

# Executive Summary: Health Impact Review of HB 2321

## Concerning Mid-Level Dental Professionals

**Evidence indicates that HB 2321 has potential to improve oral health and overall health outcomes, particularly for low-income and communities of color as well as individuals with medical disabilities or chronic conditions. These communities are disproportionately impacted by negative oral and other health impacts; therefore improving health outcomes for these populations would likely decrease health disparities.**

### BILL INFORMATION

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**Sponsors:** Representatives Cody, Walsh, Jinkins, Green, Pettigrew, Fitzgibbon, Roberts, Pollet

#### Summary of Bill:

- Creates two new mid-level dental professions: licensed dental practitioners and licensed dental hygiene practitioners.
- Outlines the required qualifications and the scopes of practice for these new professions.
- Mandates that mid-level providers must practice pursuant to a written practice plan contract with a dentist.
- Specifies that mid-level providers can only practice in Federally Qualified Health Centers, clinics operated by accredited schools of dentistry or dental hygiene, clinics operated by a Tribal Health Program or an Urban Indian Organization, or a practice setting where at least 35% of the total patient base of the mid-level provider consists of Medicaid patients, patients with a medical disability/chronic condition that creates a significant barrier to dental care, or patients that do not have dental coverage and have an annual income of less than 133% of the federal poverty level.
- Encourages the American Dental Association and the Washington State Dental Association to study and report to the Legislature on programs in the state that use volunteer dentists and oral surgeons to provide specialty care and explore how these programs can be expanded and financed in underserved areas.

### HEALTH IMPACT REVIEW

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#### Summary of Findings:

This review assumes that if the Legislature creates these mid-level professions than individuals will pursue these careers and find employment in Washington.

This health impact review found the following evidence regarding the provisions in HB 2321:

- Strong evidence that having mid-level oral health providers employed in Washington state would increase access to oral healthcare.
- Some evidence that having mid-level oral health providers employed in Washington state would decrease oral healthcare costs.
- Some evidence that decreased costs of oral healthcare would increase access to care.
- Very strong evidence that increased access to oral healthcare would improve oral health outcomes.
- Strong evidence that mid-level dental professionals provide safe, high quality care.
- Very strong evidence that improved oral health outcomes would decrease health disparities.
- Very strong evidence that improved oral health outcomes would improve overall health.
- Very strong evidence that improved overall health would decrease health disparities.

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# **Health Impact Review of HB 2321**

## **Concerning Mid-Level Dental Professionals**

**November 6, 2014**

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## Introduction and Methods

A health impact review is an analysis of how a proposed legislative or budgetary change will likely impact health and health disparities in Washington state ([RCW 43.20.285](#)). For the purpose of this review ‘health disparities’ have been defined as the differences in disease, death, and other adverse health conditions that exist between populations ([RCW 43.20.270](#)). This document provides summaries of the evidence analyzed by State Board of Health staff during the health impact review of House Bill 2321 ([HB 2321](#)).

Staff analyzed the content of HB 2321 and created a logic model depicting possible pathways leading from the provisions of the bill to health outcomes. We consulted with various stakeholders and conducted objective reviews of the literature for each component of the pathway using databases including PubMed and Google Scholar. Dental therapist, dental health aide therapist, advanced dental therapist, licensed dental hygiene practitioner, licensed dental practitioner, among other professions are considered mid-level oral health providers. In most cases we have used the term “mid-level provider,” but we have also used these other more specific terms throughout the review. We recognize that mid-level provider is no longer a preferred term by many, however we have used this term to reflect the language used in the bill title. Although the specific training, scope of practice, and required supervision of mid-level oral health providers varies between regions where these providers are currently practicing, similar findings across multiple sites has led to a body of evidence that is in many respects generalizable to the providers that would be established by HB 2321.

The following pages provide a detailed analysis of the bill including the logic model, summaries of evidence, and annotated references. The logic model is presented both in text and through a flowchart (Figure 1). The logic model includes information on the strength of the evidence for each relationship. The strength-of-evidence has been defined using the following criteria:

- **Minimal evidence:** the literature review yielded only one study supporting the association, *or* the literature review yielded several studies supporting the association but also some studies which found no association or a negative relationship.
- **Some evidence:** the literature review yielded several studies supporting the association, but a large body of evidence was not established.
- **Strong evidence:** the literature review yielded a large body of evidence on the relationship (a majority of which supported the association) but the body of evidence contained some contradictory findings, did not incorporate the most robust study designs or data analysis, had significant but not meaningful results, or some combination of these.
- **Very strong evidence:** the literature review yielded a very large body of robust evidence supporting the association with few if any contradictory findings. The evidence indicates that the scientific community largely accepts the existence of the association.

This review was subject to time constraints, which allowed for only a preliminary search of the evidence. The annotated references are only a representation of the evidence and provide examples of current research. In many cases only a few review articles or meta-analyses are referenced. One article may cite or provide analysis of dozens of other articles. Therefore the number of references included in the bibliography does not necessarily reflect the strength-of-evidence. In addition, some articles provide evidence for more than one research question so they are referenced for multiple research questions.

## Analysis of HB 2321 and the Scientific Evidence

### *Summary of HB 2321*

- Creates two new mid-level dental professions: licensed dental practitioners and licensed dental hygiene practitioners.
- Outlines the required qualifications and the scopes of practice for these new professions.
- Mandates that mid-level providers must practice pursuant to a written practice plan contract with a dentist.
- Specifies that these mid-level providers can only practice in Federally Qualified Health Centers; clinics operated by accredited schools of dentistry or dental hygiene; clinics operated by a tribal health program or an Urban Indian Organization; or any practice setting where at least 35% of the total patient base of the mid-level provider consists of Medicaid patients, patients with a medical disability or chronic condition that creates a barrier to dental care, or patients that do not have dental coverage and have an annual income of less than 133% of the federal poverty level.
- Encourages the American Dental and Washington State Dental Associations to report to the Legislature on programs that use volunteer dentists and oral surgeons to provide specialty care and explore how these programs can be expanded and financed in underserved areas.

### *Health impact of HB 2321*

Evidence indicates that HB 2321 has potential to improve oral health and overall health outcomes, particularly for low-income and communities of color as well as individuals with medical disabilities or chronic conditions. These communities are disproportionately impacted by negative oral and other health impacts; therefore improving health outcomes for these populations would likely decrease health disparities.

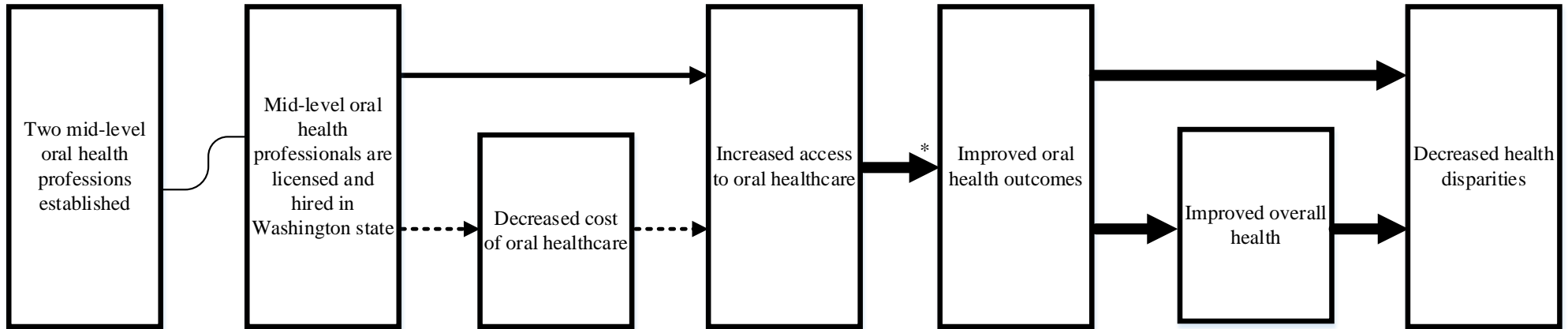
### *Pathways to health impacts*

We have assumed that if the Legislature creates these mid-level professions than individuals will pursue these careers and find employment in Washington. There is strong evidence that having mid-level oral health providers employed in Washington state would increase access to oral healthcare.<sup>1-10</sup> There is also some evidence that having mid-level oral health providers employed in Washington state would decrease oral healthcare costs,<sup>1-7,11,12</sup> which could in turn help increase access to care.<sup>3-5,7</sup> We found very strong evidence that increased access to oral healthcare helps improve oral health outcomes.<sup>10,11,13-16</sup> In addition we found strong evidence that mid-level dental professionals provide care within their scope of practice that is at least as high in quality as care provided by a licensed dentist.<sup>2,6,9-11,17</sup> HB 2321 specifically indicates that the mid-level providers must practice in settings that serve low-income and communities of color as well as individuals with medical disabilities or chronic conditions.<sup>18-21</sup> There is very strong evidence that these communities are disproportionately impacted by negative oral and other health outcomes<sup>22-34</sup>; therefore improving oral health outcomes for these populations would likely decrease oral health disparities. In addition there is very strong evidence that improved oral health outcomes would likely improve overall health for these populations,<sup>29,35,36</sup> therefore also contributing to a decrease in other health disparities.<sup>31-33</sup>

Due to time limitations we only researched the primary connections between the provisions of the bill and decreased health disparities and did not explore the evidence for all possible pathways. For example, potential pathways that were not researched include:

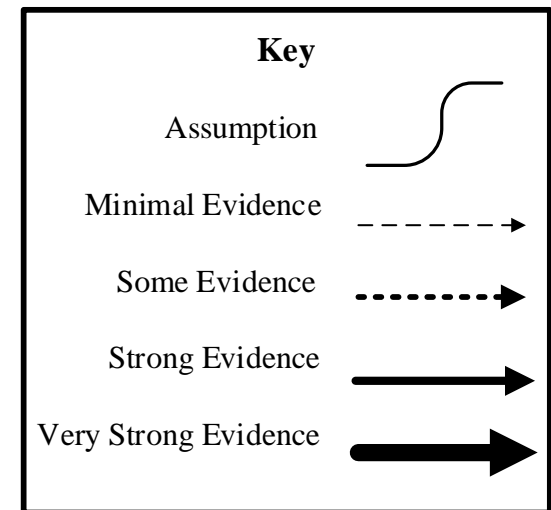
- Evidence of the impacts of oral health on educational outcomes (such as school attendance and grades), and the pathways between educational outcomes and health.
- Evidence of the impacts of oral health on social, emotional, and employment outcomes, and the pathways between these outcomes and health.

## Logic Model



**Figure 1**  
**Concerning Mid-Level Dental Professionals**  
**HB 2321**

\*There is very strong evidence that access to oral healthcare in general is associated with improved oral health outcomes. In addition, we found strong evidence that mid-level dental professionals provide safe, high quality care.



## Summaries of Findings

### **Will creating two mid-level oral health professions in Washington state lead to licensing and hiring of these mid-level providers?**

We have made the assumption that if the Washington Legislature creates a licensed dental practitioner and a licensed dental hygiene practitioner than individuals will pursue these careers and find employment in Washington. This assumption is based on evidence from other states and countries that have established a mid-level provider and have licensed and hired these professionals.

### **Will having mid-level oral health providers employed in Washington state increase access to oral healthcare?**

There is strong evidence that having mid-level dental providers employed in Washington state would increase access to oral healthcare. Studies have found that: a) patients treated by mid-level providers have fewer untreated cavities than those who have not received recent care or who have received care by a private practice dentist; b) practices that hired mid-level providers saw decreased wait times for their patients to get an appointment and decreased travel time to these appointments; and c) mid-level providers increased the number of patients that could be treated and the number of procedures that could be performed in the practice or clinic.<sup>2-7,9,10</sup> In Minnesota the 32 licensed mid-level providers served 6,338 new patients between 2011, when the first mid-level provider was hired, and February of 2014. Eighty-four percent of these patients are enrolled in public insurance. Nearly one-third of surveyed patients in Minnesota reported a reduction in wait time for an appointment since the dental therapist was employed, a trend that was stronger in rural clinics. Interviews with clinic managers, supervising dentists, and mid-level providers at the Minnesota sites also indicated that mid-level providers have increased access to care for uninsured and publically insured patients, children, medically complex individuals, and other special populations.<sup>5</sup>

Analysts have created several models to estimate the impact of a mid-level provider on productivity and access. While these models lead to drastically different estimates (ranging from an increase in patient visits from 1% to 51%), each of these models do predict that employing a mid-level provider would increase the number a patients a practice or clinic could serve.<sup>1,3,4,7</sup>

As of July 2014, 34 of Washington's 39 counties contained Federally Designated Health Professional Shortage Areas for dental care. For 32 of these, the entire county is designed as a shortage area. In some regions of the state the entire population has limited access to care because of a provider shortage while other regions are classified as shortage areas due to an insufficient number of providers serving low-income populations.<sup>8</sup> This indicates that a shortage of providers is at least one barrier to receiving oral healthcare in Washington state.

### **Will having mid-level oral health providers employed in Washington state decrease the cost of oral healthcare?**

There is some evidence that having mid-level oral health professions employed in Washington state would lead to decreased costs for clinics and private dental practices.<sup>1-7,12</sup> A model developed by Beazoglou et al. estimates that a mid-level provider working in a Federally Qualified Health Center (FQHC) and serving only children could lead to a maximum reduction

in cost to the center of about 6% of child services.<sup>3</sup> A similar model developed by some of the same authors estimates that a general dental practice could realize a reduction in costs between 0.53% and 5.61% after hiring a mid-level provider. This model assumes that the practice would pass cost savings along to the patients.<sup>4</sup> Another model developed by the Pew Center on the States estimates that a mid-level provider could increase the profit of a private practice dental clinic by between 7% and 54% depending on the scope of practice of the mid-level provider hired and the characteristics of the practice.<sup>7</sup> Evidence also indicates that the use of expanded function dental auxiliaries in Colorado is associated with decreased costs and higher practice gross income. In addition higher levels of delegation to these providers was associated with increased gross billing and increased practice net income.<sup>2</sup> However, one study conducted in the United Kingdom (UK) did find that the dental therapists in four private practices did not generate enough income to cover the expenses of their employment.<sup>11</sup>

It is very unclear if cost savings would be passed on to the patients and we did not find any evidence that this would occur. In addition, because Medicaid would reimburse at the same rate for services provided by mid-level oral health providers and dentists, mid-level providers would not lead to a direct savings to the state on each claim paid. There is preliminary evidence in Minnesota that mid-level providers have helped decrease emergency room visits for dental care which does help reduce costs to the state.<sup>5</sup> We did not evaluate the evidence for this relationship as it fell outside of the scope of this review.

### **Does a decrease in the cost of oral healthcare lead to an increase in access to oral healthcare?**

There is some evidence that a decrease in the cost of oral healthcare would increase access to care. This could result from a number of mechanisms. Medicaid does not reimburse for 100% of the cost of oral health services,<sup>7</sup> but would reimburse at the same rate whether an oral health service is provided by a mid-level provider or a dentist.<sup>5</sup> FQHCs must supplement the cost of care for Medicaid patients with other funding sources. If a FQHC can decrease its personnel costs by employing mid-level dental providers (who earn less per hour than a dentist) they can theoretically serve more patients with available funding. In Minnesota this mechanism seems to be at work where preliminary findings indicate that lower personnel costs have allowed clinics to serve more patients.<sup>5</sup> A model developed by Beazoglou et al. for FQHCs estimates that the cost savings associated with having a mid-level provider who only serves children would lead to an increase in the dental services for children by between 1.9 and 2.9%.<sup>3</sup>

Another model developed by Beazoglou et al. concerning private clinics estimates that the decreased costs associated with hiring a mid-level provider would likely increase demand (if that cost savings is passed on to patients) and therefore increase the number of patients seen by private practice dentists by about 1%.<sup>4</sup> This estimate assumes that the only driving factor for increasing the number of patients seen is an increase in demand due to decreased costs of services. This does not take into account that a mid-level provider could allow a practice currently operating at full capacity to increase its capacity. A model developed by the Pew Center on the States estimates that if a private practice employs a mid-level provider it can see an increase in profit even after increasing the percentage of Medicaid patients served despite the fact the Medicaid does not reimburse at 100% of the dentist's fees.<sup>7</sup>

### **Does increased access to oral healthcare lead to improved oral health outcomes?**

There is very strong evidence that increased access to oral healthcare would improve oral health outcomes in Washington.<sup>10,11,13-16</sup> Evidence indicates that individuals who receive regular dental care have more healthy teeth.<sup>14</sup> In addition at least one longitudinal study also indicates that individuals who reported improved oral health had received significantly more dental services than those who reported that their dental health had not changed or had deteriorated.<sup>16</sup> A study conducted in Washington state found that mothers who had a regular source of dental care rated their children's oral health higher than mothers without a regular source of care.<sup>15</sup> In addition, a number of studies specifically on mid-level dental providers have found that care by a mid-level provider is associated with improved oral health outcomes such as fewer untreated cavities.<sup>10</sup> There is also a strong body of evidence indicating that care provided by mid-level dental providers within their scope of practice is at least as high in quality as care provided by a licensed dentist.<sup>2,6,9-11,17</sup> We were not able to identify any evidence of harm associated with care provided by a mid-level dental provider.

### **Will improved oral health outcomes lead to decreased health disparities?**

House Bill 2321 requires that dental practitioners and dental hygiene practitioners practice in specific settings. These settings include Federally Qualified Health Centers (FQHC), clinics operated by accredited schools of dentistry or dental hygiene, or clinics operated by a Tribal Health Program or an Urban Indian Organization. These providers can also practice in other settings in which at least 35% of the total patient base of the mid-level provider is enrolled in Medicaid, have a medical disability or chronic condition that creates a significant barrier to dental care, or do not have dental insurance and have an annual income of less than 133% of the federal poverty level. These provisions of the bill would help ensure communities that are disproportionately impacted by negative oral health outcomes will benefit, thereby helping to decrease oral health disparities by income, race/ethnicity, and medical disability or chronic condition.

#### ***Income***

By definition, FQHCs must serve underserved areas or populations and offer a sliding fee scale.<sup>26</sup> Data from several FQHCs in Washington as well as national data indicate that these clinics serve high percentages of low-income individuals, uninsured patients, homeless populations, and migrant/seasonal farmworkers.<sup>18-21</sup> We were unable to identify the demographics of patients served in Washington clinics operated by accredited schools of dentistry or dental hygiene; however it appears that many of these clinics offer affordable care and/or accept Medicaid, indicating that they likely serve low-income patients. The University of Washington (UW) dental clinic's website indicates that they provide services at 20 to 40% lower costs than the average private practice in the greater Seattle area, with even further reduced fees for Medicaid-eligible adults.<sup>27</sup> We were able to identify eight accredited dental hygiene schools in Washington state. It appears that the majority of the clinics operated by these school accept Medicaid or offer low-fee services.<sup>25</sup> There is very strong evidence that in Washington low-income populations are disproportionately impacted by negative oral health outcomes.<sup>24,29,30,34</sup> Therefore improving oral health for low-income populations would help decrease oral health disparities by income.



### *Race/ethnicity*

House Bill 2321 would also allow mid-level dental health professionals to practice in Tribal Health Programs or Urban Indian Organizations. There is very strong evidence that in Washington American Indian and Alaska Native (AI/AN) populations are disproportionately impacted by negative oral health outcomes.<sup>24,29,30</sup> For example, data from the 2012 Healthy Youth survey indicate that AI/AN 6<sup>th</sup> graders were more likely than any other racial/ethnic group to report that they had missed school due to a toothache.<sup>24</sup> Behavioral Risk Factor Surveillance System data from 2010 indicate that the rate of adult tooth loss for AI/AN individuals was significantly higher than that for white, and Asian adults.<sup>34</sup>

Data from Washington FQHCs as well as national data also indicate that these sites serve high percentages of people of color and individuals who speak a primary language other than English.<sup>18-21</sup> For example, in 2012 65% of Washington's International Community Health Services' patients had limited English proficiency and 95% were persons of color.<sup>20</sup> While this specific health center's data may not reflect all FQHCs in Washington, national data does indicate that 90% of the patients served in FQHCs had incomes below 200% of the federal poverty level, about 40% lacked insurance coverage, and about 50% were patients of color.<sup>21</sup> There is very strong evidence that in Washington, communities of color are disproportionately impacted by negative oral health outcomes.<sup>24,29,30,34</sup> For example, 2010 data indicate that Head Start, kindergarten, and third grade students of color and those who spoke a language other than English at home were more likely to have rampant decay than their counterparts.<sup>30</sup> In addition, Behavioral Risk Factor Surveillance System data from 2004 and 2006 indicate that AI/AN, Hispanic, and black adults were significantly more likely to experience adult tooth loss than their white counterparts.<sup>29</sup> Data from 2010 mirrors these trends although the disparity for AI/AN respondents was the only difference that reached statistical significance when only one year of data was analyzed.<sup>34</sup> Improving oral health for these populations would help decrease oral health disparities by race/ethnicity.

### *Medical disability or chronic condition*

The UW School of Dentistry also operates the Dental Education in the Care of Persons with Disabilities program. This program treats persons with severe disabilities.<sup>28</sup> HB 2321 allows mid-level oral health providers to practice in clinics operated by schools of dentistry; therefore this setting could hire mid-level dental providers to increase capacity. The bill also allows mid-level providers to work in practice settings for which at least 35% of the mid-level providers patient base have a medical disability or chronic condition that creates a significant barrier to receiving dental care. The bill does not further define this population, but the implication is that this is a population that is experiencing barriers to accessing dental care. National evidence also indicates that at least some populations with medical disabilities or chronic conditions (i.e. dementia and diabetes) do have worse oral health outcomes than their counterparts.<sup>22,23</sup> Therefore improving oral health for these populations would also decrease health disparities.

### **Will improved oral health lead to improved overall health?**

There is very strong evidence that improving oral health would improve overall systemic health in Washington. Research links poor oral health with harms to other parts of the body such as the lungs and kidneys. For example, evidence indicates that periodontal diseases are risk-factors for coronary heart disease, can hinder diabetes control, and increase risk for pneumonia. There is

also evidence for an association between poor oral health and kidney disease, preterm and low birth weight babies, respiratory infections, and bacteremia (the presence of bacteria in the blood).<sup>29,35</sup> Bacteria in the blood can then be transported throughout the body and cause complications in vital organs such as the heart.<sup>36</sup> This evidence indicates that improving oral health has potential to improve overall systemic health.

### **Will improved overall health lead to decreased health disparities?**

There is very strong evidence that the same populations that experience oral health disparities experience other health disparities in Washington. For example, 2010 state data indicate that low-income and people of color were more likely to be effected by obesity, asthma, limited activity due to health problems, heart disease, and diabetes. Data also indicate that people of color and individuals with low incomes in Washington are disproportionately impacted by stroke and colorectal cancer.<sup>31-33</sup> The body of evidence highlighting the health disparities that low-income and communities of color, including AI/AN populations, face is extensive. This review only provides a few examples from Washington state specific data. Improving overall health for the populations targeted by this bill has potential to decrease not only disparities in oral health but in overall health as well.

### **Other considerations**

We pursued a number of other research questions in order to determine if there were alternate pathways leading from the provisions in the bill to health impacts. We ultimately did not include these pathways in the logic model on page three of this review as the available evidence is not concrete enough to support these pathways. We evaluated the evidence concerning: workforce diversity, rural access to dental care, risk of harm, and supply and demand of dental providers.

#### ***Workforce diversity***

We reviewed the evidence to determine if mid-level dental providers come from diverse racial/ethnic, cultural, and/or geographic backgrounds, which could in turn increase the availability of culturally and linguistically appropriate oral healthcare. We were not able to identify any studies evaluating the diversity of mid-level dental providers. Alaska has found that Dental Health Aide Therapists (DHAT) are likely to come from the communities that they serve,<sup>9</sup> however it is not clear if Alaska's model of targeted recruitment would be replicated in Washington. If Washington focused recruitment efforts as Alaska has to ensure that students come from the communities with high need for oral healthcare it is possible that this trend would be observed in Washington as well. In Saskatchewan, Canada when recruitment efforts moved from a focus on the less populous northern territories to recruitment in Saskatchewan, they began to see a decrease in the geographic diversity of the mid-level providers.<sup>12</sup>

One survey also found that Registered Dental Hygienists in Alternative Practice (RDHAP), providers authorized to practice independently in underserved settings, were significantly more likely than Registered Dental Hygienists to be black, Hispanic, or Native American, and also to be able to communicate with patients in a language other than English. RDHAPs were also significantly more likely than Registered Dental Hygienists to express a desire to work with "disadvantaged patients" and to indicate that improving access is important.<sup>37</sup> It is possible that professions that, by statute, are required to work in underserved settings may attract individuals who come from these communities. There may be other ways to make predictions about the

diversity of a mid-level dental provider workforce based on evidence available for other mid-level professionals such as medical mid-level providers, but due to limited time we did not pursue these less direct research questions.

### ***Rural access to dental care***

Minnesota and Alaska have both seen increased access to care in rural regions.<sup>5,9</sup> The high percentage of dental provider shortage areas in rural Washington raises the question of whether mid-level providers would also increase access to care in rural regions of Washington.<sup>8</sup> Minnesota's law allows mid-level oral health providers to practice in dental health professional shortage areas.<sup>5</sup> Alaska has conducted targeted recruitment efforts in rural areas of the state.<sup>9</sup> There are no mechanisms such as these within HB 2321 (either allowing mid-level providers to practice in shortage areas or requiring targeted recruitment in rural areas) that would ensure mid-level providers would come from or practice in rural settings. It is possible that mid-level dental providers would choose to practice in FQHCs or other allowable settings in rural areas, but we did not have enough evidence to make this conclusion. Canada found that a majority of dental therapists began practicing in urban settings once practice restrictions were lifted and recruitment began to focus inward on Saskatchewan.<sup>12</sup>

### ***Risk of harm***

We also explored the literature to determine if there are any negative impacts associated with care by mid-level dental providers within their scope of practice. We did not identify any evidence of harm, and as noted previously, we found strong evidence that mid-level dental professionals provide high quality, safe, and effective care.

### ***Supply and demand of dental providers***

We also explored whether creating new mid-level dental professionals would create a supply of dental providers that would outweigh the demand for care and increase unemployment among recent dentist, hygienist, and mid-level dental professional graduates. This question likely requires a much more in-depth and technical exploration; however we did not find any evidence that this scenario has occurred in other regions that have established mid-level dental providers. In addition data indicate that we have historically had, and continue to have, a shortage of dental health providers in Washington. As of July 2014, 34 of Washington's 39 counties contain Federally Designated Health Professional Shortage Areas for dental care. For 32 of these, the entire county is designed as a shortage area.<sup>8</sup>

In addition the Washington State Dental Association's *2012 Dental Workforce Report* indicates that the 2012 ratio of dentists to the population statewide is 71 dentists for every 100,000 Washingtonians. The authors project that this ratio will increase over the next few years and then fall slightly below the current ratio. The projection estimates that there will be 69 dentists for every 100,000 Washingtonians in 2022 and 66 dentists per 100,000 Washingtonians in 2032.<sup>38</sup> These numbers are above the national average of 61 dentists per 100,000 people,<sup>38</sup> but will still be unlikely to meet the state's oral health needs considering that with the current provider to population ratio there is already a provider shortage. In addition these providers are not equally distributed across the state. King County has a ratio of 108 dentists per 100,000 people while Ferry County has only 13 dentists for 100,000 people. Eight counties have less than 5 dentists in the entire county.<sup>38</sup>

The 2013 workforce update completed in collaboration between the Washington Student Achievement Council, State Board for Community and Technical Colleges, and the Workforce Training and Education Coordinating Board indicates that there are significant shortages of mid-level healthcare professionals being educated in Washington. The authors also indicate that the demand for healthcare personnel will likely increase in the coming years as more people get healthcare coverage under the Affordable Care Act and the aging healthcare workforce reaches retirement.<sup>39</sup> Medicaid and Children's Health Insurance Program (CHIP) enrollment grew by over 22% in Washington following open enrollment under the Affordable Care Act. The monthly average enrollment for these programs increased by 251,603 individuals between September 2013 and February 2014.<sup>40</sup> The report also projects a shortfall in the supply of dental hygienists from Washington in the coming years.<sup>39</sup> The 2013 Annual Report published by the Healthcare Personnel Shortage Task Force also projects that there will be a shortfall of both dentists and dental hygienists in the coming years in Washington.<sup>41</sup> Note that these reports are focused on the supply of providers educated in Washington state and do not take provider migration into Washington into account when projecting personnel shortfalls. Migration of oral health providers into Washington may be significant considering the Dental Association's findings that a decreasing percentage of the dentists in Washington are being trained in-state (with only 22% of newly-licensed dentists trained in-state in 2011).<sup>38</sup> The Bureau of Labor Statistics has also predicted that employment of dentists, dental hygienists, and dental assistants nationally is expected to grow faster than the average for all occupations over the next eight years.<sup>42</sup> This also seems to indicate that the supply of providers is unlikely to outweigh the demand if mid-level professions are established.

### *Report to the Legislature*

Section 24 of HB 2321 encourages the American Dental Association and the Washington State Dental Association to study and report to the Legislature on programs in the state that use volunteer dentists and oral surgeons to provide specialty care and explore how these programs can be expanded and financed in underserved areas. We did not analyze the health impacts of this provision due to the time limitations of this review and recognition that any health impacts resulting from a study would be indirect and difficult to assess.

## Annotated References

1. **Bailit HL, Beazoglou TJ, DeVitto J, McGowan T, Myne-Joslin V. Impact of dental therapists on productivity and finances: III. FQHC-run, school-based dental care programs in Connecticut. *Journal of Dental Education*. 2012;76(8):1077-1081.**

Bailit et al. estimate the impact of mid-level dental providers on the finances and productivity of school-based Federally Qualified Health Centers (FQHC) based on theoretical modeling and analysis of a FQHC school-based dental program in Connecticut. They estimate a cost savings of 5% if mid-level dental providers are substituted for dentists in school settings. The authors also indicate that the analyzed clinic has had difficulty recruiting dentists to work in school settings with portable equipment.

2. **Beazoglou T, Brown J, Subhash Ray, Chen L, Lazar V. An Economic Study of Expanded Duties of Dental Auxiliaries in Colorado. American Dental Association, Health Policy Resources Center; 2009.**

Beazoglou et al. cite over ten sources in the background of their report that indicate expanded function dental auxiliaries (e.g. dental hygienists) are associated with greater production, decreased costs, higher practice gross income, high quality of care, increased number of patients seen and the number of procedures completed, and they allowed dentists to work at the top of their scope of practice. The authors also highlight evidence that higher delegation to dental auxiliaries was strongly related to an increase in the number of patients seen each day. The authors collected survey information from 164 private practice dentists in Colorado (43% response rate). Beazoglou et al. found that both dentist hours and dental auxiliary hours generated significantly higher gross billing, more patient visits, and value-added. Value-added is defined as the dollar value of the practice's outputs minus the dollar value of the practice's inputs (e.g. lab expenses and dental supplies). They also found that for every percent increase in these inputs, a larger percentage of these outputs were observed. The data also indicate that higher levels of delegation to dental auxiliaries was associated with increased gross billings, patient visits, efficiency, value-added, and practice net income. The authors do note that they could not control for confounding factors outside of delegation to dental auxiliaries that may also be contributing to these increases. This article is focused on dental auxiliaries such as dental hygienists and dental assistants rather than specifically focusing on mid-level providers with a scope of practice and type of supervision comparable to the professions created by HB 2321. However, this research is still pertinent this health impact review as it indicates that greater delegation to non-dentist providers has positive cost and access outcomes. The larger scope of practice of dental practitioners and dental hygiene practitioners would allow for greater delegation than is currently available in Washington.

3. **Beazoglou TJ, Bailit HL, DeVitto J, McGowan T, Myne-Joslin V. Impact of dental therapists on productivity and finances: II. Federally Qualified Health Centers. *Journal of Dental Education*. 2012;76(8):1068-1076.**

Bailit et al. estimate the impact of mid-level dental providers on the finances and productivity of FQHCs based on theoretical modeling and a convenience sample of FQHCs in Connecticut and Wisconsin. The authors make the assumption that mid-level providers would only provide services to children in FQHCs and conclude that this would lead to a maximum reduction in cost

to the centers of about 6% of child service values. They also estimate that the increase in FQHC clinic dental services for children would be between 1.9 and 2.9%. Bailit et al. indicate that further investigation is needed in order to estimate these figures if mid-level dental providers serve both children and adults.

**4. Beazoglou TJ, Lazar VF, Guay AH, Heffley DR, Bailit HL. Dental therapists in general dental practices: an economic evaluation. *Journal of Dental Education*. 2012;76(8):1082-1091.**

Beazoglou et al. estimate the impact of mid-level dental providers on the finances and productivity of general dental practices based on theoretical modeling. Using this model the authors conclude that in private dental practices there would be a reduction in cost between 0.53% and 5.61% with an estimated increase in utilization of about 1%. The authors conclude that although a solo dental provider could see an increase in their hourly earnings by employing a dental therapist, they would likely see a decrease in their overall income as they would be sharing chair-hours with a dental therapist. This model assumes that dentists would decrease their prices as a result of the cost savings that would result per procedure performed by a dental therapist, and that this price reduction is what would drive the increase in demand (number of patients). This assumed reduction in prices also partially explains the conclusion that private practice dentists would see a decline in personal income. This model looks at all private dental practices, not just those that serve Medicaid and low-income individuals as HB 2321 would require. This model also assumes the practice was not already operating with a demand higher than the supply that could be provided by dentists already working at the practice. The authors also note that a practice employing a dentist could see an increase in revenue if they employed a mid-level provider in place of the dentist.

**5. Minnesota Department of Health, Minnesota Board of Dentistry. Early Impacts of Dental Therapists in Minnesota. 2014.**

As of February 4, 2014 there were 32 licensed dental therapists in Minnesota, six of whom also held certifications in advanced dental therapy. Administrative data indicate that the majority of patients served by these mid-level providers (84%) are enrolled in public insurance programs. Since 2011 when the first mid-level provider was hired, dental therapists have served 6,338 new patients. The authors analyzed patient survey data (n=1,382) collected at 15 clinics employing mid-level dental providers as one way of evaluating the mid-level provider model in Minnesota. Nearly one-third of patients surveyed reported a reduction in wait time for an appointment since the dental therapist was employed, a trend that was stronger in rural clinics. Survey data also indicate that at least some patients have experienced a reduction in travel time to reach their appointment. This trend was also more pronounced in rural areas. The authors did not note if these differences were statistically significant. They also conducted interviews with clinic managers, supervising dentists, and mid-level providers at the sites. Themes from these interviews include: the mid-level providers have increased access to uninsured and publically insured patients, children, medically complex individuals (in part because of cost savings), and other special populations. These interviewees also indicated that having a mid-level provider has likely helped decrease emergency room visits for dental care which helps reduce costs to the state. They also expressed that they have seen significant savings in personnel costs and increased productivity since employing a mid-level provider. The authors indicate that because

state public program reimbursement rates for services provided by mid-level providers is the same as the rates for dentist service, “there is not necessarily an immediate savings to the state on each claim paid; however, the differential between [Department of Human Services] DHS rates and clinics’ lower personnel costs for dental therapists appears to be contributing to more patients being seen.” Note that Minnesota’s statute requires that mid-level dental providers primarily practice in settings that serve low-income and underserved patients or those in dental health professional shortage areas.

**6. Nash DA, Friedman JW, Mathu-Muju KR, et al. A review of the global literature on dental therapists. *Community Dentistry and Oral Epidemiology*. 2014;42(1):1-10.**

Nash et al. conducted an extensive review of the global literature on dental therapists. This article provides a highlight of the information provided in their full report: A Review of the Global Literature of Dental Therapists: In the Context of the Movement to Add Dental Therapists to the Oral Health Workforce in the United States. Nash et al. indicate that the available studies vary in quality and design, but that the literature consistently indicates that the “quality of technical care provided by dental therapists (within their scope of competency) was comparable to that of a dentist and in some studies was judged superior.” The authors cite 17 sources supporting this conclusion. The authors also indicate that they did not find any evidence that care provided by mid-level dental providers is associated with safety issues or harm. The article also highlights evidence that mid-level provider models have increased access to care and provided cost savings to countries which use these providers in school dental programs.

**7. Pew Center on the States. *It Takes a Team: How New Dental Providers Can Benefit Patients and Practices*. Washington DC: The Pew Charitable Trusts;2010.**

The Pew Children’s Dental Campaign contracted with to develop the Productivity and Profit Calculator which can be used to estimate the impact of adding a mid-level provider to a private practice dental team. Using this tool the authors estimate that adding a mid-level dental provider could increase productivity and profitability in solo pediatric dental practices, solo general dental practices, and small-group practices. They estimate increase in productivity between 8% and 51% and increases in profit between 7% and 54% depending on the mid-level provider hired and the characteristics of the private practice. In addition the authors indicate that if these practices increase their Medicaid patient load from 0% to 20% they would see a decrease in profit if they do not hire a dental hygienist, dental therapist, or dental hygiene therapist. However if they hire one of these mid-level providers they can actually see an increase in profit even after increasing their Medicaid patient load. The exact impact on profit is dependent on the Medicaid reimbursement rates and which mid-level provider is hired (with mid-level providers with larger scopes of practice having a more positive impact on profit). Note that HB 2321 would require that mid-level providers only work in practices that have a Medicaid patient load of at least 35%.

**8. Washington State Department of Health website. Federally Designated Health Professional Shortage Areas for Dental Care. 2014; <http://ww4.doh.wa.gov/gis/pdf/dental.pdf>. Accessed October 28, 2014.**

As of July 2014, 34 of Washington’s 39 counties contain Federally Designated Health Professional Shortage Areas for dental care. For 32 of these, the entire county is designed as a shortage area. This indicates that individuals residing in a large part of the state are living in a

county that does not have sufficient oral health providers to meet the needs of the area's population, and that the county bordered only by other counties which are also shortage areas.

**9. Wetterhall S BJ, Burrus BB, Lee JY, Shugars DA. *Evaluation of the Dental Health Aide Therapist Workforce Model in Alaska: Final Report*. Research Triangle Park, N.C.: RTI International 2010.**

Wetterhall et al. conducted an implementation evaluation of the Dental Health Aide Therapist (DHAT) model in Alaska. The evaluators found that the majority of patients who had seen a mid-level provider in the previous 12 months positively responded to questions about communication skills, chairside manner, making young patients feel comfortable, and explaining treatment. The evaluators collected data on the clinical technical performance of these providers both through direct observation of dental care or review of past completed dental work by a dentist who was blinded to the type of provider that had provided the care (either mid-level provide or dentist). They found that deficiencies were occasionally observed in the work completed by both dentists and mid-level providers. In some tasks a greater percentage of work completed by mid-level providers than dentist had deficiencies, though differences in the number of deficiencies between these two providers were not large. In other cases a greater percentage of dental work completed by dentists than mid-level providers had deficiencies. These analyses included small sample sizes and the authors did not report if the number of deficiencies was statistically significantly different between the two provider populations. They authors found that there were few complications following restorations (one complication for the 54 analyzed restorations) and no complications following the 37 extractions completed by mid-level providers. In addition, they identified the following-themes through 65 interviews with supervisory dentists, mid-level providers, other dental staff, community members, and other individuals: mid-level providers served as a role model for their community, that community members appreciated not having to travel so far or wait so long to see a dental provider, few patients refused to be seen by a mid-level provider, and the supervisory dentists interviewed indicated that the mid-level providers' work was technically competent.

**10. Wright JT, Graham F, Hayes C, et al. A systematic review of oral health outcomes produced by dental teams incorporating midlevel providers. *Journal of the American Dental Association*. 2013;144(1):75-91.**

The American Dental Association completed a review of the literature on the impact of mid-level dental providers. Eighteen studies met their inclusion criteria. The authors note that the quality of these studies was poor overall and that many of these publications had high risk of study design bias. Seven of these studies addressed the association between treatment by a mid-level dental provider and cavities. All of these studies showed a consistent trend of a reduction in the severity of cavities for these patients across time. In addition, they reviewed five studies on the impact of these providers on untreated cavities and found that all five studies showed a consistent reduction in untreated cavities across time. The authors of the review do indicate that these studies have a high risk of bias and that they may not be generalizable to the current U.S. population. This led the authors to conclude that in select groups who have received dental treatment by teams that include mid-level providers, the number and severity of cavities decreased over time. The reviewers highlight six studies that reported statistical significance and looked at the cavity outcomes in patients treated by a mid-level provider versus those that did not receive care



recently or who were treated by a private practice dentist. All of these studies showed no statistically significant difference in cavity severity between patients who did not receive recent care, those treated by a mid-level provider, and those treated by a private practice dentist. The researchers included 13 studies that compared untreated dental disease among patients treated by a mid-level provider versus those who did not receive care recently, or who were treated by a dentist. They reported that these studies generally found that populations treated by a mid-level provider had lower levels of untreated cavities than populations without care or who were treated by a private practice dentist. This led the authors to conclude that in select groups treated by teams that included mid-level providers, there was a decrease in untreated cavities compared with that in populations in which dentists provided all treatment. The authors did not find evidence to determine the effect of irreversible procedures provided by mid-level providers on oral diseases other than cavities or cost effectiveness.

**11. Rodriguez TE, Galka AL, Lacy ES, Pellegrini AD, Sweier DG, Romito LM. Can midlevel dental providers be a benefit to the American public? *Journal of health care for the poor and underserved*. 2013;24(2):892-906.**

Rodriguez et al. conducted a review of the literature on the impacts of mid-level dental and medical providers. The authors highlight studies which have found the school-based programs staffed by mid-level dental providers in New Zealand to be effective in controlling and treating cavities. They also point to a study conducted in the United Kingdom (UK) which found the dental therapists in four private practices did not generate enough income to cover the expenses of their employment. The authors indicate that the UK remuneration system is embedded with disincentives to delegate procedures to dental therapists and that these could be mitigated by changing the reimbursement arrangements within practices. The authors also highlight evidence indicating that mid-level dental providers provide safe and effective oral healthcare and high patient satisfaction.

**12. Uswak G, Keller-Kurysh E. Influence of private practice employment of dental therapists in Saskatchewan on the future supply of dental therapists in Canada. *Journal of Dental Education*. 2012;76(8):1092-1101.**

Uswak and Keller-Kurych provide a literature review on the private practice employment of dental therapists in Canada. This article highlights evidence indicating that mid-level providers are effective in improving health outcomes, are safe, and are cost effective. It also highlights the history of the Saskatchewan program and points out that recruitment efforts and insufficient payment incentives have failed to recruit from and fill positions in the more rural areas.

**13. Ahovuo-Saloranta A, Forss H, Walsh T, et al. Sealants for preventing dental decay in the permanent teeth. *The Cochrane Library*. 2013.**

Ahovuo-Saloranta et al. conducted a meta-analysis of the evidence to compare the effects of different types of sealants in preventing cavities in permanent teeth in children and adolescents. They identified twelve trials which evaluate the impact of sealants versus no sealants. The authors conclude that sealants are effective in reducing cavities.

**14. Donaldson AN, Everitt B, Newton T, Steele J, Sherriff M, Bower E. The effects of social class and dental attendance on oral health. *Journal of dental research*. 2008;87(1):60-64.**

Donaldson et al. reference four studies which have found that regular dental attendance is associated with better oral health after adjusting for socioeconomic status (SES). They used data from the 1998 Adult Dental Health Survey in the UK (n=3,817). They developed a statistical model of the relationship between dental care and the number of healthy teeth and included other factors that may impact this relationship in the model (e.g. age, socioeconomic status). The modeling showed that the most important determinants of the number of healthy teeth in adulthood were age, SES, and regular dental care from a provider. The authors conclude that the association between lower SES and worse oral health is partially explained by a pathway indicating that low SES leads to barriers to dental care, which lead to worse attendance (fewer dental visits), and then to fewer healthy teeth. Dental attendance, however, does not account entirely for the relationship between SES and number of healthy teeth.

**15. Grembowski D, Spiekerman C, Milgrom P. Linking mother access to dental care and child oral health. *Community Dentistry and Oral Epidemiology*. 2009;37(5):381-390.**

Grembowski et al. analyzed survey data from the mothers of a random sample of 3,874 children enrolled in Medicaid in Washington state (44% response rate). They found that across all racial/ethnic groups, mothers with a regular source of dental care consistently rated their children's oral health higher than mothers without a regular source of dental care, even after controlling for mother and child characteristics. Past studies have found guardian reports of child oral health to be highly correlated with clinical findings. The authors cite additional evidence indicating that cavity-prevention technologies delivered to mothers effectively reduces bacteria and cavities in their infants.

**16. Locker D. Does dental care improve the oral health of older adults? *Community dental health*. 2001;18(1):7-15.**

Locker conducted a longitudinal study with interview and clinical treatment data collection at baseline and again three years later. At baseline 907 participants provided data a baseline while 611 participants provided information three years later. Locker found that participants who reported that their oral health had improved made significantly more dental visits and received significantly more dental services than those who reported that their oral health had not changed or had deteriorated. This trend remained even after controlling for other factors that impact oral health.

**17. Phillips E, Shaefer HL. Dental therapists: evidence of technical competence. *Journal of dental research*. 2013;92(7).**

Phillips and Shaefer conducted a review of the literature on the technical competence of mid-level dental providers. They found that 21 of the 23 identified publications concluded that mid-level dental providers were technically competent in the assessed procedures. All of the studies that directly compared the performance of mid-level providers and dental students or dentists found that mid-level providers performed at least as well.

**18. Sea Mar Community Health Centers. 2013 Users and Encounters (unpublished data). 2013.**

In response to a request for data from State Board of Health staff, Sea Mar staff provided data on patient demographics, clinic outcomes, and services provided for three counties where their health centers are located. Clinics in Clark, King, and Grays Harbor Counties serve large percentages of traditionally underserved patients. In 2013 Sea Mar had 61,936 total patient encounters in Clark County. Over 35% of patients served were people of color; over 96% earned an annual income below 200% of Federal Poverty Level (FPL); almost 30% had no insurance; and over 67% were on Medicaid, Medicare, or Basic Health Plan. In 2013 Sea Mar had 150,054 total patient encounters in King County. Over 66% of patients served were people of color; 94% earned an annual income below 200% of FPL; nearly 46% had no insurance; and over 45% were on Medicaid, Medicare, or Basic Health Plan. In 2013 Sea Mar had 44,466 total patient encounters in Grays Harbor County. Over 19% of patients served were people of color; over 95% earned an annual income below 200% of FPL; over 25% had no insurance; and nearly 65% were on Medicaid, Medicare, or Basic Health Plan. In addition, in all three counties Sea Mar served migrant/seasonal farmworkers, homeless patients, individuals with limited English proficiency, and veterans.

**19. Yakima Valley Farmworkers Clinic. Toppenish Medical-Dental Clinic: HIR Response (unpublished). 2012.**

In response to a request for data from State Board of Health staff, Yakima Valley Farmworkers Clinic (YVFWC) staff provided data on demographics and health outcomes of patients served at the Toppenish Medical-Dental Clinic. In 2013 this clinic served 16,979 medical, 6,969 dental, and 1,673 program patients. Eighty-three percent of the medical patients and 89% of the dental patients were Hispanic. Ninety percent of the medical patients and 60% of the dental patients earned less than 200% of the federal poverty level. Nearly 30% of the medical patients and over 20% of the dental patients were migrant/seasonal farmworkers or their dependents. Fifty percent of the medical patients and 63% of the dental patients spoke a primary language other than English. Twenty-two percent of both the medical and dental patients were uninsured. Fifty percent of the medical and 65% of the dental patients were insured through Medicaid.

**20. International Community Health Services. 2012 Annual Report. 2012.**

In 2012 ICHS reached 20,017 patients through its clinic services and community outreach efforts. Large percentages of their patients come from traditionally underserved populations. For example, in 2012 65% of ICHS's patients had limited English proficiency and needed interpretation services, 95% were persons of color, 29% were uninsured, and 19% were homeless.

**21. Shi L, Lebrun LA, Zhu J, et al. Clinical quality performance in U.S. health centers. Health Services Research. 2012;47(6):2225-2249.**

Shi et al. analyzed national 2009 data from the Uniform Data System. All FQHCs are required to submit data to this system annually. The researchers found that over 90% of the patients served had incomes below 200% of FPL, about 40% lacked insurance coverage, and about 50% were patients of color.

**22. Albert DA, Ward A, Allweiss P, et al. Diabetes and oral disease: implications for health professionals. *Annals of the New York Academy of Sciences*. 2012;1255(1):1-15.**

Albert et al. highlight conversations from the Diabetes and Oral Disease: Implications for Health Professionals symposium held in New York in 2011. They indicate that prevalence of periodontal disease is significantly higher in individuals with diabetes. In addition they indicate that the systemic inflammation and infections that can result from periodontal disease can in-turn have negative health outcomes particularly for individuals with diabetes.

**23. Chen X, Clark JJJ, Naorungroj S. Oral health in older adults with dementia living in different environments: a propensity analysis. *Special Care in Dentistry*. 2013;33(5):239-247.**

Chen et al. cite 16 studies indicating that community-dwelling older adults with dementia experienced more cavities, tooth loss, and periodontal disease; were less likely to use dentures; and had greater prevalence of oral soft tissue pathology than those without dementia.

**24. Healthy Youth Survey website. Survey Results. 2012; <https://www.askhys.net/>. Accessed October 28, 2014.**

Data from the 2012 Healthy Youth survey indicate that AI/AN 6th graders were more likely than any other racial/ethnic group to report that they had missed school due to a toothache. Over 11% (95% CI 8.7-14.1%) of AI/AN students reported that they had missed school due to a toothache, a significantly higher percent than the white (5.1% [95% CI 4.2-6.0%]) or Asian or Pacific Islander students (5.4% [95% CI 3.6-7.2%]). Black and Hispanic students as well as students who reported their race as “other” or “multiple” also missed school due to toothaches at significantly higher rates than white students.

**25. Oral Health Watch website. Community Dental Clinics/Access Programs in Washington - Sorted by County: Spring 2014. [http://www.oralhealthwatch.org/wp-content/uploads/Community\\_Clinics\\_2011\\_02.pdf](http://www.oralhealthwatch.org/wp-content/uploads/Community_Clinics_2011_02.pdf). Accessed October 28, 2014.**

This matrix outlines the Community Dental Clinics/Access Programs in Washington state. This includes most of the eight dental hygiene school clinics in Washington. The matrix indicates that most of these school clinics accept Medicaid.

**26. U.S. Department of Health and Human Services website. Health Information Technology and Quality Improvement: What are Federally Qualified Health Centers (FQHCs)? . <http://www.hrsa.gov/healthit/toolbox/RuralHealthITtoolbox/Introduction/qualified.html>. Accessed February 18, 2014.**

An FQHC must “serve an underserved area or population, offer a sliding fee scale, provide comprehensive services, have an ongoing quality assurance program, and have a governing board of directors.”

**27. University of Washington School of Dentistry website. Patient Care. <http://dental.washington.edu/dental-care/>. Accessed October 28, 2014.**

The University of Washington website indicates that its Dental Student Clinics provide care at, on average, 40% lower cost than the average for private practices in the greater Seattle area. The website also indicates that the school's Graduate Specialty Clinics provide care for fees 20-25% lower than those charged by the average private practice in the greater Seattle area. The care provided by UW Dentist Faculty Practice is comparable in price to the average private practice in the greater Seattle area. UW also offers greater discounts under the UW Community Dental Plan for Medicaid-eligible adults.

**28. University of Washington School of Dentistry website. DECOD Clinic.**

<http://dental.washington.edu/oral-medicine/patient-care/decod-clinic/>. Accessed October 28, 2014.

Dental Education in the Care of Persons with Disabilities is a program in the UW School of Dentistry that treats persons with severe disabilities. This program provides over 4,500 dental visits per year. The majority of patients are on Medical Assistance.

**29. Washington State Department of Health. *The Health of Washington State: Oral Health*. 2007.**

Data from the 2005 Washington State Smile Survey indicate that among 2nd and 3rd grade students, AI/AN students were more likely than all other racial/ethnic groups to have experienced cavities. Seventy-seven percent of AI/AN students in these grades had experienced cavities, a percent statistically significantly higher than the percent for black and white students. Asian or Pacific Islander and Hispanic students also had significantly higher rates than white students. Black students also had rates higher than white students, but this differences did not reach statistical significance. Behavioral Risk Factor Surveillance System data from 2004 and 2006 indicate that for adults, as household income decreases the risk of experiencing adult tooth loss increases. Adults with an annual income of less than \$20,000 are significantly more likely to experience tooth loss than adults with incomes greater than \$20,000. The rate of adult tooth loss for AI/AN is significantly higher than that for Hispanic, white, and Asian or Pacific Islander adults. Hispanic and black adults also had significantly higher rates of adult tooth loss than white adults. This report by the Department of Health also highlights evidence indicating that oral health impacts general health. For example oral bacteria can cause infection in the mouth or in other parts of the body, infectious oral microbes can lead to several systemic diseases, and oral infections have been associated with “diabetes, cardiovascular diseases, respiratory infections, bacteremia, and adverse pregnancy outcomes.”

**30. Washington State Department of Health. *Smile Survey 2010: The Oral Health of Washington's Children*. 2011.**

Washington data from 2010 indicate that students who are eligible for free and reduced lunches (a proxy for being a part of a low income family) were more likely than their counterparts to have “more decay experience, rampant decay, and treatment needs.” For example, 68% of third grade students eligible for free and reduced lunches had decay while 47% of students who were not eligible had decay. In addition, Head Start preschool students, kindergarteners, and third graders of color and those who spoke a language other than English at home were more likely to have rampant decay than their counterparts. The authors did not report if these differences were statistically significant.

**31. Centers for Disease Control and Prevention website. Washington State Behavioral Risk Factor Surveillance System Data. 2010;**

**[http://apps.nccd.cdc.gov/s\\_broker/WEATSQL.exe/weat/freq\\_analysis.hsrl?survey\\_year=2010](http://apps.nccd.cdc.gov/s_broker/WEATSQL.exe/weat/freq_analysis.hsrl?survey_year=2010). Accessed February 18, 2014.**

Washington state BRFSS data from 2010 indicate that multiracial and Hispanic respondents were significantly more likely to report fair or poor overall health than white respondents. Black, AI/AN, and Hispanic respondents were more likely to have a Body Mass Index (BMI) in the obese range than white and Asian respondents. There was not a large enough sample size to report this measure for Native Hawaiian or Pacific Islander (NHOPI) participants. AI/AN adults were significantly more likely to report currently suffering from asthma than white and Asian respondents. Respondents who identified as AI/AN, multiracial, or as a race other than the categories offered were significantly more likely to report that they had limited activity due to health problems than white, Asian, NHOPI, and Hispanic respondents. AI/AN and Hispanic respondents were less likely than white respondents to have been vaccinated against influenza that year. When considering disparities by income, BRFSS data indicate that low-income populations are significantly more likely than middle- and high-income populations to experience a number of adverse health outcomes such as: adult asthma, heart disease, obesity, diabetes, activity limitation due to health problems, and fair or poor general health.

**32. Kaiser Family Foundation. Putting Women's Health Care Disparities on the Map: Examining Racial and Ethnic Disparities at the State Level. 2009;**

**<http://kaiserfamilyfoundation.files.wordpress.com/2013/01/7886.pdf>.**

The Kaiser Family Foundation has calculated disparity indexes for women for a number of health conditions by state. Researchers calculated the disparity index by comparing the ratio between non-Hispanic white women and women of all other racial/ethnic groups combined. The ratio was calculated using appropriate and available data (e.g. prevalence, incidence, or frequency data). The index reveals that non-Hispanic white women in Washington have higher access to health care services and lower rates of adverse health outcomes such as low birth weight deliveries, cardiovascular disease, diabetes, late or no initiation of prenatal care, and fair or poor health status.

**33. Washington State Department of Health. Health of Washington State Report: Most Recent Report.**

**<http://www.doh.wa.gov/DataandStatisticalReports/HealthofWashingtonStateReport/MostRecentReport>. Accessed October 29, 2014.**

Data from Washington death certificates from 2009-2011 indicate AI/AN and black individuals have significantly higher death rates from stroke than white, Asian, and Hispanic individuals. These data also indicate that stroke deaths increase in a neighborhood as the percent of that population living in poverty increases. Washington BRFSS data from 2008-2010 indicate that American Indian/Alaska Native adults have significantly higher rates of asthma than every other racial/ethnic group. Asthma rates also increase as income decreases. Data from the Washington State Cancer Registry (2008-2010) indicates that AI/AN and black individuals have the highest incidence of colorectal cancer with AI/AN rates being significantly higher than those for white, Asian, and Hispanic populations. These incidence rates are also significantly higher in census

tracks where 20% or more of the population lives in poverty than in tracks where less than 5% of the population lives in poverty. Washington BRFSS data from 2010-2012 indicate that white individuals have significantly lower diabetes rates than AI/AN, black, Hispanic, and Asian individuals. Prevalence of diabetes also increases as household income decreases.

**34. Centers for Disease Control and Prevention website. Washington State Behavioral Risk Factor Surveillance System Data: Oral Health. 2010; <http://www.cdc.gov/brfss/>. Accessed November 4, 2014.**

Washington state BRFSS data from 2010 indicate that black, AI/AN, multiracial, and Hispanic respondents as well as those that reported their race/ethnicity as “other” had higher rates of adult tooth loss than white and Asian respondents. Not all of these differences reached statistical significance, however AI/AN adults reported significantly higher rates of adult tooth loss (51.1% [95% CI 40.7-61.5%]) than white (36.1% [95% CI 35.1 - 37.2%]) and Asian (33.7% [95% CI 27.1 - 40.4%]) respondents. The sample size was too small to report for NHOPI participants. These data also indicate that the likelihood of having an adult tooth extracted increases as income decreases. Respondents with annual incomes less than \$15,000 had nearly two times higher rates of adult tooth loss (51.0% [95% CI 46.1 - 55.9]) than respondents with incomes over \$50,000 per year (27.0% [95% CI 25.7 - 28.3]).

**35. Vargas CM, Arevalo O. How Dental Care Can Preserve and Improve Oral Health. *Dental Clinics of North America*. 2009;53(3):399-420.**

Vargas and Arevalo highlight evidence that oral health impacts overall systemic health. They outline study findings that indicate that periodontal diseases are risk-factors for coronary heart disease, can hinder diabetes control, and increase risk for pneumonia. They also include evidence on the association between poor oral health and kidney disease, preterm and low birth weight babies. The article also indicates that untreated dental disease tends to follow a “downward spiral” of increasingly worse oral health, and the need for more complex and expensive treatment.

**36. Akar H, Akar GC, Carrero JJ, Stenvinkel P, Lindholm B. Systemic consequences of poor oral health in chronic kidney disease patients. *Clinical journal of the American Society of Nephrology : CJASN*. 2011;6(1):218-226.**

Akar et al. outline studies which have found associations between periodontitis (oral inflammation) and coronary heart disease and cerebrovascular disease (which impacts circulation of blood to the brain). The authors also indicate that poor oral health is associated with complications in chronic kidney disease such as protein-energy wasting, infections, and arterial diseases. The articles highlights evidence indicating that several chronic conditions (as well as their treatments) can lead to poor oral health. However, they also indicate that the literature (and physiological mechanism) supports that infections in the mouth can lead to negative health consequences throughout the body. For example, poor oral health can lead to bacteremia (the presence of bacteria in the blood) which can then transport bacteria to other parts of the body such as the heart. Oral bacteria may also be breathed into the lungs which can lead to respiratory infections such as pneumonia.

**37. Mertz E, Glassman P. Alternative practice dental hygiene in California: past, present, and future. *Journal of the California Dental Association*. 2011;39(1):37-46.**

In California Registered Dental Hygienists in Alternative Practice (RDHAP) are authorized to practice independently (with a “dentist on record” on file for referral, consultation, and emergency services) in under-served settings. Mertz and Glassman highlight findings from a 2005 survey of 2,776 registered dental hygienist (response rate 73%) and 10 RDHAPs (response rate 92%). The survey data indicate that RDHAPs are significantly more likely than registered dental hygienists to be black, Hispanic, or Native American and also to be able to communicate with patients in a language other than English. RDHAPs (88.4%) were significantly more likely to express a desire to work with “disadvantaged patients” than registered dental hygienists (28.1%). RDHAPs (94.9%) were also significantly more likely to indicate that improving access is important (66.5%). The authors speculate that the fact that RDHAPs must work in underserved communities attracts individuals to the profession that are likely to have a desire to work with these populations.

**38. Washington State Dental Association. *2012 Dental Workforce Report*. 2013.**

The Washington State Dental Association compiled data from several sources to highlight past and current workforce numbers as well as to project future trends. The report indicates that the number of female dentists is growing. Twenty-five percent of the state's licensed dentists are female, 41% of the newly-licensed dentists in 2011 were female. The authors also indicate that the racial/ethnic diversity of the dental workforce in Washington has been increasing over time. The report also indicates that the 2012 ratio of dentists to the population statewide is 71 dentists for every 100,000 Washingtonians. The authors project that this ratio will increase over the next few years and then fall slightly below the current ratio. The projection estimates that there will be 69 dentists for every 100,000 Washingtonians in 2022 and 66 dentists per 100,000 Washingtonians in 2032. These numbers are above the national average of 61 dentists per 100,000 people. These providers are not equally distributed across the state. While about 84% of Washingtonians live in urban areas, 92% of dentists practice in urban areas. King County has a ratio of 108 dentists per 100,000 people while Ferry County has only 13 dentists for 100,000 people. Eight counties have less than 5 dentists in the entire county. In addition the percentage of dentists who practice in a rural area increases with the increasing age of the dentists. While 12% of 70-74 year olds practice in rural areas only 4% of 25-29 year olds practice in these areas. This indicates that as dentists retire rural regions may have even fewer providers. In addition, the report indicates that while the number of University of Washington dental graduates who have gone to work in Washington has remained fairly stable, the percentage of newly-licensed dentists who were trained out of state has increased dramatically. Only 22% of newly-licensed dentists were trained in-state in 2011 versus 33% in 1992.

**39. Washington Student Achievement Council, State Board for Community and Technical Colleges, Workforce Training and Education Coordinating Board. *A Skilled and Educated Workforce: 2013 Update*. 2013.**

The report found that significant gaps exist between Washington’s workforce supply and demand for professions requiring mid-level preparation (more than one year but less than four years of postsecondary training/education). The authors indicate that the demand for trained healthcare personnel will likely increase dramatically in the coming years due to increased healthcare



coverage under the Affordable Care Act, an increasingly aging population, and an aging healthcare workforce reaching retirement. There is an expected supply shortfall of dental hygienists and dental laboratory technicians. Note that this report does not take migration into Washington into account in the supply analysis as it is focused on reducing the need to “rely heavily on workers trained in other states and nations.”

**40. Wachino V, Artiga S, Rudowitz R. *How is the ACA Impacting Medicaid Enrollment?* : The Henry J. Kaiser Family Foundation 2014.**

Wachino, Artiga, and Rudowitz outline data released by the Centers for Medicare and Medicaid Services. These data indicate that Medicaid and Children’s Health Insurance Program (CHIP) enrollment grew by over 22% in Washington following open enrollment under the Affordable Care Act. The monthly average enrollment for these programs increased by 251,603 individuals between September 2013 and February 2014.

**41. Healthcare Personnel Shortage Task Force. *Healthcare Personnel Shortage Task Force: 2013 Annual Report.* 2013.**

The Healthcare Personnel Shortage Task Force measures and projects provider shortages in Washington state based on the projected job openings and the number of new entrants completing health care education programs. The 2013 Annual Report indicates that there is an anticipated annual gap between supply and demand of -100 dentists between the expected new annual supply (64 dentists) and the projected annual job openings between 2016 and 2021 (164 dentists). Similarly, the report estimates that there will be a shortage of dental hygienists by 38 hygienists per year. The new supply of hygienist is expected to be 229 providers will the annual net job opening is expected to be 267. These calculations are made based on the supply of providers education in Washington state only and do not account for providers entering Washington who receive their education out of state. The authors also indicate that the impacts of the Affordable Care Act (ACA) were still not fully known at the time the report was drafted, but that they expected that many areas of the state (particularly rural areas) would struggle to find sufficient healthcare personnel as more people gain access to health insurance. However the shortage estimates do not account for the increasing demand expected from the ACA.

**42. United States Department of Labor website. Bureau of Labor Statistics <http://www.bls.gov/home.htm>. Accessed October 28, 2014.**

Employment of dentists is expected to grow 16% between 2012 and 2022, which is faster than the average for all occupations. Employment of dental hygienists is projected to grow 33 percent from 2012 to 2022. Employment of dental assistants is projected to grow 25 percent from 2012 to 2022.