prophylactic oral health services in public health settings (Table 2).

- Exploratory (EFA) and Confirmatory Factor Analysis (CFA) were conducted on the 4 categories for each year (2001 and 2014). Both EFA and CFA statistically validated a one-factor model for each year (Table 1).

- The 2002 BRFSS was matched to the 2001 DHPPI indices and the 2012 BRFSS was matched to the 2014 DHPPI indices.

- Due to an inherently nested data structure, multilevel logistic modeling was selected as the most appropriate statistical tool to determine the effect of the state-level dental hygiene SOP on the oral health of individuals residing within states.

- Individual-level variables selected from the 2002 and 2012 BRFSS included:
  - Gender (Female=1)
  - Education (Bachelor’s degree=1)
  - Employment (Employed=1)
  - Income (Income $50,000=1)
  - Marital Status (Married=1)

- State variables included:
  - Last Dental Visit (Last visited within 12 months=1)
  - Oral Health Education (No=1)

- The outcome measure was binary (those reporting no teeth removed due to decay or disease were coded 1; those with some teeth removed due to decay or disease were coded 0).

- State-level variables (2001 and 2014) included the dentist and dental hygienist rate (per 100,000 population), percent on public fluoridated water systems, per capita income, percent living in urban areas, and the DHPPI.

- The composite index and each of the 4 categories were run separately in 2001 and 2014.

RESULTS

- The average DHPPI score across states increased from 43.7 in 2001 to 57.6 in 2014 on a 100 point scale (Table 2). Most notably, the Supervision category progressed from a mean score in all states of 19.1 in 2001 to 27.3 in 2014. The maximum state score increased only slightly from 97 in Colorado in 2001 to 98 in Maine in 2014, but the minimum score changed more noticeably from 10 in West Virginia in 2001 to 18 in Mississippi in 2014. More states distributed higher on the index in 2014 than in 2001.

- The Regulatory environment component was statistically significant in 2014 (p-value = 0.026) although not in 2001 (p-value = 0.178). The dental hygienist rate was statistically significant in both 2001 (p-value = 0.007) and 2014 (p-value = 0.029) (Table 4).

- The Supervision component exerted a positive and statistically significant effect (p < 0.001) on the oral health of individuals in 2001, holding constant all relevant state- and individual-level factors; it exerted the strongest state-level effect. Supervision was not significant in the 2014 model.

- The Task component exhibited the strongest state-level effect, compared with all other variables, with a positive and statistically significant relationship (p = 0.004) in the 2001 model. However, the relationship was not significant in 2014 (p = 0.299). The rates of dentists and dental hygienists increased in 2014, but not in 2001.

- The Reimbursement component demonstrated positive and significant correlations in 2001, holding constant all other state- and individual-level variables. The dental hygienist rate and the dentist rate were also significant. Reimbursement was also statistically significant in 2014 (p = 0.002).

- For 2001, 4 out of the 5 multilevel logistic models indicated a positive, statistically significant effect of state level professional practice environment upon oral health outcomes, while in 2014, 3 out of the 5 multilevel logistic models revealed a positive and statistically significant effect. The overall increase in scope of practice over the decade reduced variation among states and therefore, produced fewer statistically significant differences in the 2014 analysis.

CONCLUSIONS

- The DHPPI is a valid tool for assessing differences in dental hygienist scope of practice across states.

- Multilevel modeling demonstrates that dental hygiene scope of practice exerts 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.

REFERENCES